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Preface

This third Environmental Performance Review of Hungary shows that significant progress has been made in decoupling growth from environmental pressures. Hungary, the first EU member state to ratify the Paris Agreement, has shown its commitment to developing a low-carbon economy. Since 1990, its total gross greenhouse gas emissions have decreased by 35% and regulatory frameworks have been strengthened.

However, its energy supply remains largely dependent on fossil fuels and frequent institutional changes and capacity constraints impede more effective implementation of environmental law. To achieve long-term climate-related targets, Hungary needs to improve the energy efficiency of its buildings, further develop renewable energy resources and promote sustainable transport. Air pollution, especially fine particulate matter, is a serious health concern, while surface water quality remains poor despite large-scale investments in wastewater treatment infrastructure.

The review looks in detail at waste management and biodiversity protection. While Hungary has made progress in waste recycling and recovery, more than half of the country's waste is deposited in landfills, a higher proportion than its EU neighbours. Despite efforts to improve resource efficiency, sustainable material management has not yet been integrated into sectoral policies. A whole-of-government approach is needed to facilitate Hungary's transition to a circular economy.

Protecting Hungarian biodiversity, which includes the largest continuous natural grassland in Europe, is also key. Hungary has a well-developed network of protected areas covering over 22% of its territory, exceeding the respective international target. However, their management requires increased public budget support to maintain biodiversity conservation priorities. The country has made progress in integrating biodiversity considerations into policy making for agriculture, forestry and fisheries sectors, but more efforts are needed to mainstream biodiversity protection into energy, transportation, tourism and industry strategies.

This review is the result of extensive policy dialogue between Hungary and the other members and observers of the OECD Working Party on Environmental Performance. It presents 36 recommendations to help Hungary to advance towards a greener, low-carbon economy, to better manage its natural assets and to improve its environmental governance and management.

I am confident that this collaborative effort will support Hungary as it continues to design, deliver and implement better environmental policies for better lives.

Angel Gurría

Secretary-General, Organisation for Economic Co-operation and Development (OECD)

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 Hungary's environmental performance since the second review in 2008. 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 Hungary's historical environmental record, present state of the environment, physical endowment in natural resources, economic conditions and demographic trends.

The OECD is grateful to the government of Hungary for its co-operation in providing information, for the organisation of the review mission to Budapest (29 May to 2 June 2017) and for facilitating contacts both inside and outside government institutions.

Thanks are also due to the representatives of the two examining countries, Andrea Nouak (Austria) and Bogusława Brzdąkiewicz (Poland).

The authors of this report were Carla Bertuzzi, Ivana Capozza, Nathalie Cliquot and Eugene Mazur from the OECD Environment Directorate and Rachel Samson of Carist Consulting. Nathalie Girouard provided oversight and guidance. Carla Bertuzzi also provided statistical support; Annette Hardcastle and Natasha Cline-Thomas provided editorial and administrative support; and Mark Foss copy-edited the report. Preparation of this report also benefited from comments from several members of the OECD Secretariat, including Katia Karousakis of the Environment Directorate, Jens-Christian Hoj and Paul O'Brien of the Economics Department, Kurt van Dender and Luisa Dressler of the Centre for Tax Policy and Administration, and Juan Casado Asensio of the Development Co-operation Directorate.

The OECD Working Party on Environmental Performance discussed the draft Environmental Performance Review of Hungary at its meeting on 13 February 2018 in Paris, and approved the Assessment and Recommendations.

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Reader's guide

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, Latvia, 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: Hungarian forint (HUF)

In 2017, EUR 1.00 = HUF 309.26; USD 1.00 = HUF 275.09

In 2016, EUR 1.00 = HUF 311.41; USD 1.00 = HUF 281.52

In 2015, EUR 1.00 = HUF 309.80; USD 1.00 = HUF 279.33

Cut-off date

This report is based on information and data available up to December 2017.

Disclaimer

* 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.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Abbreviations and acronyms

C&D	Construction and demolition
CAP	EU Common Agricultural Policy
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO_2	Carbon dioxide
CSR	Corporate social responsibility
DAC	Development Assistance Committee
DMC	Domestic material consumption
EEEOP	Environment and Energy Efficiency Operational Programme
EGS	Economy Greening Scheme
EHIR	Electronic Waste Information System
EIA	Environmental impact assessment
ELD	Environmental Liability Directive
EMAS	EU Eco-Management and Audit Scheme
EMS	Environmental management system
EPR	Extended producer responsibility
ESD	Effort Sharing Decision
ETS	Emissions Trading System
EU	European Union
EV	Electric vehicle
GDP	Gross domestic product
GEFS	Green Economy Financing Scheme
GHG	Greenhouse gas
GIS	Geographic information system
GMO	Genetically modified organism
GNI	Gross national income
GO	Government office
GPO	Green Point Office
GPP	Green public procurement
HCSO	Hungarian Central Statistical Office
HFC	Hydrofluorocarbon
HIR	Waste Management Information System
HNVA	High nature value area
IFKA	Industrial Development Coordination Agency
IPPC	Integrated pollution prevention and control
KIC	Knowledge and Innovation Community
LULUCF	Land use, land-use change and forestry
METÁR	Hungarian Renewable Energy Support Scheme
MoA	Ministry of Agriculture
MSW	Municipal solid waste
NAC	National Adaptation Centre
NBMS	National Biodiversity Monitoring System
NCCS	National Climate Change Strategy
NEC	National Emission Ceiling

NEP	National Environmental Programme
NETIS	National Environmental Technology Innovation Strategy
NFSSD	National Framework Strategy on Sustainable Development
NGO	Non-governmental organisation
NH_3	Ammonia
NHKV	National Organiser of Waste and Asset Management
NKFI	National Research, Development and Innovation Fund
NMVOC	Non-methane volatile organic compound
NO_x	Nitrous oxides
NPCR	National Plans for Collection and Recovery
NREAP	National Renewable Energy Action Plan
NWMD	National Waste Management Directorate
NWMP	National Waste Management Plan
NWMPSP	National Waste Management Public Services Plan
ODA	Official development assistance
OKIR	National Environmental Information System
OKT	National Environmental Council
OP	Operational programme
PM	Particulate matter
PNA	Protected natural area
PPP	Purchasing power parity
PRO	Producer responsibility organisation
R&D	Research and development
RBMP	River basin management plan
RDP	Rural Development Programme
SCI	Site of Community Importance
SDG	Sustainable Development Goal
SEA	Strategic environmental assessment
SMEs	Small and medium-sized enterprises
SO_X	Sulphur oxides
STAR	State Territorial Administration Reform
TFC	Total final energy consumption
TPES	Total primary energy supply
UNWTO	UN World Tourism Organization
VAT	Value-added tax
WEEE	Waste electrical and electronic equipment
WHO	World Health Organization

Basic statistics of Hungary

2016 or latest available year* (OECD values in parentheses)[a]

PEOPLE AND SOCIETY					
Population (million)	10	(1 286)	Population density per km²	105	(35)
Share of population by type of region:			Population compound annual growth rate, latest 5 years (%)	-0.3	(0.6)
Predominantly urban (%)	18	(48)	Income inequality (Gini coefficient)	0.29	(0.32)
Intermediate (%)	63	(27)	Poverty rate (% of population with less than 50% med.income)	10	(11)
Rural (%)	19	(25)	Life expectancy	76	(81)
ECONOMY AND EXTERNAL ACCOUNTS					
Total GDP (HUF, billion)	35 005		Imports of goods and services (% of GDP)	82	(29)
Total GDP (USD, billion, current PPPs)	262	(53 867)	Main exports (% of total merchandise exports)		
GDP compound annual real growth rate, latest 5 years (%)	1.9	(1.8)	Electrical machinery, equipment and parts thereof; television image and sound recorders and reproducers, and accessories	20	
GDP per capita (1 000 USD current PPPs)	26.9	(42)	Nuclear reactors, boilers, machinery, mechanical appliances, etc.	19	
Value added shares (%)			Vehicles other than railway or tramway rolling-stock, and accessories	18	
Agriculture	4	(2)	Main imports (% of total merchandise imports)		
Industry including construction	32	(25)	Electrical machinery and equipment and parts thereof; television image and sound recorders and reproducers, and accessories	20	
Services	64	(73)	Nuclear reactors, boilers, machinery, mechanical appliances, etc.	17	
Exports of goods and services (% of GDP)	91	(29)	Vehicles other than railway or tramway rolling-stock, accessories	10	
GENERAL GOVERNMENT					
Percentage of GDP					
Expenditure	47	(41)	Education expenditure	5.2	(5.2)
Revenue	46	(38)	Health expenditure	5.3	(7.8)
Gross financial debt	97	(112)	Environmental protection expenditure	1.2	(0.5)
Fiscal balance	-1.9	-(2.8)	Environmental taxes (2014): (% of GDP)	2.6	(1.6)
			(% of total tax revenue)	6.8	(5.2)
LABOUR MARKET, SKILLS AND INNOVATION					
Unemployment rate (% of civilian labour force)	5.1	(6.3)	Patent applications in environment-related technologies (% of all technologies)[b]	7	(11)
Tertiary educational attainment of 25-to-64 year-olds (%)	23.7	(35.7)	Environmental management	4	(4)
Gross expenditure on R&D, % of GDP	1.4	(2.4)	Water-related adaptation technologies	0.5	(0.5)
			Climate change mitigation technologies	5	(9)
ENVIRONMENT					
Energy intensity: TPES per capita (toe/cap.)	2.6	(4.1)	Road vehicle stock (veh./100 inhabitants)	40	(68)
TPES per GDP (toe/1 000 USD, 2010 PPPs)	0.11	(0.11)	Water stress (abstraction as % of available resources)	4	(10)
Renewables (% of TPES)	11	(10)	Water abstraction per capita (m³/cap./year)	506	(812)
Carbon intensity (energy-related CO_2):			Municipal waste per capita, (kg/capita)	379	(520)
per capita (t/cap.)	4.3	(9.2)	Material productivity (USD, 2010 PPPs/DMC, kg)	2.3	..
per GDP (t/1 000 USD, 2010 PPPs)	0.18	(0.24)	Land area (1 000 km²)	91	(34 404)
GHG intensity:[c]			% of arable land and permanent crops	51	(12)
per capita (t/cap.)	6.2	(12.0)	% of permanent meadows and pastures	8	(23)
per GDP (t/1 000 USD, 2010 PPPs)	0.26	(0.32)	% of forest area	23	(31)
Mean pop. exposure to air pollution ($PM_{2.5}$), g/m³	22.4	(14.5)	% of other land (built-up and other land)	18	(33)

* Values earlier than 2010 are not taken into consideration.

a) OECD value: where the OECD aggregate is not provided in the source database, a simple OECD average of the latest available data is calculated.

b) Higher-value inventions that have sought patent protection in at least two jurisdictions. Average of latest three years.

c) Excluding emissions/removals from land use, land-use change and forestry.

Source: Calculations based on data extracted from databases of the OECD, IEA/OECD, EUROSTAT and the World Bank.

Executive summary

Hungary needs to speed up transition to a low-carbon economy

Hungary has made significant progress in decoupling its output growth from main environmental pressures, largely due to implementing requirements of European Union (EU) directives. The country has gradually reduced its reliance on coal and natural gas in favour of low-carbon energy sources. However, fossil fuels still make up about 70% of the energy supply. The recent rebound of economic activity and energy consumption is intensifying pressures on the natural environment.

The share of renewable energy sources in gross final energy consumption is likely to exceed the national 2020 target of 14.7%. As the renewable energy supply relies heavily on biomass, the country should consider focusing on developing other renewable sources such as solar or geothermal energy.

Hungary's total gross greenhouse gas emissions have decreased by 35% since 1990. Yet emissions have recently started to increase, driven by transport and agriculture. Hungary was the first EU member state to ratify the Paris Agreement. However, its National Climate Change Strategy does not manifest climate policy ambition beyond EU requirements. According to government projections, the country is on track to reach its 2020 and 2030 targets for sectors outside the EU Emissions Trading System with existing measures. However, further progress in energy savings, development of renewable energy resources and sustainable transport is needed in the context of economic recovery.

More needs to be done to address air and water pollution

Local air quality has not improved significantly, making Hungary's mortality rates due to air pollution exposure among the highest in the OECD. The average exposure of Hungarian citizens to fine particulate matter is more than double the annual guideline limit set by the World Health Organization. The government needs to do more to address particulate emissions and meet the respective EU targets for 2020 and 2030.

EU funds have helped increase wastewater infrastructure investment. As a result, the share of population connected to wastewater treatment reached 78% in 2016. However, this share remains one of the lowest in the OECD. Most rivers have a bad to moderate ecological status due to pollution from agriculture and wastewater discharges.

Environmental authorities should be strengthened and encouraged to adopt best regulatory practices

Over the last decade, Hungary has undergone a broad, multi-phase, administrative reform that has consolidated central and territorial government bodies. This process has had an impact on the institutional capacity in the environmental domain. The recent changes in the institutional framework, including the elimination of environmental inspectorates,

have created challenges that impede more effective implementation of environmental law and uptake of good international practices. Environmental authorities should introduce risk-based planning and targeting of environmental inspections, and promote compliance and green business practices through sector-specific activities.

Legal provisions for environmental democracy need better implementation

Despite Hungary's strong legal guarantees on access to information, public participation in decision making and access to justice on environmental issues, regress has occurred in these domains. Public consultation in environmental law-making and environmental impact assessment of large government-sponsored infrastructure and industrial projects is insufficient. Access to justice is complicated by restrictions on legal standing of individuals and non-governmental organisations, and the high cost of administrative and judicial appeals. Hungary's environmental democracy practices must comply with its constitutional requirements and international commitments.

Green taxes could provide additional revenue for much-needed investment

Hungary has long applied a wide range of environmentally related taxes and charges and has further extended their use. However, their design needs to be improved, and their rates should be better aligned with environmental costs. Rates should also be regularly increased to provide stronger incentives for sustainable consumption, resource efficiency and pollution abatement, as well as to maintain revenue.

The country needs significant investment in residential energy efficiency, renewables, and sound waste and material management. To meet these needs, it should make better use of economic instruments and scale back state aid to environmentally harmful sectors. At the same time, it could improve efficiency in using the EU structural and investment funds to extend access to basic services, better leverage investment in the business sector, invest in research and development and education, and better target social programmes.

Progress in municipal solid waste management, but resource efficiency and recycling need further improvement on the path to a circular economy

Hungary has achieved decoupling of waste generation from economic growth, especially for municipal waste. In another achievement, the rate of recycling and recovery has increased since 2006, although it remains low compared to neighbouring EU countries. Landfills not complying with EU standards were closed by 2009. However, most waste (54%) still ends up in landfills. The country should reinforce incentives, including economic instruments, for municipalities to strengthen waste management performance.

Hungary has taken steps to improve the resource efficiency of its economy. There are ongoing efforts to include resource efficiency and circular economy considerations into some sectoral policies. However, the Hungarian government perceives the transition to a circular economy as an aspect of waste management. There is limited consideration of other circular economy aspects such as sustainable material management. A whole-of-government approach would help Hungary to steer the transition to a circular economy.

The expansive network of protected areas requires better management and financing

Hungary has surpassed the Aichi target, with protected areas covering over 22% of the territory. It was one of the first EU member states to have its Natura 2000 network of protected areas declared complete. However, work remains to complete management plans for all the protected areas: only 10% of protected areas had binding management plans in 2016. The most significant issue is the lack of public financing for National Park Directorates, which are driven to raise money from ecotourism and organic farming in protected areas to fund operations. Hungary should provide dedicated budgets for the management of protected areas to maintain biodiversity conservation priorities.

Biodiversity concerns are well integrated in some sectors, but there is room for improvement in others

Hungary has done well at mainstreaming biodiversity into the strategic plans for agriculture, forestry and fisheries sectors. These sectors are included in the National Biodiversity Strategy and managed under the same Ministry of Agriculture. In the agricultural sector, for example, implementing this strategy requires additional measures to curb pesticide use, limit cultivation of flooded land and significantly increase the share of organic farming. Hungary needs to do more to integrate biodiversity considerations into sectoral strategies for energy, transportation, tourism and industry. It should also improve the effectiveness of spatial planning policies and instruments by developing regional-level biodiversity indicators and using biodiversity experts to support informed decisions.

Assessment and recommendations

The Assessment and recommendations present the main findings of the OECD Environmental Performance Review of Hungary and identify 36 recommendations to help Hungary make further progress towards its environmental policy objectives and international commitments. The OECD Working Party on Environmental Performance reviewed and approved the Assessment and recommendations at its meeting on 13 February 2018. Actions taken to implement selected recommendations from the 2008 Environmental Performance Review are summarised in the Annex.

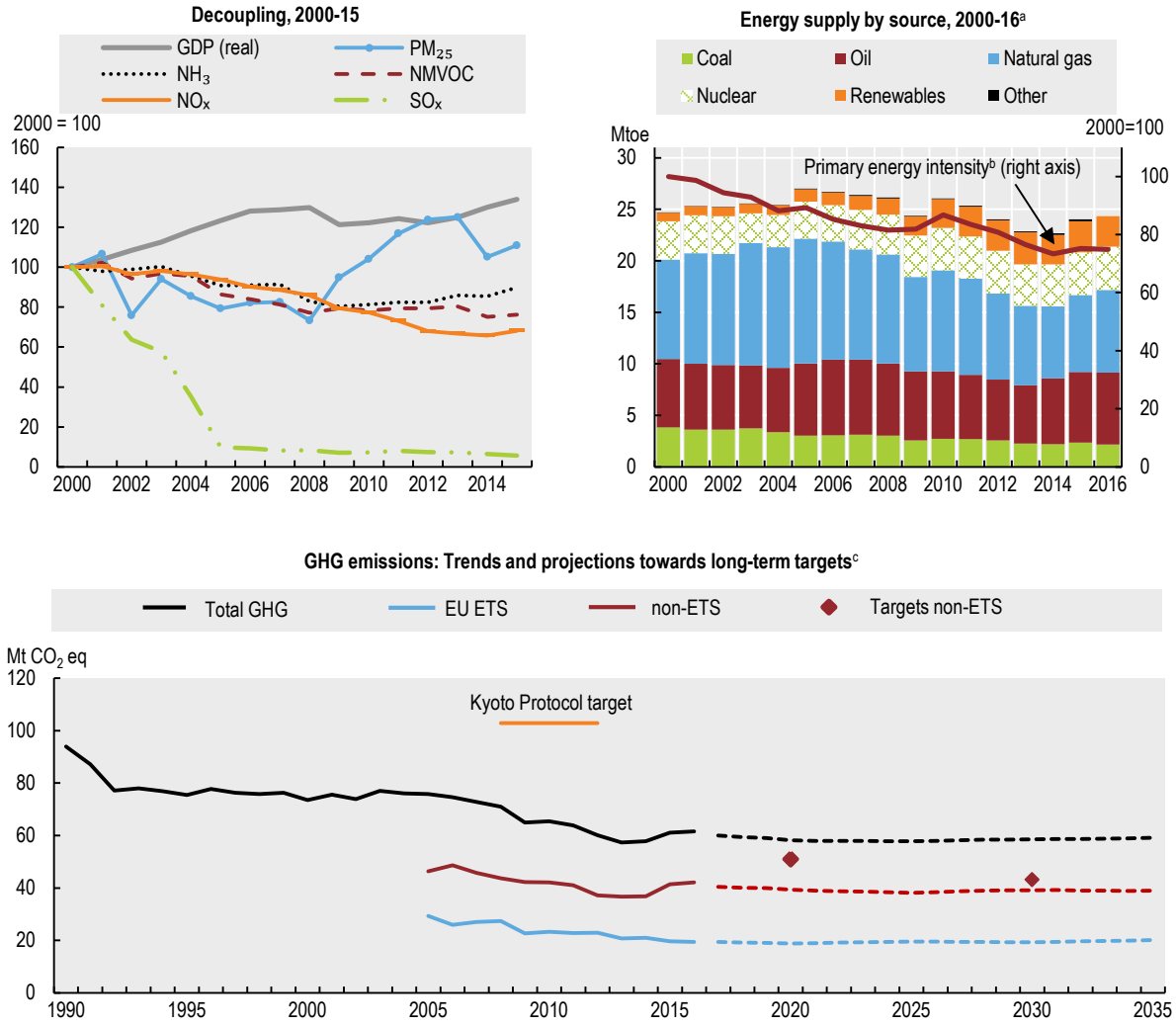
The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

1.1. Environmental performance: Trends and recent developments

After Hungary joined the European Union (EU) in 2004, its economy grew at a faster pace than the OECD average until it was hit by the global downturn. Growth picked up in 2012 and reached its pre-crisis level in 2014. It is expected to continue at a rate above 3.5% in 2017-18. However, convergence of income levels towards the OECD average has stalled since the crisis, reflecting weak productivity growth and low levels of investment (OECD, 2017a). The poverty rate and overall inequality are below the OECD average. They had been rising until 2013 but have started to decrease in recent years. There are wide regional disparities in income levels, employment and access to basic services.

The country has made significant progress in decoupling its output growth from main environmental pressures (Figure 1), largely due to implementing requirements of EU directives. However, the recent rebound of economic activity is intensifying pressures on the natural environment. Energy consumption and greenhouse gas (GHG) emissions have started to pick up. Local air quality has not improved significantly, making Hungary's mortality rates due to air pollution exposure among the highest in the OECD. Despite the growing wastewater treatment coverage of the population, water quality remains at risk from pollution from agriculture and wastewater discharges. Shrinking water flows caused by prolonged droughts aggravate the problem. Most Hungarians are concerned about climate change, air and water pollution, and growing waste generation, recognising them as serious issues (EC, 2015, 2014).

Figure 1. Selected environmental performance indicators



a) Total primary energy supply. Breakdown excludes electricity trade.
b) Index of relative change of total primary energy supply as percentage of GDP at 2010 prices and purchasing power parities.
c) GHG emissions excluding land use, land-use change and forestry (LULUCF). Dotted lines refer to national projections with existing measures. Reduction targets under the Effort Sharing Decision covering most sectors that fall outside the scope of the EU ETS, except LULUCF and international shipping.
Source: IEA (2017), *IEA World Energy Statistics and Balances* (database); OECD (2017), *OECD Environment Statistics* (database); OECD (2017), *OECD National Accounts Statistics* (database); OMSZ (2017), *National Inventory Report for 1985-2015*.

StatLink http://dx.doi.org/10.1787/888933713042

1.1.1. Transition to an energy-efficient and low-carbon economy

Hungary has gradually reduced its reliance on coal and natural gas in favour of low-carbon energy sources. Over 2000-16, the use of coal dropped by 43%, while the use of natural gas fell by 17%. However, fossil fuels still make up about 70% of the energy supply, and the share of oil has started to pick up again (Figure 1). The share of nuclear energy in the total primary energy supply (TPES) has increased since 2000, albeit not as much as its share in power generation, which grew by 25%.

The National Energy Strategy 2030 and the National Renewable Energy Action Plan 2010-2020 aim at reducing Hungary's energy dependence. Specifically, they seek to boost the share of renewable energy sources in gross final energy consumption to 14.7% by 2020 (beyond the EU target of 13%). This share already stood at 14.5% in 2015 (Eurostat, 2017), a threefold increase since 2000, and is likely to exceed the national 2020 target. The increase of renewable energy supply is, however, likely to slow down due to its heavy reliance on biomass (93% in 2016). Further stimulus should focus on developing other renewable sources such as solar, wind or geothermal energy (IEA, 2017).

The National Energy Strategy 2030 also aims at reducing Hungary's energy dependence by increasing energy efficiency economy-wide. Since 2000, primary energy intensity has declined by 25% and is now on par with the OECD average. It remains significant, primarily due to the energy-intensive chemical and steel industries, and poor energy efficiency in buildings. Recent measures have led to an improvement of space heating efficiency in the residential sector. However, this sector remains the biggest energy consumer, with 80% of the building stock lacking modern and efficient heating systems. Energy consumption in the transport sector has grown the fastest since 2000 and is expected to continue to increase along with a rapid expansion of the private motor vehicle ownership, which is currently one of the lowest in the OECD. The Transport Energy Efficiency Improvement Action Plan (TEEIAP) and the E-mobility Programme (the Jedlik Ányos Plan) envisage a wide array of measures to enhance the use of electric vehicles (EVs), including tax incentives and subsidies for the purchase of such vehicles (Section 1.3).

Total gross GHG emissions have decreased by 35% since 1990 (Figure 1). About 80% of this reduction came from the power sector due to the change in the fuel mix. Other factors included the restructuring of the chemical industry and modernisation of the building stock. Yet emissions have recently started to increase: in 2015, they grew by almost 6% over the previous year, driven by transport and, to a lesser extent, agriculture. According to government projections, the country is on track to reach its 2020 and 2030 targets for sectors outside the EU Emissions Trading System (ETS) with existing measures. However, further progress in energy savings, development of renewable energy resources and transport are needed in the context of economic recovery and the recent increase in GHG emissions.

Hungary was the first EU member state to ratify the Paris Agreement. The first National Climate Change Strategy (NCCS) for 2008-25 aims at further reducing GHG emissions through improved energy efficiency in buildings, the use of renewable energy sources, increased environmental sustainability of transport and afforestation. The second NCCS to 2030, with an outlook to 2050, awaiting parliamentary approval, will include a National Decarbonisation Roadmap and a National Adaptation Strategy. These will be supported by a Climate Change Action Plan to monitor implementation. However, the second NCCS does not manifest climate policy ambition beyond EU requirements or set national emission reduction targets.

Hungary is vulnerable to flooding caused by extreme climate events, with a quarter of the territory and 18% of the population exposed to flood risks. Since 2008, the country has taken measures to address flood risks. It adopted a national Flood Risk Management Plan, completed the High Water Riverbed Management Plan and constructed emergency storage reservoirs. Hungary also needs to strengthen measures to address droughts, which affect both the quality and quantity of groundwater resources.

Hungary has reduced emissions of sulphur and nitrogen oxides, ammonia and non-methane volatile organic compounds (NMVOC) significantly since 2000, decoupling them from economic growth (Figure 1). Major drivers of the emission decline have been the shift from coal to natural gas in power generation, technological improvement in heating systems of the residential sector fleet and the reduction in livestock. Hungary has met its 2010 targets under the EU National Emission Ceilings Directive for these pollutants. However, additional efforts will be required to meet the 2020 objectives, particularly for ammonia emissions from agriculture and NMVOC emissions from industry.

Emissions of particulate matter have been increasing significantly since 2000, worsening air quality in Budapest and several towns in northern Hungary. The average exposure of Hungarian citizens to $PM_{2.5}$ is more than double the annual guideline limit set by the World Health Organization (WHO) (EEA, 2016). The cost of premature death in Hungary due to exposure to $PM_{2.5}$ and ozone attained an estimated 9% of gross domestic product (GDP), the second highest value in the OECD (Roy and Braathen, 2017). In 2011, the government launched an Action Programme to reduce PM_{10}. The programme focuses on transport and residential heating, which rely heavily on burning lignite and wood. However, the government needs to do more to address emissions of $PM_{2.5}$ and meet the respective EU targets for 2020 and 2030.

1.1.2. Transition to efficient resource management

Hungary is relatively poorly endowed with raw materials and relies heavily on energy and material imports. Its economy is less resource-intensive than that of other OECD member countries: domestic material consumption (DMC) per capita is significantly below the OECD average, but close to the average for OECD Europe countries. Total DMC decreased by 20% between 2008 and 2016. In terms of material productivity (GDP per unit of DMC), Hungary is below the OECD Europe average. This indicates that the country could use material resources more efficiently to produce wealth.

From 2008 to 2015, total waste generation decreased by 17% while GDP increased by 3%, which is a significant achievement. Hungary has also achieved decoupling between economic growth and municipal waste generation. Material recovery is on the rise for construction and demolition waste and municipal waste. Landfilling is declining, but still accounts for 54% of municipal waste generation (Section 1.4).

Agriculture uses about 60% of the total land area, with important environmental implications. The consumption of nitrogen fertilisers increased between 2000/02 and 2012/14 by 25%, while crop production grew by about 40%. However, the intensity of nitrogen fertiliser use per hectare of agricultural land increased by almost 40%, much faster than in other European countries of the OECD. Sales of pesticides have also increased (by 11% over 2011-15). The share of organic farming in the total farming area increased from 2.4% in 2010 to 3.5% in 2016 (HCSO, 2017). Still, this rate is small compared to other OECD member countries (Section 1.5).

1.1.3. Management of natural assets

Hungary ranks high among OECD member countries in water abstraction per capita. The government recently changed its water pricing policy to reduce consumption and take into account the economic value of the resource. In January 2017, water abstraction charges were extended to all uses, including agriculture.

The share of the population connected to wastewater treatment reached 78% in 2016 thanks to massive EU-funded investment in new treatment facilities and sewerage networks. However, this share remains one of the lowest in the OECD and is uneven across the country. Although better access to wastewater treatment has helped improve water quality, a large proportion of rivers (88%) have a bad to moderate ecological status. Nitrate pollution from fertilisers and resulting eutrophication remain of concern, and nitrate-vulnerable zones cover about 70% of the national territory. In addition, according to national estimates, 38% of the population receives drinking water of unsatisfactory quality.

The National Water Strategy, the pillar of Hungary's water, irrigation and drought management policy, was revised in 2017. It aims at integrating agriculture and nature conservation issues into water resources management, as well as developing climate change adaptation measures. The Fourth National Environmental Programme (NEP) for 2015-20 includes objectives for conservation of water resources and prevention of water pollution.

Over the last decade, Hungary has made several improvements in the area of biodiversity. It was one of the first EU member states to have its Natura 2000 network of protected areas declared complete in 2011. However, most habitats remain in an unfavourable state. Further effort is needed to reduce pressures on biodiversity from land-use change, habitat fragmentation, pollution, invasive species and climate change (Section 1.5).

Recommendations on climate change, air pollution and water management

Climate change

- Strengthen efforts to co-ordinate the implementation, including monitoring and reporting, of energy- and climate-related strategies and action plans; develop ambitious targets for reducing domestic GHG emissions and analyse the economic, environmental and social impacts of different scenarios to achieve them.
- Integrate adaptation concerns into the National Climate Change Strategy and infrastructure investment plans; address the risk of increased flooding and resulting vulnerability of the water supply and sanitation systems through improved engineering and water management practices.

Air quality

- Significantly reduce particulate emissions from solid fuel combustion in residential heating and mitigate related adverse health impacts by introducing more efficient and less polluting heating and cooling systems and better insulation of buildings.

Water

- Reinforce measures to reduce the abstraction of freshwater through enhanced water use efficiency in irrigation and other agricultural practices.
- Reduce diffuse water pollution from agriculture by promoting sustainable use of fertilisers; complement EU funds with increased national public and private investment to upgrade wastewater treatment; increase the share of population connected to the sanitation infrastructure and improve access to drinking water fully compliant with EU requirements.

1.2. Environmental governance and management

Since the 2008 Environmental Performance Review, Hungary has not demonstrated substantial progress in environmental governance. A broad administrative simplification reform since 2010 has consolidated central and territorial government bodies. This process has had a considerable impact on the institutional capacity in the environmental domain. Although the regulatory framework has been strengthened, serious institutional challenges impede more effective implementation of environmental law and uptake of good practices. Certain regress has occurred regarding environmental democracy.

1.2.1. Institutional framework

Hungary has a centralised system of environmental governance, where most powers are exercised by the national government and its territorial institutions. Hungary is one of the few EU member states without a dedicated environment ministry. The environment-related responsibilities are fragmented across several large ministries. The Ministries of Agriculture, National Development and Interior play key roles in the water domain. A major overhaul of the government's territorial institutions has, among other measures, abolished the national and county (regional) environmental inspectorates and divided

permitting and compliance assurance functions between consolidated county and district government offices and, in the water domain, disaster management authorities.

Dismantling of the environment ministry and associated inspectorates coupled with other frequent changes in the institutional framework have led to fragmentation of environmental responsibilities at the national level, policy uncertainty and loss of human resource capacity. Horizontal co-operation between institutions of national and territorial governments, facilitated by the creation of consolidated county and district government offices, has improved in line with a recommendation of the 2008 Environmental Performance Review. However, this happened primarily to compensate for the break-up of the former environment ministry's functions.

1.2.2. Regulatory framework

Hungary has firm constitutional guarantees in the environmental domain. The strengthening of its environmental laws and regulations has been heavily influenced by the transposition of EU directives. Regulatory and policy evaluation tools, including regulatory impact assessment and strategic environmental assessment (SEA), have been used more extensively over the last decade.

The environmental permitting system complies with the EU Integrated Pollution Prevention and Control Directive for high-risk industrial installations. However, there is no coherent regime for regulating lower-impact facilities across environmental media. National, regional, county and local spatial plans consider environmental impact, but SEA in land-use planning is only applied in larger cities or in connection with applications for EU funding.

1.2.3. Compliance assurance

Recent institutional changes have made compliance monitoring and enforcement more complex. District government offices often have insufficient human and technical resources to do the job adequately. The number of inspections has been declining in recent years, which has led to lower rates of detection of non-compliance. The relative risk level (including compliance record) of individual installations is not explicitly considered in inspection planning. Competent authorities do not follow good enforcement practices such as multifactor guidance for application of sanctions. There are no adequate data collection arrangements to track the use and effectiveness of different compliance assurance interventions, including administrative fines.

At the same time, Hungary actively implements its system of strict (i.e. independent of fault) liability for damage to the environment. It has made progress in the remediation of old contaminated sites using budgetary and EU funding. It has also introduced a system of mandatory financial security, but this is currently limited to hazardous waste management. The environmental insurance market is underdeveloped (EC, 2017a).

Environmental authorities do not engage in compliance promotion activities. Although the 2015 National Action Plan on Corporate Social Responsibility (CSR) emphasises environmental performance, there are no voluntary agreements with individual economic sectors on achieving environmental targets. Several CSR initiatives emanate from the business community, but the government does not recognise or reward them. The potential of green public procurement and environmental management systems certifications to promote green business practices and generate economic opportunities is

not fully exploited. For now, there is little domestic market demand for good environmental performance.

1.2.4. Environmental democracy

The government has improved management of environmental information by establishing a data collection and processing network. However, it does not do enough to disseminate it to the public. There are restrictions and fees (since 2011) for accessing environmental information held by public bodies and state-owned enterprises. In addition, civil society has expressed concerns that privately-held environmental information is excessively protected on the grounds of commercial confidentiality. Environmental education is part of the National Core Curriculum. However, Hungary has not fully implemented the 2008 Environmental Performance Review recommendation to ensure environmental training of public servants and justice officials. Despite several targeted campaigns, the public's low environmental awareness remains a challenge.

Hungary has made little progress in implementing the 2008 recommendation to further promote citizen participation in environmental decision making and access to justice on environmental issues. The Deputy Commissioner for Fundamental Rights, Ombudsman for Future Generations – whose role is highly appreciated by civil society groups – has repeatedly raised concerns about environmental democracy in his reports. Public consultations are insufficient on draft environmental legislation. Public participation in environmental impact assessment (EIA) of large government-sponsored infrastructure and industrial projects is also weak (EC, 2017a). Access to justice is complicated by restrictions on legal standing of individuals and non-governmental organisations (NGOs) that limit possibilities to take government agencies to court on environmental matters. The high cost of administrative and judicial appeals also undermines access to justice.

Recommendations on environmental governance and management

Institutional and regulatory framework

- Raise the political profile of the environment by renaming the Ministry of Agriculture as the Ministry of Agriculture and Environment; reduce the fragmentation of policy and regulatory responsibilities in the water domain by consolidating them within that ministry; continue to integrate environmental aspects into other ministries' mandates and enhance horizontal co-ordination at the national level; merge all environmental compliance assurance functions at the territorial level within respective government offices.
- Build capacity of government staff, particularly at the local level, on best practices in implementation of environmental law; enhance the technical resources in support of their functions.
- Streamline and simplify the environmental permitting regime for installations not subject to integrated pollution prevention and control permits; consider introducing sector-specific, cross-media regulations for facilities with low environmental impact.
- Strengthen the implementation of SEA by applying it systematically to all spatial plans and territorial development concepts, as well as to all government policies and programmes with a potential environmental impact.

Compliance assurance

- Introduce risk-based planning and targeting of environmental inspections; enhance the use of economic sector-specific guidance, certifications and recognition awards to promote compliance and green business practices.
- Evaluate the deterrent effect of administrative fines and consider reforming them to account for the economic benefit of non-compliance; develop enforcement policies and guidance for inspectors on proportionate application of sanctions; expand use of financial security instruments such as insurance, security deposits and letters of credit to help enforce liability for damage to the environment.

Environmental democracy

- Enhance opportunities for meaningful public participation as part of environmental rule-making and EIA; restore government funding for environmental NGOs; remove restrictions for individuals and NGOs to access justice on environmental matters and ensure that it is free of charge.
- Make environmental information, including facility inspection records, more accessible to the public online; remove all restrictions and fees for public access to environmental information held by public bodies and review confidentiality-related restrictions of access to enterprise data.
- Strengthen vocational environmental training for public officials; step up environmental awareness-raising campaigns on energy- and climate-related issues, as well as biodiversity protection, and increase budgets for them.

1.3. Towards green growth

Hungary has significant opportunities for accelerating the transition towards a low-carbon, greener and more inclusive economy, especially by investing in residential energy efficiency, renewables, and sound waste and material management (EC, 2017a). To seize these opportunities, it should make better use of economic instruments and scale back state aid to environmentally harmful sectors. At the same time, it could improve efficiency in using the EU structural and investment funds to extend access to basic services, better leverage investment in the business sector, invest in research and development (R&D) and education, and better target social programmes.

1.3.1. Framework for sustainable development and green growth

The government approved the second National Framework Strategy on Sustainable Development (NFSSD) for 2012-24. The government's 2017 second biennial review of the NFSSD recommended that it be harmonised with the Sustainable Development Goals. Hungary has also developed a wide set of sectoral and cross-sectoral strategies, such as the National Environmental Technology Innovation Strategy (NETIS) 2011-20. In 2012, the government approved a decree requiring harmonisation of strategic planning documents and monitoring of their implementation. However, it is not always clear how it ensures coherence across policies to guide action towards a low-carbon, resource-efficient and greener economy.

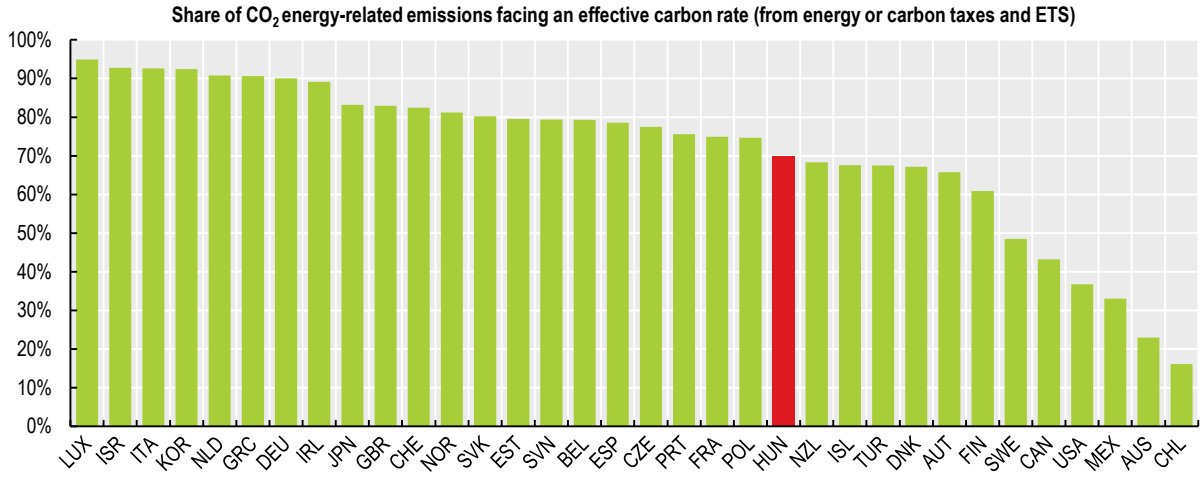
1.3.2. Greening taxes and subsidies

Hungary has long applied a wide range of environmentally related taxes and charges and has further extended their use. In addition to energy and vehicle taxes, which are commonly applied in OECD member countries, Hungary imposes levies on air emissions, water abstraction, water/soil pollution, waste disposed of in landfills and several environmentally harmful products. The revenue from environmental taxes is relatively high in international comparison, although it has grown at a lower rate than GDP and total tax revenue since the mid-2000s. It accounts for about 7% of total tax revenue and almost 3% of GDP. However, these taxes mainly raise revenue; there is no evidence that they have delivered tangible environmental outcomes. Their design needs to be improved, and their rates should be better aligned with environmental costs and regularly increased to provide stronger incentives for sustainable consumption, resource efficiency and pollution abatement, as well as to maintain revenue. Given high spending needs for investment, education and health (among others), and the government's focus on reducing taxes on labour and businesses (OECD, 2016a), additional and less distortive revenue sources such as environmentally related taxes may be appropriate.

The government recently raised tax rates on energy products, but the carbon price signal remains weak. To stabilise revenue from consumption taxes, the standard tax rates on petrol and diesel temporarily increase when the world oil market price is below USD 50/barrel. Tax rates on energy products do not fully reflect the estimated environmental costs of carbon emissions: tax rates on transport fuels are relatively low; rates on other fuels are set at or only slightly above the EU minimum rates; and fuel use in some sectors is fully tax exempt. Tax rates are not systematically adjusted for inflation. All this puts Hungary among the ten OECD member countries with the lowest effective tax rate on energy on an economy-wide basis (OECD, 2015).

In addition to putting a price on carbon via energy taxes, Hungary participates in the EU ETS. However, as in many other countries, the effects of the EU ETS on low-carbon investment in Hungary's energy and manufacturing sectors have been limited. This is due to a systematic surplus of emission allowances, free allocations to the manufacturing sector and low carbon prices in the market. When accounting for both energy taxes and the CO_2 emission allowance price emerging in the EU ETS, about 70% of CO_2 emissions from energy use face a carbon price signal in Hungary (OECD, 2016b). This share is below that observed in many other OECD member countries (Figure 2). In all sectors other than transport, CO_2 emissions are either priced below EUR 30 per tonne of CO_2 (a conservative estimate of the climate costs from 1 tonne of CO_2 emissions) or not at all.

Figure 2. A relatively low share of carbon emissions faces a price signal



Notes: CO_2 emissions from biomass included. Effective carbon rates resulting from specific energy taxes, carbon taxes and emissions trading systems (ETS). Tax rates are as of 1 April 2012, based on OECD (2015), *Taxing Energy Use 2015: OECD and Selected Partner Economies*. ETS prices are from several years (2012, 2014 and 2015).
Source: OECD (2016), *Effective Carbon Rates: Pricing CO_2 through Taxes and Emissions Trading Systems*.

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The structure of vehicle taxes does not fully take into account the environmental performance of vehicles, discourages the renewal of the vehicle fleet and encourages acquisition of second-hand cars. Partly due to these contradictory price signals, the car fleet in Hungary is outdated and more carbon-intensive than the EU average. Removing the tax depreciation for old vehicles and linking vehicle taxes to emission standards would encourage the switch to cleaner cars, including EVs. A company car tax based on emission levels of the vehicle applies at the company level. This provides an incentive to businesses to choose less-emitting vehicles for their company car fleets. However, Hungary is among the few OECD countries that do not tax benefits arising from the personal use of company cars. This tends to encourage private car use and long-distance commuting, potentially leading to higher emissions of GHGs and local air pollutants, noise and congestion (Harding, 2014).

As in many other EU countries, road tolls do not fully reflect the environmental and social costs of infrastructure use. Hungary has put in place a distance-based electronic road toll system for heavy goods vehicles, with tolls based on vehicles' emission standard, and a time-based electronic toll system for passenger and small commercial vehicles (so-called e-Vignette). However, Hungary is the only EU country among those implementing the e-Vignette system that does not differentiate tolls by vehicles' Euro emission class.

Hungary is among the few EU member states that have introduced or increased taxes on pollution and resources in recent years. These taxes account for about 10% of environmentally related tax revenue, well above most other OECD member countries. Some of these, such as the water-related taxes, have a sophisticated design. However, the effectiveness of pollution and resource taxes has generally been limited. Rates are relatively low and not systematically adjusted, and the exemptions and rebates may hinder their effectiveness.

Hungary supports fossil fuel consumption in several ways. These include support for electricity production from coal, for fuel used in agriculture and for residential use of heat (OECD, 2016c). In addition, since 2013 the government has cut prices of natural gas, heating and electricity for households at levels below costs, while raising those for industrial users. This reduces the incentive to invest in the energy sector, including in renewables (IEA, 2017). It undermines the government's efforts to improve energy efficiency in buildings, and contravenes the recommendations of Hungary's own National Energy Strategy to 2030.

Energy price cuts and subsidies for residential use of heat aim to address increasing risks for energy affordability. While these risks are common to other Central and Eastern European countries, they seem to be more acute in Hungary, where over a fifth of households spend more than 10% of their income on energy and fall under the poverty line after paying their energy bills (Flues and van Dender, 2017). However, below-cost energy prices and subsidies for energy use are not an effective way of increasing energy affordability. They risk locking households into fuel poverty, as artificially low prices do not encourage efficient energy use. Moreover, these types of support for energy bills do not target the people most in need. Government-imposed price controls benefit all users, including well-off households. Meanwhile, subsidies for heat consumption mostly benefit people in urban areas, where the natural gas and district heating networks are developed (Tirado Herrero and Ürge-Vorsatz, 2012). These subsidies could be removed, and the resulting budget savings used for cash transfers to poor households.

1.3.3. Investing in the environment to promote green growth

Hungary has significantly benefited from EU structural and regional funds to finance public investment. Over 2007-20, EU funds allocated to Hungary represented 3% of GDP a year, on average. These funds have contributed to considerably increasing public environment-related expenditure since the mid-2000s, including in wastewater, waste and transport infrastructure. However, business environmental investment has declined. This indicates that price signals and financial incentives have not been effective in stimulating private investment to improve energy and resource efficiency in production processes. More generally, a high administrative burden alongside frequent and unpredictable regulatory changes reduce the country's attractiveness to potential investors (EC, 2017b). A wide range of financial support schemes is available to encourage environment-related investment. However, there is high dependence on EU funds for financing both public and business environment-related investment. There is a risk that national and EU funds are not used cost-effectively to finance investment that would occur even without public support.

Investment needs remain high despite increased investment and tangible progress in expanding environment-related infrastructure such as wastewater treatment. The quality of infrastructure varies by region and is perceived to be low relative to local expectations. User fees for water supply, wastewater discharges and waste management have been either frozen or cut in recent years; in most cases, user fees only partly cover the costs of these services. As a result, many water utilities have been struggling to ensure adequate maintenance of the ageing water infrastructure (World Bank, 2015).

Hungary has promoted renewable energy through various forms of financial assistance for capital investment and feed-in tariffs. The new renewable energy support scheme (METÁR), which partly replaced the feed-in tariff system in 2017, is significant progress. However, the development of renewables faces non-financial barriers such as strict

technical requirements for wind energy. The electricity network needs to better integrate increasing renewable generation (IEA, 2017).

There is still significant potential for improving buildings' energy performance. Incentives for energy efficiency in buildings should be better aligned: although the government provides financial support for energy efficiency investment, below-cost end-use prices of energy lead to lower returns on investment in renewables and energy efficiency (IEA, 2017). Recent actions have helped reduce space heating needs and the energy intensity of the residential sector. These include the Warmth of Home programme, local tax incentives, awareness-raising and energy certification of buildings. Additional measures are needed to address non-pricing barriers to adopting energy-efficient technology in industry, transport and buildings.

Most transport investment has been in the road network. While this is needed to meet increasing transport demand, Hungary should ensure investment priorities for transport infrastructure are consistent with long-term climate and environmental objectives. Hungary's TEEIAP foresees investment in, among others, railway electrification and network modernisation, public transport services, bus replacement and bicycle lanes. The 2015 E-mobility Programme (the Jedlik Ányos Plan) aims to extend use of EVs nearly tenfold by 2020. The programme lays out a wide range of measures, including generous subsidies to purchase EVs that tend to support mostly well-off people. Overall, investment needs and financing sources for fully implementing the E-mobility Programme, as well as the programme's impact on electricity generation and cost-effectiveness, are not clear.

1.3.4. Promoting eco-innovation

Hungary has made considerable efforts to improve its innovation system, but R&D investment remains low and the skill base is often inadequate (OECD, 2016a). Focus on eco-innovation has increased, including by targeting environmental technology in strategic documents such as the NETIS. However, eco-innovation performance lags behind. As for other research fields, the government is the main source of funding for environmental research. However, the share of government R&D outlays dedicated to environment-related R&D declined by about 25% between 2008 and 2014/15. On the other hand, research in renewables and energy efficiency attracts nearly the entire small, public energy-related R&D budget. Overall, Hungary spends nearly 5% of its government R&D budget on environment- and energy-related research, lower than the OECD average. Patent applications related to environmental management and climate-change mitigation technologies made up about 7% of all patent applications in 2012-14. This is among the lowest shares in the OECD and below the shares observed in the other countries of the Visegrád Four (Czech Republic, Poland and Slovak Republic).

Similarly, the environmental goods and service sector has grown in Hungary, but seems to be less developed than in most EU countries. A lower percentage of small and medium-sized enterprises (SMEs) produce greener products and services in Hungary than on average in the European Union (EC, 2017a). The government plans to make the green industry more competitive and enlarge environmental markets as part of the 2016 Innovative Industry Development Directions (so-called Irinyi Plan).

Co-ordination among environmental, innovation and education policies remains challenging. The economic efficiency of the environment-related innovation policy and its contribution to improving environmental performance, resource productivity and energy efficiency are not systematically evaluated. As in most OECD member countries,

the policy mix for innovation and eco-innovation is biased towards supply-side measures such as R&D funding. More efforts are needed on the demand side, such as green public procurement, aligning market incentives with environmental objectives and enforcement of environmental legislation. This would help make the green industry more competitive, stimulate innovative investment and enlarge environmental markets.

1.3.5. Contributing to the global environmental agenda

Hungary has a long tradition of international, regional and bilateral co-operation in the environment field, especially to address transboundary issues related to the Danube River Basin. Hungary has an excellent record in signing and ratifying the international environmental agreements to which the European Union is party (EC, 2017a). In line with the OECD Arrangement on Officially Supported Export Credits, Hungarian authorities have developed screening and monitoring procedures to assess the environmental, social and human rights impact of the export projects that are publicly financed.

In December 2016, Hungary joined the OECD Development Assistance Committee (DAC). The volume of its official development assistance (ODA) has almost doubled since Hungary's accession to the European Union. At 0.13% of the country's gross national income (GNI) in 2016, ODA is in line with the efforts of the other Visegrád Four countries. However, it is considerably below the target of 0.33% of GNI by 2030 common to all member states that have joined the European Union since 2002 (OECD, 2017b). Environmental protection and climate change are among the priority areas of Hungary's development co-operation. While modest, ODA flows devoted to address global environmental issues have increased. They focus on adaptation to climate change, mainly on water management infrastructure and flood management. With its good economic and fiscal performance, Hungary has an opportunity to increase its ODA volume, particularly bilateral ODA targeting the environment, in line with international goals and its new DAC membership. It must also ensure systematic evaluation of the environmental and social impact of development co-operation projects.

Recommendations on green growth

Strategic framework

- Ensure alignment of the National Framework Strategy on Sustainable Development with sectoral strategies; develop a framework for monitoring their implementation and progress towards green growth objectives, based on a targeted set of indicators linking economic activity and social welfare with environmental performance.

Price signals

- Improve the design of environmentally related taxes to reinforce their incentive function: i) take advantage of the low world oil price to permanently raise the tax rates on petrol and diesel to levels that reflect the environmental costs of driving; ii) consider introducing a carbon tax on sectors outside the EU ETS; iii) link vehicle taxes to fuel economy and air emission standards and progressively untie them from the age of vehicles; iv) gradually raise the rates of pollution and resource taxes to align them with the environmental costs of pollution and resource use; v) regularly adjust tax rates for inflation.

- Remove incentives to private car use and long-distance commuting; reform the tax treatment of the personal use of company cars and parking spaces; link road tolls for passenger vehicles to the vehicles' emission standards; consider introducing congestion charges in major cities.
- Establish a process for systematic review of environmentally harmful subsidies and regularly evaluate proposals for new subsidies and subsidy removals against their potential environmental, social and economic impacts.
- Re-introduce market-based energy prices and gradually phase out the heat subsidy, while compensating vulnerable groups through social benefits that are not linked to energy consumption.

Green investment and innovation

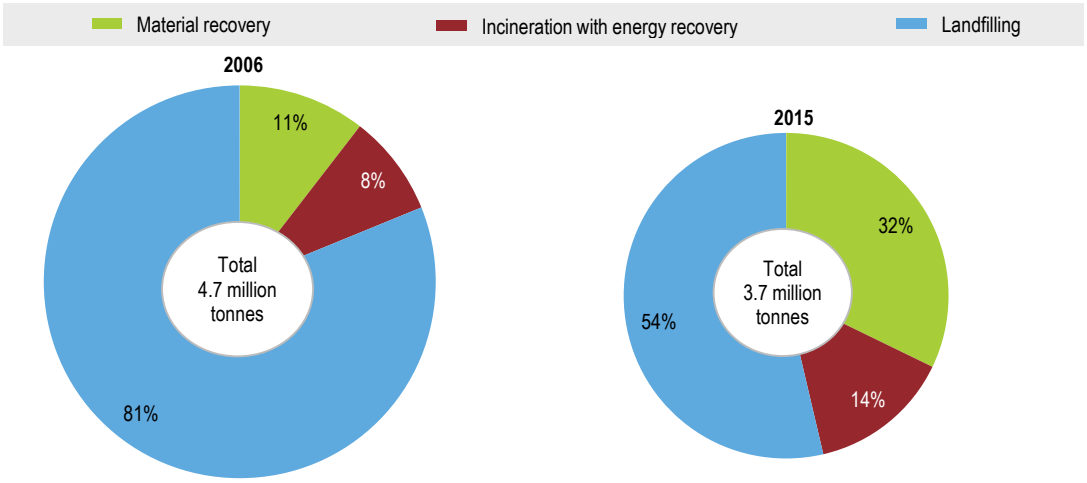
- Increase, better prioritise and enhance the transparency and cost-effectiveness of national public spending on environment-related infrastructure while reducing reliance on EU funds; leverage private funding and revise tariffs for energy and water to ensure better cost recovery.
- Align transport infrastructure investment with long-term environmental objectives; identify investment needs and financing sources for implementing the E-mobility Programme; analyse its impact on electricity generation; compare its cost-effectiveness with other options to reduce GHG emissions from transport.
- Strengthen energy efficiency standards for new buildings; set rules for dividing the costs and benefits of energy efficiency improvements between tenants and landlords; scale up investment in raising energy efficiency of public buildings; develop energy networks to connect additional renewable generation capacity.
- Reduce transaction and administrative costs to facilitate investment decisions in green technology; increase public R&D funding for environment-related innovation and evaluate the efficiency and effectiveness of its allocation; swiftly adopt and implement a national action plan for green public procurement.

1.4. Waste, material management and circular economy

Since the 2008 Environmental Performance Review, Hungary has experienced positive trends for waste and material management. However, its overall performance remains average. The instability of the governance structure and its recent re-centralisation could be counterproductive in fostering further improvements and investments in a circular economy.

Hungary has achieved decoupling of waste generation from GDP, especially for municipal waste. In another achievement, the rate of recycling and recovery has increased since 2006, although it remains low compared to neighbouring EU countries. Landfills not complying with EU standards were closed by 2009. However, most waste (54%) still ends up in landfills (Figure 3). Hazardous waste generation is on the decline despite substantial yearly variations. DMC is low and decreased substantially between 2008 and 2012, mainly due to the economic crisis. However, DMC is now growing quickly in line with the economic recovery.

Figure 3. Municipal waste generation and the share of landfilling have decreased



Note: Household and similar waste collected by or for municipalities, originating mainly from households and small businesses. Includes bulky waste and separate collection. 2006 data include estimates to account for population not served by municipal waste services. As of 2013, 100% of the population is served by municipal waste services.
Source: OECD (2016), "Municipal waste generation and treatment", *OECD Environment Statistics* (database).

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1.4.1. Policy, legal and institutional framework

Hungary's waste management policies are mainly driven by EU objectives and targets. The legal framework for waste management was updated in 2012: the Act on Waste transposes the EU Waste Framework Directive (2008/98/EC), while the Environmental Product Fee Act targets a wide range of environmentally harmful products.

Since 2008, Hungary has centralised and nationalised the waste management system. The central government has progressively taken over the responsibilities of municipalities for establishing waste tariffs and paying public waste service providers. This move risks limiting municipalities' flexibility to tailor waste management services to their needs, possibly slowing down improvements in waste performance.

This major reform coincided with an important reorganisation of the institutional framework at the national level. Administrative responsibilities for waste management have been reallocated on several occasions, and the National Waste Agency has been dismantled. The Ministry of Agriculture is now the leading ministry for waste management and circular economy policies, while the Ministry of National Development oversees municipal waste services. A new central state entity, the National Organiser of Waste and Asset Management Plc., was established in 2016.

The new centralised waste management system was meant to improve implementation of national waste management policies at the local level. However, national objectives and targets are not always well incorporated into local priorities. The elimination of local waste management plans could make it more difficult to address the specific challenges of local territories. Indeed, there are wide discrepancies in performance across counties and municipalities, particularly regarding separate collection of municipal waste.

Regarding the information system for waste and material management, waste and material flows data are collected in line with EUROSTAT requirements. Hungary

monitors some resource-efficiency achievements as part of the NETIS. However, waste and material flows data are not well integrated.

1.4.2. Environmentally sound management of waste, recovery and recycling

Hungary has met its objective to increase diversion of biodegradable municipal waste from landfills. It is on track to recycle half of municipal paper, plastic, metal and glass by 2020. Door-to-door collection systems for municipal paper, plastic and metal waste have been mandatory for municipalities since 2015. This is likely to improve separate collection, which is quite low in many areas of the country. The illegal burning of household waste for heating remains an important issue despite ongoing awareness campaigns.

Regarding hazardous waste, Hungary strengthened control of its transboundary movements by increasing inspections and creating a 24-hour service to detect illegal international shipments. Nevertheless, Hungary experienced several accidents related to questionable hazardous waste management practices during the review period.

The share of landfilling of construction and demolition waste has significantly decreased (by 53% since 2009), while material recovery has increased. Hungary is on track to meet its objective of 70% of material recovery by 2020 for this waste stream. It is now emphasising waste prevention in construction, particularly through selective demolition to remove recyclable and reusable parts of waste.

1.4.3. Economic instruments for waste management

Hungary further expanded use of economic instruments with the introduction of a landfill tax in 2013. The tax successfully diverted construction and demolition waste from landfills, where it has encouraged recovery in backfilling operations. However, the landfill tax rates were frozen at 2014 levels. As landfilling costs remain low, the market signal to divert waste from landfills is insufficient.

Waste management tariffs for households, set at the national level, were first frozen in 2012 and then reduced in 2013 for social reasons. This has raised questions of long-term financing of municipal waste management and capacity of waste businesses to recover their costs when they contribute to public service operations (EC, 2017a).

A state-controlled extended producer responsibility system based on product fees recently replaced producer-funded producer responsibility organisations for packaging, industrial and automotive batteries, and some waste electrical and electronic equipment. For Hungarian authorities, the new system shows positive short-term impacts with more reliable waste management data and enhanced recycling. However, difficult access to waste market information and limited flexibility to adapt to recycling market developments may increase operating costs and be detrimental in the longer term. Companies and operators claim the system has removed incentives for private investments in recycling infrastructure, and that product fees do not reflect the costs of end-of-life management.

1.4.4. The shift to a circular economy

Hungary has taken steps to improve the resource intensity of its economy. There are ongoing efforts to include resource efficiency and circular economy considerations into some sectoral policies. For example, the National Environmental Technology Innovation Strategy includes 17 targets for sustainable resource management to be achieved by 2020.

Some material use and material productivity indicators are included in environmental strategies such as the NFSSD and the fourth NEP. However, these targets are indicative and often remain disconnected from other policy measures and mechanisms.

There are several non-governmental circular economy initiatives and a growing interest in this issue from the private sector. So far, however, the Hungarian government perceives the transition to a circular economy as an aspect of waste management, particularly in terms of increased recycling. There is limited consideration of other circular economy aspects such as sustainable material management. There is no institutional platform dedicated to the circular economy: co-ordination between the Ministries of Agriculture, National Development and National Economy on this issue appears limited.

Recommendations on waste, material management and circular economy

- Introduce a whole-of-government approach through collaboration between relevant ministries to steer the transition to a circular economy; develop a national circular economy action plan with measurable targets and timelines; improve the prominence and visibility of resource efficiency targets and circular economy measures in the Waste Management Plan and the Irinyi Plan on Innovative Industry Development Directions; establish a platform for broader co-operation between businesses, financial institutions and other stakeholders to promote development of a circular economy.
- Design and implement additional incentives for municipalities to strengthen waste management performance and allow for greater flexibility for municipalities in waste management planning; encourage best practice exchanges between municipalities by supporting associations of local authorities or environmental NGOs in developing guidelines, training and best practice recognition initiatives.
- Continue improving door-to-door separate waste collection; introduce deposit-refund or pay-as-you-throw schemes for glass.
- Evaluate the impact of new fixed waste tariffs for households on waste management performance and on the viability of waste management companies and infrastructure projects; consider raising waste tariffs, while compensating vulnerable households for the costs of waste management services; continue increasing the landfill tax to levels initially foreseen to encourage more separate collection and recycling efforts by municipalities.
- Monitor the impact and evaluate the performance of state-operated extended producer responsibility schemes on long-term waste management performance, overall costs and promotion of eco-design of products; ensure that product fees reflect end-of-life management costs, are predictable and encourage private sector investment.

1.5. Biodiversity

Hungary's vast grasslands, caves, rivers and wetlands are home to an abundance of biodiversity, including species that are found nowhere else in the world. The region is particularly significant to birds, with hundreds of thousands using the salt marshes and shallow alkaline lakes to rest and feed during annual migration. The region harbours 17% of the priority species listed in the EU Habitats Directive and 36% of species listed in the

Birds Directive, despite representing only 3% of EU territory. This gives Hungary great responsibility for protecting biodiversity.

1.5.1. Trends and pressures on biodiversity

Like most countries, Hungary did not achieve the objective set by the Convention on Biological Diversity (CBD) to significantly reduce the rate of biodiversity loss by 2010, despite improvement between 2007 and 2013. In 2013, over 80% of Sites of Community Importance remained in an unfavourable state, although Hungary's performance was better than the EU average. The status of forests improved the most, with other habitat types seeing modest improvement. Around 56% of 1 026 natural and artificial water bodies have been classified as at risk from organic, nutrient or priority substances listed under the EU Water Framework Directive (GoH, 2014). Draining of flooded areas, impacts from agriculture and forestry, land-use change, fragmentation from development, municipal effluent, climate change and invasive species are among the greatest sources of pressures to habitats.

The status of species under the EU Habitats Directive improved between 2007 and 2013. However, 62% remain in bad or unfavourable condition. Invasive species are a significant issue, with over 13% of natural or near-natural habitats heavily infested (GoH, 2014).

1.5.2. Strategic and institutional framework

Hungary has a strong legislative framework to support biodiversity, and EU directives continue to heavily influence biodiversity policy. Its National Biodiversity Strategy for 2015-20 is comprehensive and ambitious, with 20 objectives, 69 measurable targets and 168 related actions, including a set of indicators to measure progress. The strategy is linked to the Aichi targets under the CBD, which Hungary has been a party to since 1994. However, the strategy has insufficient influence over other ministries beyond the Ministry of Agriculture. The interim evaluation expected in 2018 will provide an important indication of progress in implementation. International agreements have played a role in influencing biodiversity measures. Indeed, Hungary has prepared its own national regulation to implement the Nagoya Protocol on access to genetic resources and fair and equitable sharing of the benefits from their use. All but one native species listed by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) are strictly protected. Hungary's co-operation with countries sharing the Danube River Basin has also been important to its protection and rehabilitation.

As noted in Section 1.2, Hungary has significantly transformed its governance systems relating to the environment and biodiversity. Biodiversity policy is now the responsibility of the Ministry of Agriculture, following its merger with the Ministry of Environment in 2010. Water management was transferred to the Ministry of Interior. While biodiversity governance is mainly centralised, environment and nature regulatory enforcement has been transferred to consolidated government offices at the county and district levels. This move provides a growing role for local authorities. The merger of biodiversity responsibilities within the same ministry that is responsible for agriculture, forestry and fisheries has resulted in some positive co-ordination benefits. However, the changes have also led to confusion regarding roles and responsibilities and a lack of capacity at district offices. Greater effort is needed for clear overarching policy direction, effective co-ordination across relevant organisations, and monitoring and evaluation of the results of policies and programmes. District offices require more financial and human resources.

There are 50 to 60 NGOs in Hungary working on nature conservation, employing 80 to 120 staff. The Ministry of Agriculture's Green Fund that supports nature conservation activities of NGOs was reduced by one-third between 2011 and 2014 (Thorpe, 2017). In addition, recent legislative changes have increased requirements for NGOs receiving foreign financing. The drop in financing is ill-timed, given the growing need for NGOs to play a role in overseeing progress in nature conservation and fill gaps in government monitoring and evaluation.

1.5.3. Information systems

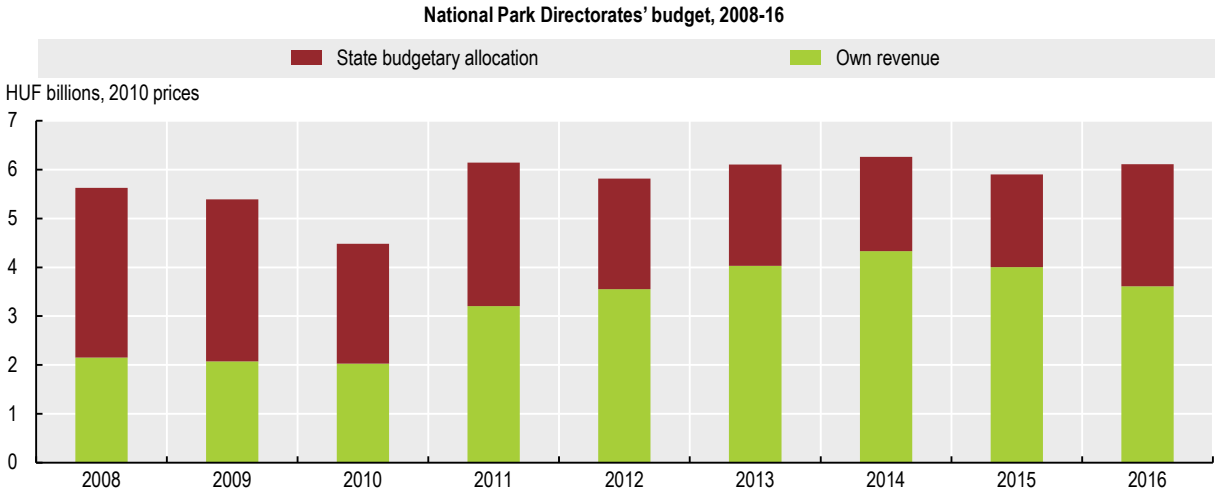
Hungary has a relatively well-developed monitoring system for habitats and species in protected areas. It has made significant investments in the conservation of genetic resources. However, ecological data at the local level, outside of protected areas, is limited. This lack of information can hinder adequate assessment of the impacts of development projects such as transportation infrastructure. Hungary has launched a project to improve data collection, monitoring and research related to biodiversity. It will map and assess ecosystems and their services within and outside protected areas by 2020. This information will be invaluable to support policy making and environmental impact assessments. This could serve as a foundation for the determination of monetary values associated with ecosystem services. With only 10% of Hungarians familiar with the term biodiversity, further effort is needed to improve public awareness. Gaps in the availability and accessibility of data should also be addressed. This should allow for greater involvement of NGOs and academic researchers in the assessment of progress and identification of priorities for action.

1.5.4. Protected areas

Protected areas are the main tool for biodiversity conservation and sustainable use. Hungary has already surpassed the Aichi target to protect 17% of land and inland waters by 2020, with a total protection of over 22% (GoH, 2014). It was one of the first EU member states to have its Natura 2000 network of protected areas declared complete. The proportion of protected grasslands is double the EU average.

The total area protected has remained relatively stable since 2008, but work remains to complete management plans for all the protected areas. While there have been significant improvements since 2008, only 8% to 10% of protected areas had binding management plans in 2016. There is also less coverage of species types than habitat types across protected areas, and a shortage of park rangers. Habitat reconstruction and development have been carried out on 5% of Natura 2000 areas and 10% of nationally protected areas. In addition, some targeted species conservation projects have proceeded with EU funding. Efforts to manage invasive species have taken place within and outside of protected areas. Further effort is needed to improve the status of species in Hungary, both within and outside of protected areas. The most significant issue appears to be a lack of public financing for National Park Directorates. These directorates are driven to expand ecotourism facilities and seek EU subsidies for environmentally friendly farming in protected areas to raise sufficient revenue to fund operations (Figure 4). Programmes outside of protected areas are also very limited.

Figure 4. National Park Directorates increasingly rely on non-budget revenue sources



Source: Country submission.

StatLink http://dx.doi.org/10.1787/888933713099

1.5.5. Economic instruments and other policy tools

Economic instruments that support biodiversity conservation and sustainable use include several taxes, fees and charges for use of protected areas, water use, fishing licences and land conversion. Subsidies encourage good environmental practices in agriculture, forestry and aquaculture. These instruments could be expanded to address pressure on biodiversity from pesticide use.

1.5.6. Financing biodiversity

The Ministry of Agriculture does not allocate an independent budget to the Department of Nature Conservation or the Department of National Parks and Landscape Protection. Capital, county and district government offices receive a general budget with no specified allocation for nature conservation. The National Park Directorates do receive dedicated funding. However, they generate a significant proportion of their budget through revenue raised from environmentally friendly farming eligible for EU agricultural grants and ecotourism.

EU nature conservation funding under the Environment and Energy Efficiency Operational Programme and the Competitive Central Hungary Operational Programme is lower for 2014-20 than for 2007-13. However, it is still significant (HUF 34.3 billion compared to HUF 45.3 billion). The drop in EU funding is due to shifting priorities and the near completion of projects such as nature education facilities. Hungary continues to receive significant funding from the Nature and Biodiversity Component of the EU LIFE programme, with 19 projects financed between 2008 and 2016. Hungary should consider gradually reducing its reliance on EU funds, potentially through revenue raised from new or enhanced economic instruments.

1.5.7. Mainstreaming biodiversity across sectors

Hungary has done relatively well at mainstreaming biodiversity into the strategic plans for agriculture, forestry and fisheries sectors. These sectors are included in the National

Biodiversity Strategy and managed under the same ministry. However, it has been less successful at implementation, and in integrating biodiversity considerations into other sectoral strategies, notably for energy, transportation, tourism and industry.

Agriculture features prominently in the National Biodiversity Strategy. However, additional measures are needed to address ammonia emissions, pesticide use and cultivation of flooded land. While Hungary's preferred policy tools for the agricultural sector are information and subsidy programmes, a shift towards regulation or taxation may be needed if these do not yield results. Subsidies for environmentally beneficial practices should extend to the modernisation of irrigation systems. Hungary has committed to review support policies detrimental to the preservation of agricultural biodiversity. These could include measures supporting flood protection that encourage the drainage of wetlands important to birds and other species. The 2014 Action Plan for Developing Organic Farming sets a target to double the organic farming area by 2020, but this will be difficult to achieve.

Aquaculture production in Hungary grew by almost 35% between 2000 and 2015 (FAO, 2017). Fish farms can help support biodiversity, including the birds and otters that feed from them. However, there are also risks from the escape of non-native species, disease transmission to wild fish, effluents that cause eutrophication and use of ecologically sensitive lands, particularly for intensive aquaculture. The Fisheries Operational Programme of Hungary 2014-20 incorporates objectives related to biodiversity protection, and aquaculture producers are eligible for EU subsidies for conversion to environmentally friendly aquaculture practices.

Hungary's forest area has increased from a low of 11% in the mid-20th century to almost 23% today. The government has set a goal of reaching 25-26% by 2050 (GoH, 2014). However, over 40% of the forest consists of plantations of mainly non-native species, including some that could be harmful to biodiversity. Recent changes to the Forest Act have raised concerns about a weakening of biodiversity safeguards and a shift from sustainable forest management. Afforestation on protected areas can only be done with native tree species, but there are fewer restrictions elsewhere. The proportion of production forest with sustainability certification did, however, increase from zero in 2000 to 25% in 2014. There is potential to further improve coverage (FAO, 2015).

Outside the agriculture, forestry and fishery sectors, a key tool for mainstreaming is spatial planning. Hungary's National Spatial Plan, developed by the Prime Minister's Office in consultation with different ministries, defines specific zones. It provides detailed regulation of development that can take place within each zone. For biodiversity protection, a National Ecological Network includes habitats of national importance and a system of ecological corridors and buffer zones that link the core areas together. In 2016, the network covered an impressive 36.4% of the country. Energy and transport infrastructure is permitted within the zone if technical solutions that ensure the survival of natural habitat and functioning of ecological corridors are incorporated. In practice, however, it is not always clear that biodiversity considerations are given the same weight as economic interests. This may be due to a lack of biodiversity expertise and territorial-level indicators to support decision making.

The network of roads and rail poses a significant cost in terms of habitat loss and fragmentation, estimated at HUF 54 billion per year in 2009 (Lukács et al., 2009). Between 2009 and 2016, Hungary built an additional 394 km of new highways. Biofuels and biomass production for electricity and heat can also encourage agricultural expansion, as well as associated impacts on biodiversity. Hungary is one of the largest

bioethanol producers in the European Union. However, the use of land for conventional biofuel production in Hungary decreased by 4% between 2000 and 2014, while production and sales of biofuels increased significantly. The volume of biomass used for electricity and heat is too small to have a significant impact on land-use change, but future growth in tree plantations could become an issue. It will be important to monitor the impacts of biofuel production on land use and biodiversity regularly, ideally through the development of publicly available indicators.

Tourism is increasingly a pressure on biodiversity in Hungary. Overall visits increased by almost 20% between 2009 and 2016, and there was significant interest in protected areas. There is, however, limited restriction on tourist activities outside of protected areas. Hungary's National Tourism Development Strategy 2030 and the National Environmental Programme emphasise growth in tourism, but without specific measures to address potential negative environmental impacts. Industry can also have a significant impact on biodiversity, as demonstrated by the spill of red sludge from an alumina factory in 2010. The potential for growth in mining and fossil fuel extraction in Hungary also increases the importance of adequate measures to protect vulnerable ecosystems and species in areas of possible development. Better integration of biodiversity considerations into sectoral strategies relevant to industry, with specific commitments and indicators, will be important to limit impacts of growth on biodiversity.

Recommendations on biodiversity protection

Strategic and institutional framework

- Expand the National Biodiversity Strategy to incorporate specific commitments and indicators related to energy, transport, tourism, industry and mining; improve policy coherence and cross-linkage with sectoral strategies and plans; ensure clear accountability for achieving targets; identify financial and human resources for specific actions to achieve targets.

Information systems

- Continue to improve knowledge of the extent and value of ecosystem services and habitat and soil maps within and outside protected areas, sectoral data sharing, and accessibility and communication of information to the public.

Biodiversity protection and financing

- Ensure measures are in place to enhance the conservation status of threatened species, both in and outside protected areas by improving wildlife corridors and restricting infrastructure expansion to reduce fragmentation of habitats.
- Complete management plans of protected areas with legal force and ensure sufficient financial resources for effective implementation; provide dedicated budgets for nature conservation departments to improve the predictability of financing and reduce the risk of shifting short-term priorities; increase budget funding for National Park Directorates to reduce the need for substantial revenue-raising activity that may be contrary to biodiversity objectives.

Mainstreaming biodiversity across sectors

- Implement additional measures in the agricultural sector to reduce ammonia emissions, curb pesticide use and limit cultivation of flooded land; use subsidies and payments for ecosystem services and information provision to promote the modernisation of irrigation systems, nature conservation and restoration activities outside of protected areas; significantly increase the share of organic farming.
- Expand afforestation of indigenous species beyond protected areas; increase sustainability certification of forest companies; maintain sustainable forest management objectives.
- Improve the effectiveness of the National Ecological Network Zone instrument and other spatial planning policies by developing regional-level biodiversity indicators and using biodiversity experts to support informed decisions; avoid destruction of green space and fragmentation of habitat where possible, including in areas with no formal protection.
- Monitor the impact of biofuel and biomass production on land-use change and other factors influencing biodiversity, producing publicly available indicators to help inform decision making; give preference to added-value organic farming over biofuel and biomass production.

References

EC (2017a), The EU Environmental Implementation Review, Country Report – Hungary, Commission *Staff Working Document,* SWD (2017) 46 final, European Commission, Brussels, 3 February 2017, http://ec.europa.eu/environment/eir/pdf/report_hu_en.pdf.

EC (2017b), Country Report Hungary 2017, Commission Staff Working Document accompanying the document "Communication from the Commission to the European Parliament, the Council, the European Central Bank and the Eurogroup 2017 European Semester: Assessment of progress on structural reforms, prevention and correction of macroeconomic imbalances, and results of in-depth reviews under Regulation (EU) No 1176/2011", *Staff Working Document*, SWD (2017) 82 final/2, European Commission, Brussels, https://ec.europa.eu/info/sites/info/files/2017-european-semester-country-report-hungary-en_1.pdf.

EC (2015), "Climate change", *Special Eurobarometer,* No. 435, May-June 2015, European Commission, Brussels, https://ec.europa.eu/clima/sites/clima/files/support/docs/report_2015_en.pdf.

EC (2014), "Attitudes of European citizens towards the environment", *Special Eurobarometer*, No. 416, April-May 2014, European Commission, Brussels, http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_416_en.pdf.

EEA (2016), Air Quality in Europe: 2016 Report*, EEA Report*, No 28/2016, Publications Office of the European Union, European Environment Agency, Luxembourg, www.eea.europa.eu/publications/air-quality-in-europe-2016.

Eurostat (2017), *Shares 2015* (database), http://ec.europa.eu/eurostat/web/energy/data/shares (accessed 20 November 2017).

FAO (2017), FAO Statistics, Global Aquaculture Production website, www.fao.org/fishery/statistics/global-aquaculture-production/en (accessed 18 June 2017).

FAO (2015), Global Forest Resources Assessment 2015 website, www.fao.org/forest-resources-assessment/en/ (accessed 25 June 2017).

Flues, F. and K. van Dender (2017), "The impact of energy taxes on the affordability of domestic energy", *OECD Taxation Working Papers*, No. 30, OECD Publishing, Paris, http://dx.doi.org/10.1787/08705547-en.

GoH (2014), Fifth National Report to the Convention on Biological Diversity – Hungary, Government of Hungary, April 2014, www.cbd.int/doc/world/hu/hu-nr-05-en.pdf.

Harding, M. (2014), "Personal tax treatment of company cars and commuting expenses: Estimating the fiscal and environmental costs", *OECD Taxation Working Papers*, No. 20, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jz14cg1s7vl-en.

HCSO (2017), *STADAT* (database), www.ksh.hu/?lang=en (accessed 25 November 2017).

IEA (2017), *Energy Policies of IEA Countries: Hungary 2017*, IEA, Paris, http://dx.doi.org/10.1787/9789264278264-en.

Lukács, A. et al. (2009), "The social balance of road and rail transport in Hungary", joint study prepared by the Institute for Transport Sciences and the Clean Air Action Group (Hungary), commissioned by the Hungarian Ministry of Economy and Transport in 2008, www.levego.hu/sites/default/files/1988-2015_caag_history.pdf.

OECD (2017a), "Hungary", in *Economic Policy Reforms 2017: Going for Growth*, OECD Publishing, Paris, http://dx.doi.org/10.1787/growth-2017-25-en.

OECD (2017b), *Development Co-operation Report 2017: Data for Development*, OECD Publishing, Paris, http://dx.doi.org/10.1787/dcr-2017-en.

OECD (2016a), *OECD Economic Surveys: Hungary 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-hun-2016-en.

OECD (2016b), *Effective Carbon Rates: Pricing CO_2 through Taxes and Emissions Trading Systems*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264260115-en.

OECD (2016c), Fossil Fuel Support Country Note – Hungary, September 2016, http://stats.oecd.org/wbos/fileview2.aspx?IDFile=37348365-0442-4dd3-8d38-706eb3ad2dfa.

OECD (2015), *Taxing Energy Use 2015: OECD and Selected Partner Economies*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264232334-en.

Roy, R. and N. Braathen (2017), "The rising cost of ambient air pollution thus far in the 21st century: Results from the BRIICS and the OECD countries", *OECD Environment Working Papers*, No. 124, OECD Publishing, Paris, http://dx.doi.org/10.1787/d1b2b844-en.

Thorpe, N. (2017), "Hungary approves strict regulations on foreign-funded NGOs", BBC News, 13 June 2017, www.bbc.com/news/world-europe-40258922.

Tirado Herrero, S. and D. Ürge-Vorsatz (2012), "Trapped in the heat: A post-communist type of fuel poverty*", Energy Policy*, Vol. 49, pp. 60-68, www.sciencedirect.com/science/article/pii/S0301421511006884.

World Bank (2015), Water and Wastewater Services in the Danube Region – Hungary Country Note, May 2015, World Bank and International Association of Water Supply Companies in the Danube River Catchment Area, Washington, DC, http://documents.worldbank.org/curated/en/653681467998782643/Water-and-wastewater-services-in-the-Danube-region-Hungary-country-note.

Annex 1.A. Actions taken to implement selected recommendations from the 2008 OECD Environmental Performance Review of Hungary

Recommendations	Actions taken
Environmental performance: Trends and recent developments	
Further improve the pollution, energy and resource intensities of the Hungarian economy; promote sustainable production and consumption patterns.	Energy and resource efficiency are key elements of the Framework Strategy on Sustainable Development 2012-14, and of the Environmental Technology Innovation Strategy 2011-20. The strategies include resources management and efficiency targets and related monitoring indicators, supporting the implementation of the Sustainable Development Goals.
Identify priority measures for mitigation of and adaptation to climate change based on an analysis of their cost effectiveness; ensure the co-ordinated implementation of the National Climate Change Strategy with energy, transport, agriculture and water policies.	Specific financing schemes have been introduced to support the energy, climate and green growth objectives indicated in the NCCS (e.g. the Green Investment System and Green Financing Schemes). More needs to be done in the areas of co-ordination with sectoral strategies and in the assessment of the costs and related investment needs.
Ensure competitiveness in the energy sector, in the EU context, to improve its environmental and economic performance; take further steps to increase energy efficiency in all sectors of the economy.	Main measures implemented under the National Energy Strategy to 2030 include incentives for more efficient heating systems, improved insulation of buildings in the residential and public sectors; and support of electro-mobility and low-carbon modes of transport. Large enterprises must conduct energy audits every four years. Energy efficiency investments are eligible for a tax allowance. However, the implementation of different objectives across sectors needs to be better co-ordinated and monitored.
Strengthen measures for reducing air emissions, especially from the transport and residential sectors, so as to meet national emission ceilings and limit values for ambient air quality.	The requirements of the EU Air Quality Directive have been transposed into the national legislation and entailed the revision of air quality standards. Hungary reduced emissions of main air pollutants in most sectors, decoupling them from output growth. However, PM2.5 concentrations remain above the WHO standards in many cities, and mortalities rates due to air pollution are among the highest in Europe.
Further develop traffic management in urban areas (e.g. traffic restrictions in city centres, parking and road pricing) and continue to promote integrated public transport in major cities; give municipalities better control over their revenue sources and traffic management tools.	Sustainable urban mobility plans have been developed in most cities, driven by EU financing requirements. Traffic management systems have been introduced in Budapest, Miskolc and Debrecen and include parking fees. The E-mobility Programme also contributes to better transport management.
Speed up implementation of the Drinking Water Quality Improvement Programme, with the aim of having all public water supply comply with drinking water quality limit values.	Despite considerable improvements in the drinking water quality and the increased compliance with the microbiological parameters (95% to 99%), there are still some areas not complying with the requirements of the Drinking Water Directive (e.g. for chemical parameters).
Further strengthen the flood prevention and control efforts; further enhance the ecosystem and land use approach to flood management; develop a flood insurance policy.	Hungary has designed flood hazard maps, a High Water Level Riverbed Management Plan. The development of a Flood Risk Management Plan is ongoing. Water storage reservoirs have been developed along the Tisza river, and further increases of storage capacity for flood emergency management are planned.
Pursue efforts to connect the population to waste water treatment so as to prevent widespread bacterial contamination of large rivers.	The length of the public sewerage network almost doubled since 2000 and the cleaning efficiency of the sewerage network improved. The share of population connected to public wastewater treatment increased to 78% in 2016, albeit unevenly spread across regions. However, it remains one of the lowest rates in the OECD. In 2011, the government passed a regulation requiring compulsory connection of property owners to public sewers.

Environmental governance and management	
Continue to improve inter-institutional co-operation at national and territorial levels of government, and integration of environmental concerns into sectoral policies.	Horizontal co-operation has improved as a result of several reorganisations of the government's central and territorial institutions since 2010. However, the downside of these reforms was fragmentation of environmental responsibilities across ministries and loss of human resource capacity. Several sectoral strategies (Rural Development Strategy, the Energy Strategy 2030 and the Transport Strategy) integrate environmental aspects.
Strengthen the use of economic information and analysis for environmental projects and policies (e.g. cost-benefit analysis).	The Act on Legislation (2010) lays down rules of ex ante impact assessment of all draft bills, government decrees and municipal regulations. This assessment covers, among others, economic and budgetary aspects as well as an estimate of the administrative burden on businesses.
Secure enough financing and staff to the environmental administration and inspectorates to ensure cost-efficient management and enforcement capacity.	The EU and other international donor provide most of the financing for the National Environmental Programme, including its components on human resource development and public administration and public service development.
Further promote citizen participation in environmental decision-making and access to justice concerning environmental issues.	The Acts on Legislation and on Social Participation adopted in 2010 require government agencies to provide opportunities for public input at an early stage in the decision-making process.
Continue to develop, use and disseminate environmental indicators, and promote access to environmental information.	The Freedom of Information Act (2011) defines rules on the protection of personal data and the rights, range and access to data of public interest and its dissemination. However, whereas access to environmental information held by government authorities was free of charge before 2011, the costs of obtaining it have increased significantly since then. To improve access to environmental data, the government has established a data collection and processing network compatible with the European Environment Information and Observation Network (EIONET).
Pursue environmental education efforts; further develop the environmental training of elected officials, civil servants and teachers, and establish training for justice officials; develop closer and more sustained relations with local authorities, business and NGOs, as well as with the media, with a view to raising environmental awareness.	The Ministry of Agriculture conducts environmental training for staff of national and local governments. Environmental courses at the National University of Public Service and the Hungarian Legal Academy are available for civil servants and judicial officials as part of their in-service training programme. However, the optional nature of these courses significantly limits their reach.
Towards green growth	
Develop mechanisms of monitoring and evaluation of progress towards the objectives of the National Sustainable Development Strategy, including relevant indicators, and increased public participation.	The Central Statistical Office has developed a set of more than 100 sustainable development indicators to monitor progress towards the objectives of the National Sustainable Development Strategy. The government reports to parliament on the implementation of the strategy every two years, and progress reports were prepared in 2014 and 2016.
Develop institutional mechanisms to systematically and continuously review and revise economic instruments (e.g. taxes, charges, trading), aiming at green tax reforms and green budgeting, considering competitiveness, distributive and employment issues; make sure that the conditions for granting exemptions are fully justified or fulfilled, to avoid undermining their incentive effects.	Several revisions of economic instruments have been undertaken, including a revision of energy taxes and product charges. A comprehensive assessment of economic instruments was conducted in 2014.
Further expand the use of economic instruments and regularly assess their effectiveness, assuring a wider application of the polluter pays and user pays principles, taking into account competitiveness and social considerations; extend further cost-recovery to waste management.	Hungary has participated in the EU Emission Trading System for GHG emissions since its inception in 2005. It introduced a landfill tax in 2013 and progressively extended the products covered by environmental product charges. In 2013, an electronic distance-based toll system for heavy good vehicles was introduced, with tolls based on vehicles' emission classes. In 2017, the water abstraction charge was extended to water used for irrigation, fish farming and rice production. Municipal waste management tariffs for households were frozen in 2012 and reduced in 2013 for social reasons, raising questions about cost recovery in waste management operations. The effectiveness of economic instruments has not been regularly assessed.
Maintain the incentive value of emission charges (e.g. the environmental load charge) by regularly reviewing their rates; ensure that incentives for energy efficiency	Contrary to this recommendation, the rates of emission charges have not been regularly reviewed, and energy prices for households have been repeatedly cut since 2013.

provided by relatively high energy prices are not undermined by unjustified exemptions and subsidies.	
Further refine the structure and rates of economic instruments (e.g. user charges, abstraction and pollution charges) to give appropriate signals to all users and finance water management, while taking social factors into account.	In 2017, the water abstraction charge was extended to water used for irrigation, fish farming and rice production. Contrary to this recommendation, water and sewerage tariffs were frozen in 2012 and were decreased by law in 2013.
Review transport prices and taxes (e.g. the vehicle tax) to better internalise costs and reflect vehicle environmental performance. Create incentives to influence transport decisions by businesses and individuals, to counteract projected traffic increases (e.g. gradually link road fees to distance travelled, reduce fringe benefits and tax rebates for private car use).	The government has repeatedly raised the excise rates on road fuels since 2011 and narrowed the gap between the excise rates on petrol and diesel. In 2013, an electronic toll system for heavy good vehicles was introduced, with tolls based on distance travelled and vehicles' emission classes (but not for passenger vehicles). With the exception of the registration tax, vehicle taxes do not take account of vehicles' emission categories. No action taken to reform the favourable tax treatment of company cars and parking spaces.
Reassess the support schemes for renewables and biofuels, and their overall impacts (including those on land use); consider introducing more market-oriented measures (e.g. green certificates).	A new renewable energy support scheme (METÁR) took effect in 2017. It replaces the previous feed-in tariff system with a combination of feed-in tariffs, feed-in premiums and competitive bidding procedure depending on the capacity of energy plants.
Strive to eliminate environmentally harmful subsidies (e.g. the fringe benefits of company car use).	A company car tax based on emission levels of the vehicle provides an incentive to businesses to choose less-emitting vehicles for their car fleets. However, Hungary does not tax benefits arising from the personal use of company cars.
Promote active employment policies in eco-industries and environmental services, and the role of the not-for-profit sector in environmental employment, especially in environmentally sensitive areas.	The government plans to develop a strategy to promote the green industry by the end of 2017. The strategy would be part of the 2016 re-industrialisation plan (so-called Irinyi Plan).
	Biodiversity
Adopt at government level and implement the National Biodiversity Strategy and Action Plan as soon as possible, as a comprehensive action-oriented framework for ecosystem and species conservation at both national and local levels.	In 2015, Hungary adopted its second National Biodiversity Strategy, linked to the Aichi Targets under the Convention on Biological Diversity. The Strategy is an improvement, with clear objectives, measurable targets and identified actions. However, the Strategy focuses on protected areas and the agriculture and forestry sectors, with limited linkage to other policy frameworks or sectoral strategies.
Strengthen the implementation of the Natura 2000 Ecological Network, and develop corridors between network sites.	Hungary was one of the first EU Member States to have its Natura 2000 network of protected areas declared complete in 2011. However, work remains to complete binding management plans for all areas. An ambitious National Ecological Network Zone incorporates Natura 2000 sites with a system of corridors and buffer zones, restricting certain developments within the zone, though further effort is needed to ensure implementation is consistent with biodiversity objectives.
Increase the human and financial capacity for nature conservation and biodiversity including in the public administration and civil society; increase the involvement of stakeholders in the nature conservation sector.	Human and financial capacity for nature conservation remains a challenge for Hungary. New hires have been made in certain areas, such as managing invasive species, but there remains a shortage of park rangers and a need for additional training and resources to enhance capacity at the local level for enforcement. The budget of National Park Directorates has increased since 2008, but reliance on revenue-generating activities in protected areas may be detracting from conservation objectives. Environmental NGOs participate in several government committees related to biodiversity, but funding from the Ministry of Agriculture's Green Fund has dropped by 30% since 2011.
Continue to improve the integration of nature conservation objectives in sectoral policies such as agriculture and forestry, regional development and land use planning, transport and tourism.	Hungary has improved integration of nature conservation objectives into agriculture and forestry through its National Biodiversity Strategy, but other sectors such as energy, transport, industry, and tourism are not included. EU reform of the Common Agricultural Policy has improved financial support for environmentally-friendly agriculture. However, pesticide use, ammonia emissions, draining of flooded areas and a lack of modern irrigation technologies continue to make agriculture a significant source of pressures on biodiversity. Revisions to the Forest Act in 2016 have also raised concerns about the sustainability of forest management.

Intensify efforts to raise public awareness about nature conservation and biodiversity, targeting all age groups, as well as groups such as hunters and farmers.	Environmental awareness of Hungarians has increased, but awareness of biodiversity remains low. The government has launched several public and school awareness programmes and created a brand of National Park Products to try and improve awareness.
Assess land use changes resulting from the country's plans on bio-energy development; develop, adopt and implement a short-to medium-term strategy to promote the sustainable use of natural resources with appropriate involvement of stakeholders.	The amount of land used for production of conventional biofuels in Hungary decreased between 2000 and 2014, despite a significant increase in production, but ongoing monitoring of impacts is still needed. The use of wood biomass for electricity generation is reaching its limit, with further increases in forest plantations risking biodiversity conservation objectives.

Part I. Progress towards sustainable development

Chapter 1. Environmental performance: Trends and recent developments

This chapter examines the country's progress in decoupling economic activity from environmental pressures. Drawing on indicators from national and international sources, it reviews progress towards national policy goals, international commitments and targets, focusing on the period since 2000. To the extent possible, it compares the state of the environment and key environmental trends with those of other OECD member countries. The chapter sketches out major policy developments in environmental sectors, including air, climate and water. Progress in the policy areas related to waste management and biodiversity is analysed in the respective thematic chapters of the report.

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.

1.1. Introduction

Hungary is a small open economy that has enjoyed strong economic growth over the past 15 years. However, gross domestic product (GDP) per capita remains below the OECD average. The country's reliance on imports of oil and natural gas for energy supply, as well as intensive industrial and agricultural activities and growing road traffic, have exacerbated environmental challenges.

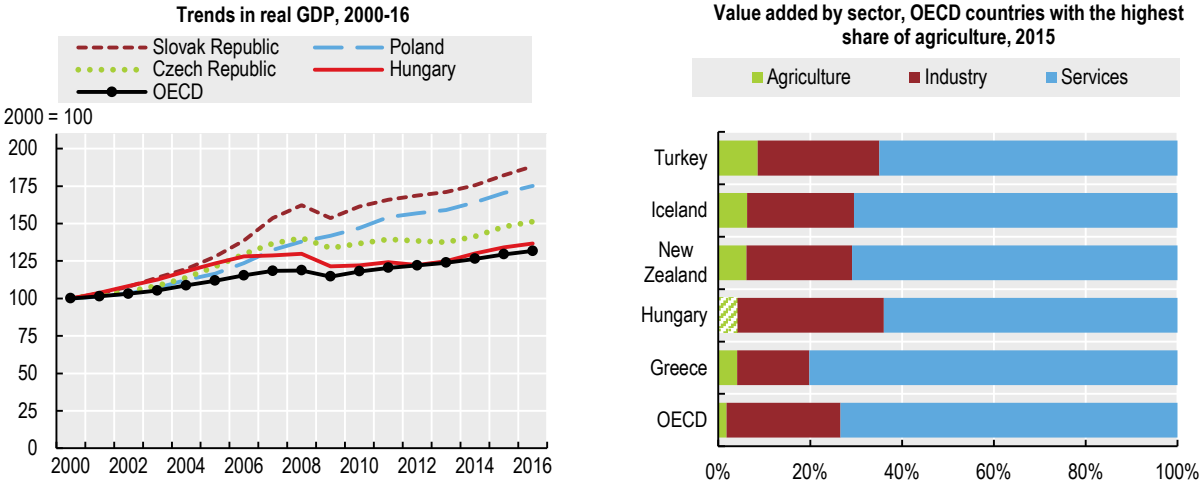
This chapter provides an overview of Hungary's main environmental achievements and its remaining challenges on the path towards green growth and sustainable development. Drawing on indicators from national and international sources, it reviews Hungary's progress towards national policy goals and international commitments, focusing on the period since 2000. To the extent possible, it compares the state of the environment and key environmental trends with those of other OECD member countries. The chapter outlines major policy developments in key environmental sectors, including air, climate and water.

1.2. Key economic and social developments

1.2.1. Economic performance and structure of the economy

Hungary experienced stronger economic growth than the OECD as a whole for most of 2000-16. However, its economy grew at a lower rate than in neighbouring Central and Eastern European countries (Figure 1.1). GDP increased by 37% or by about 2% per year. After the slowdown in 2008/09 caused by the global economic crisis, the economy recovered and reached pre-crisis levels in 2014 (Figure 1.1). This recovery was driven by macroeconomic stimulus, increased investment and private consumption, and strong exports. Per capita GDP (in real terms) increased by 43% over 2000-16, but is still one-third less than the OECD average (see Basic Statistics). Growth is expected to continue at a rate above 3.5% over 2017 and 2018. Hungary has an important agricultural sector, which accounts for more than 4% of its value added (one of the highest shares in the OECD) and 5% of its employment. Overall, in 2015, animals, vegetables, food products and wood accounted for more than 10% of total exports.

Figure 1.1. Hungary's economy grew slower than that of neighbouring countries



Source: OECD (2017), *OECD National Accounts Statistics* (database).

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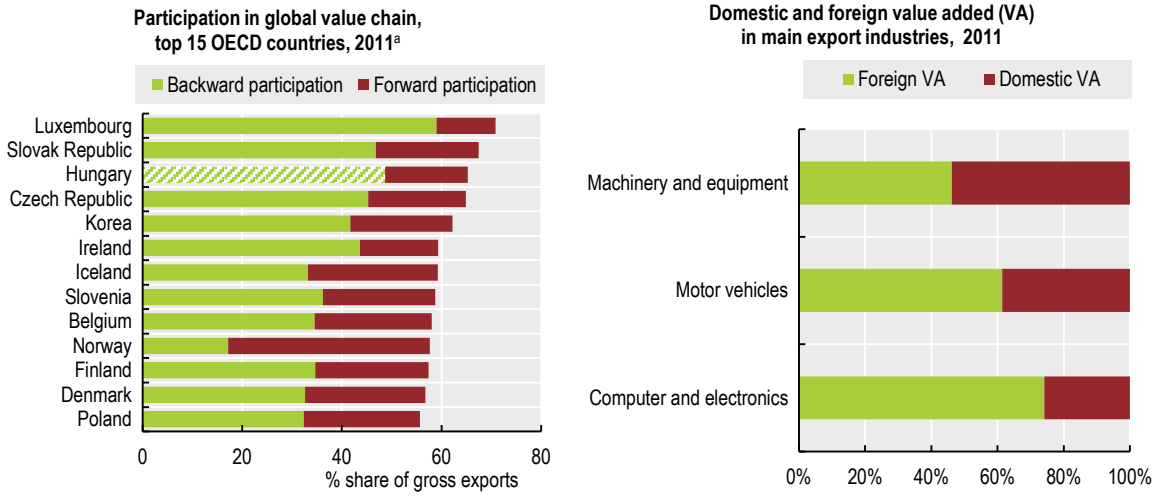
Hungary's economy relies heavily on external trade. In 2015, exports accounted for 91% of GDP, among the top five rates in the OECD; imports represented 82% of GDP. Hungary's participation in global value chains is one of the highest in the OECD. This is due to high inflows of foreign direct investment in the main exporting industries, such as those related to electronics, motor vehicles and machinery equipment. These industries exhibit a high share of produced intermediates in gross exports, as reflected by the backward participation index (Figure 1.2). The foreign content of value added in exports has increased considerably since 2008 to reach almost half of total exports. Overall, foreign-owned companies accounted for about a quarter of the employment and half of the value added of the business sector in 2014 (OECD, 2017a).

Figure 1.2. Participation in global value chains is one of the highest in the OECD



a) Backward and forward participation in terms of gross exports refer to the share of imported inputs in the overall exports of a country and to the share of exports used as intermediate inputs in other countries' exports.
Source: OECD (2017), *OECD Trade in Value Added (TiVA)* (database).

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The unemployment rate declined to 5% of the labour force in 2016. This rate is projected to go down further due to extensive public work schemes and sustained private employment growth (OECD, 2016a). Shortages of skilled labour and the mismatch between skills of employees and labour market needs represent a challenge. Labour productivity has kept decreasing since 2008, and is one of the lowest in the OECD. This is due mainly to two factors. First, the educational system is slow to react to structural changes of the economy and new technological needs. Second, low business sector investment has led to increased emigration of the young, highly skilled labour force (OECD, 2016a). As a result, Hungary ranks among the ten OECD member countries with the lowest employment rate of people with tertiary education.

1.2.2. Population, well-being and environmental quality of life

Hungary's population density is about three times the OECD average (see Basic Statistics). Yet Hungary has the fourth lowest urbanisation rate in the OECD, with only about one in five residents living in predominantly urban regions (OECD, 2016b). Hungary is facing high regional disparities, particularly regarding access to services, jobs, education and safety. Consequently, disposable income per capita in the bottom 20% of regions is less than half the OECD average.

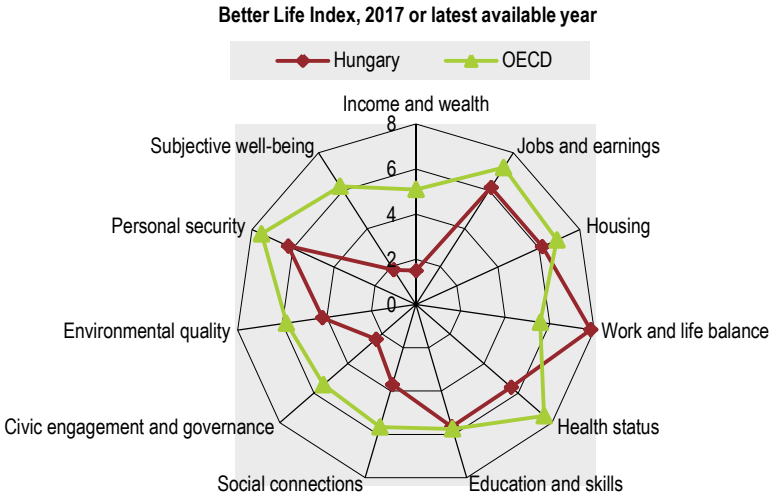
Hungary is facing demographic and health-related challenges: its population has been decreasing at a yearly rate of 0.3% since 2000 and reached 9.8 million in 2016. Young people (under 20 years old) represent less than one-third of the working-age population, well below the OECD average. The ageing population imposes increasing pressures on health care expenditure and pensions. Life expectancy at birth is 76 years, the third lowest in the OECD after Latvia and Mexico. The health status of Hungarian citizens has worsened and remains low in international comparison. This is due to unhealthy lifestyles, increasing inequality in access to services and shortcomings of the health

system. Health expenditure is lower than in most other OECD member countries (see Basic Statistics).

The level of income inequality, as measured by the Gini index on a scale from zero (full equality) to one (full inequality), is 0.29, slightly lower than the OECD average. However, inequality is increasing due to worsening living standards of poorer households (OECD, 2017b). Moreover, the share of income received by the top 20% of the population is increasing and is now more than four times bigger than that received by the bottom 20% (OECD, 2016b). The poverty rate has increased since 2000 to reach 10% of the population, still slightly lower than the OECD average. Reduction and prevention of poverty and social exclusion, as well as reinforcement of social cohesion with special regard to the Roma population, are the thrust of the National Strategy on Social Cohesion for 2011-2020. The strategy includes targets to reduce child poverty, material deprivation and social exclusion by 20%.

The OECD Better Life Index presents a mixed picture. Hungary ranks above the OECD average with respect to work and life balance, and education (due to the high percentage of people with upper secondary education). However, it underperforms with respect to other dimensions of the indicator. In particular, household disposable income is one of the lowest in the OECD, showing a high level of inequality in distribution across the population. Other indicators signalling a worsening well-being of Hungarian citizens are life satisfaction; civic engagement and social support network; and environmental quality, as measured by urban air pollution and access to clean water (Figure 1.3).

Figure 1.3. Quality of life is below the OECD average



Note: The OECD Better Life Index framework is based on 11 topics considered a good measure of the concept of well-being. Each dimension is based on one to three indicators with equal weights and then normalised to range between 0 (worst performance) and 10 (best performance). The environment dimension of the well-being indicator focuses on citizens' satisfaction with local water quality and on annual popoulation exposure to fine particulate matter ($PM_{2.5}$).
Source: OECD (2017), *How's Life? 2017: Measuring Well-being*.

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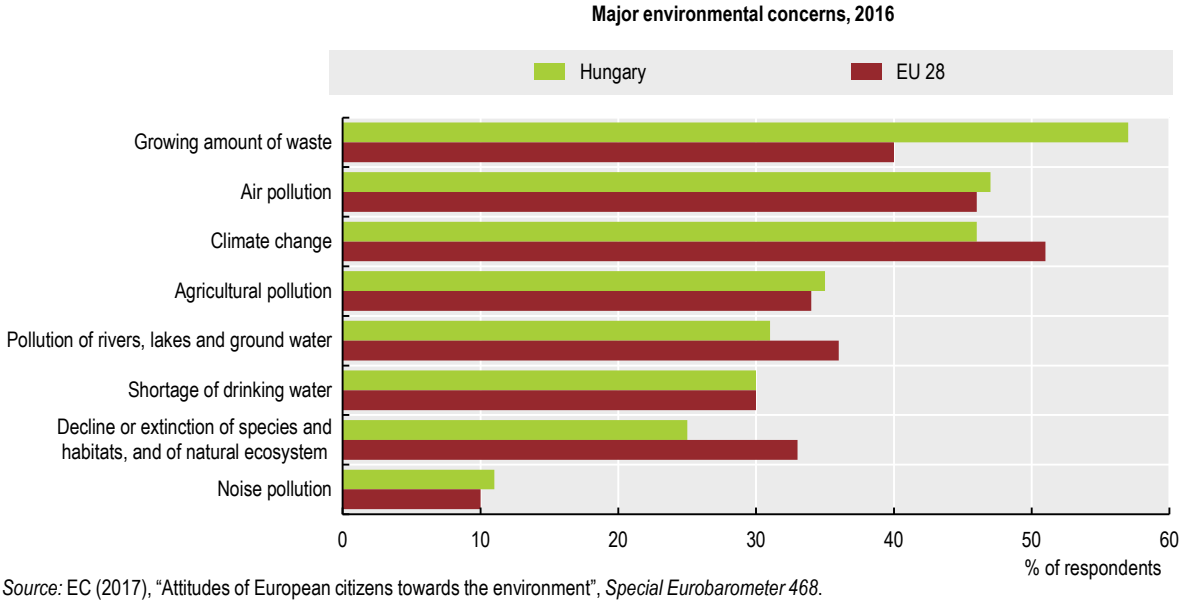
Hungarian citizens are acutely aware of many environmental challenges, with the notable exception of biodiversity protection (Chapter 5.). Environmental issues rank high on the list of threats to the future of society (Forsense Institute, 2016). Hungarians' satisfaction with the quality of their environment, measured by multiple international surveys, is

consistently low. According to a survey of attitudes of the European citizens towards the environment, most Hungarians are concerned about growing waste generation and air pollution, and recognise them as serious issues (Figure 1.4). Another recent survey indicated that only half of the inhabitants of Budapest are satisfied with the air quality and noise levels in their cities, a low score compared to other EU capitals (Eurostat, 2016a).

Figure 1.4. Hungarians are most worried about waste generation and air pollution



Source: EC (2017), "Attitudes of European citizens towards the environment", *Special Eurobarometer 468*.

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1.3. Transition to an energy-efficient and low-carbon economy

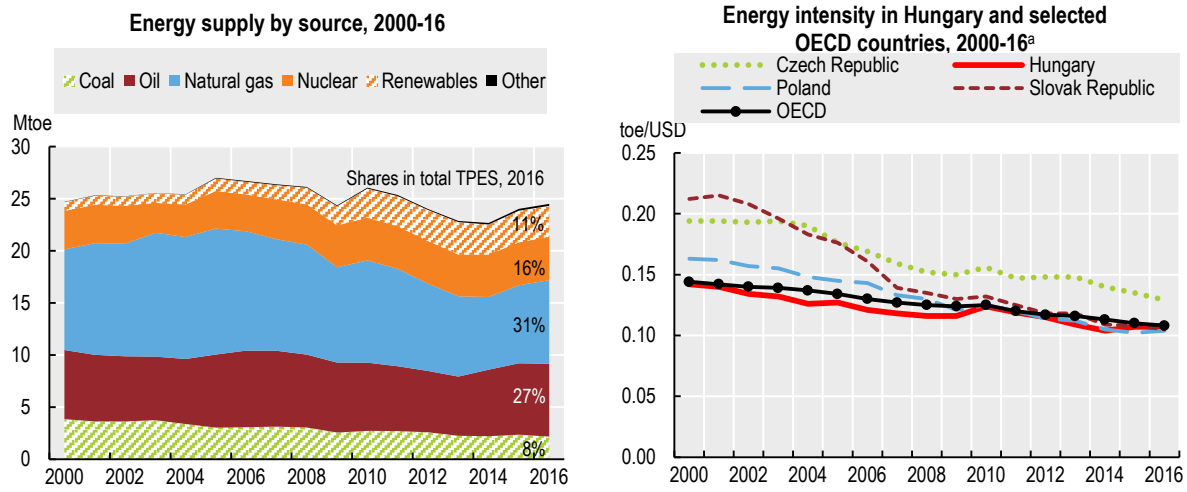
1.3.1. Energy structure and intensity

Energy mix

Like most OECD member countries, Hungary relies on fossil fuels for its energy needs. In 2016, approximately 70% of the total primary energy supply (TPES) was made up of fossil fuels: oil, gas (about one-third each) and coal (8%). Nuclear power (16%) and renewables (11%) accounted for the remainder (Figure 1.5). Hungary has reduced its reliance on fossil fuels by about 15% since 2000.

Over 2000-16, energy supply grew at a lower rate than the economy. As a result, energy intensity (measured as TPES per unit of GDP) declined by almost a quarter (Figure 1.5) and is now on par with the OECD average. Energy supply per capita remained almost constant over the period at a level well below the OECD average (see Basic Statistics). Improvements in the energy intensity were due to structural changes in the economy and, to a lesser extent, to energy efficiency measures.

Figure 1.5. The energy mix heavily relies on fossil fuels



Note: The Hungarian Administration has recently revised its methodology. Therefore, data may include breaks in time series.
a) Total primary energy supply per unit of GDP at 2010 prices and purchasing power parities.
Source: IEA (2017), *IEA World Energy Statistics and Balances* (database); OECD (2017), *OECD National Accounts Statistics* (database).

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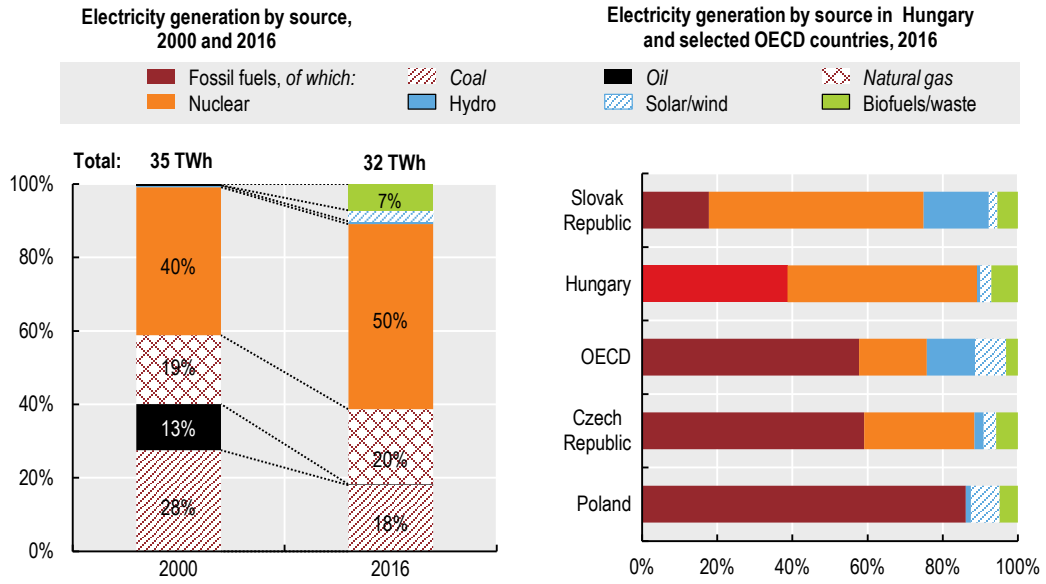
Nuclear power generates 50% of Hungary's electricity, following a 30% increase in its use since 2000 (Figure 1.6). Although coal and gas have reduced their contribution, they maintain important shares in the electricity mix (18% and 20%, respectively). Meanwhile, the share of renewables has increased almost tenfold. However, they account for about 10% of total electricity generation, the third lowest share in the OECD after Korea and Israel. The lion's share of renewable electricity (almost two-thirds) is generated through burning of biomass in old, inefficient carbon power plants or in stoves for residential heating. This contributes to the increasing emissions of particulate matter (PM) (MND, 2012). Electricity generated through hydro, solar and wind technologies has increased considerably in recent years, although starting from a very low base (IEA, 2017a).[1]

Figure 1.6. Nuclear dominates total electricity generation



Note: The Hungarian Administration has recently revised its methodology. Therefore, data may include breaks in time series.
Source: IEA (2017), *IEA World Energy Statistics and Balances* (database).

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Renewable energy supply

Renewable energy supply has increased significantly since 2000, stimulated by a feed-in-tariff system in the electricity sector[2] (Chapter 3.). Its share in TPES reached 11% in 2016, up from 3% in 2000.[3] However, it remains low in OECD comparison. Biomass, whose supply has almost tripled since 2000, dominates renewable energy sources (about 90% in 2016).[4] The remainder is provided by geothermal energy (3%) and smaller shares of renewable waste, solar, wind and hydro. Renewables are mostly used for heating and cooling in the residential and public services sectors (about 80%) and as transport fuels (8%).

As indicated in the 2015 National Reform Programme and the National Renewable Energy Utilisation Action Plan, Hungary has committed to raising the share of renewable energy sources in the gross final energy consumption by 2020 to 14.65%.[5] It is on track to achieve this target: in 2015, renewable energy sources already contributed 14.5% of gross final energy consumption, up from 4.4% in 2004 (Eurostat, 2017a). Most of the increase in renewables has been due to expanded use of biomass, which has now levelled off. Future growth should thus target other renewable sources such as solar and geothermal energy (IEA, 2017b). Hungary has been rapidly expanding the use of geothermal energy for district heating. It has the third largest geothermal district heating energy production capacity in the European Union after France and Germany (EGEC, 2017).

In 2016, the share of renewables in road transport fuel consumption accounted for 7.4%. With the current policy, it will be difficult for Hungary to reach the 2020 target of 10% biofuel content set by the EU Renewable Energy Directive (2009/28/EC).[6] To address this challenge, the government decided to raise the biofuel blending obligation to 6.4% for 2019-20.

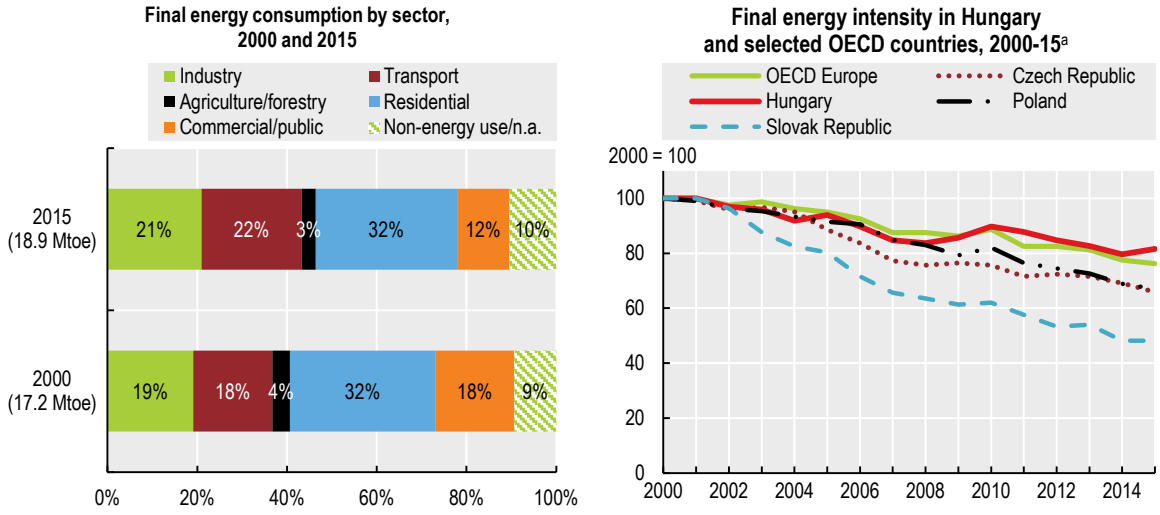
Energy consumption

Over 2000-15, the final energy intensity of Hungary's economy decreased by 18% (Figure 1.7): the total final energy consumption (TFC) increased slower than GDP. The Hungarian National Energy Strategy targets primarily the residential and public sectors, which together account for the largest share (43%) of TFC. Over the last four years, their consumption decreased by 15% mainly due to improved energy efficiency.

Currently, 80% of buildings fail to meet energy efficiency standards. This is due to the poor condition of buildings, as well as outdated heating and cooling systems that use about two-thirds of the total final household consumption of energy (MND, 2015). Recent measures have improved space heating efficiency, which reduced energy consumption per floor area by one-third (IEA, 2017b). It is estimated that energy efficiency measures in new buildings could reduce related energy consumption by more than half (MND, 2015). There is, however, scope for further improving energy performance in existing buildings and promoting innovative energy-saving technologies.

Industrial energy consumption has on average been growing slower than industrial output. In 2015, it accounted for slightly less than a quarter of TFC (Figure 1.7). Four industries alone – chemicals, food and tobacco, wood products and machinery – account for two-thirds of the sector's consumption.

Figure 1.7. Energy consumption in transport and industry is increasing



Note: The Hungarian Administration has recently revised its methodology. Therefore, data may include breaks in time series.
a) Total final consumption of energy per unit of GDP at 2010 prices and purchasing power parities.
Source: IEA (2017), *IEA World Energy Statistics and Balances* (database).

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Energy consumption of the transport sector (22% of TFC) has grown the fastest since 2000 despite the economic recession. As in many OECD member countries, road transport makes up most of the sector's energy use (96%), and passenger cars account for the largest share of fuel consumption. While energy intensity of road freight transport has decreased since 2000, it has increased for passenger cars. This is a consequence of the old and inefficient car fleet: the average vehicle age is 15 years (HCSO, 2017). The share of diesel fuel in total road fuel consumption increased from 51% to 63% over 2000-15 (IEA, 2017a), even though only 28% of passenger cars are diesel-powered

(Eurostat, 2017b). Diesel cars perform better than petrol cars in terms of energy use and carbon dioxide (CO_2) emissions. However, their contribution to fine particulate matter ($PM_{2.5}$) emissions is higher, with considerable impacts on air quality.

Energy demand in the transport sector is likely to continue rising fast. Hungary's motor vehicle ownership, one of the lowest in the OECD at 40 vehicles per 100 inhabitants, will go up with rising income levels. Between 2000 and 2016, the total number of vehicles in Hungary grew by 42%, leading to considerable increase in road traffic. Likewise, freight transport is also expected to increase with economic growth. Rail has ceased to be the dominant mode of freight since 2000. It represents only 18% of terrestrial inland transport, while the volume of goods transported by road more than doubled during the same period.

Energy policies and measures

In line with a recommendation of the 2008 Environmental Performance Review, Hungary has introduced measures to improve energy efficiency on both the supply side (power sector) and demand side (residential and transport sectors). The key measures included:

- Modernisation of heating systems of residential buildings and district heating systems, through several support programmes. As required by the EU Directive on Energy Efficiency in Buildings (2010/31/EC), the government introduced the National Building Energy Performance Strategy 2015-20. It envisaged energy efficiency standards for new buildings and other obligations for existing dwellings, energy audits of buildings, certification schemes and other instruments. Energy requirements for new buildings and major renovations were introduced in the 2014 Ministry of Interior regulation. Energy efficiency subsidies for apartment and public buildings were introduced in 2015 with respective budgets of HUF 10 billion and 150 million (Concerted Action for EED, 2016).
- Reduction of emissions in the transport sector through renewal of the vehicle fleet to foster use of electric vehicles. The policy is in line with requirements of the EU Directive on the Deployment of Alternative Fuels Infrastructure (2014/94/EU). The measures include installing charging stations and allowing electric vehicles to use bus lanes (Chapter 3.).
- Increased reliance on economic instruments such as motor fuel and vehicle taxes, road tolls and parking meters (Chapter 3.).Chapter 3.
- Development of integrated public transport systems offering viable alternatives to private cars. This includes improving parking facilities close to public transport stations, upgrading metro lines in Budapest and promoting use of bicycles in urban areas.

The National Energy Strategy 2030 (adopted in 2011) aims to reduce Hungary's energy dependence (MND, 2012). The National Renewable Energy Action Plan 2010-2020 seeks to increase energy efficiency economy-wide and boost the share of renewable energy sources. The fourth National Energy Efficiency Action Plan for 2010-2020 supports implementation of energy efficiency targets in the different economic sectors in co-ordination with related programmes and strategies.

The Transportation Energy Efficiency Improvement Action Plan (2015) falls under the umbrella of the 2014 National Transport Strategy. It lays out initiatives to support sustainable low-carbon modes of transport (bicycle lanes, bus replacement programmes, improved commuting facilities). The E-mobility Programme (the Jedlik Ányos Plan, see

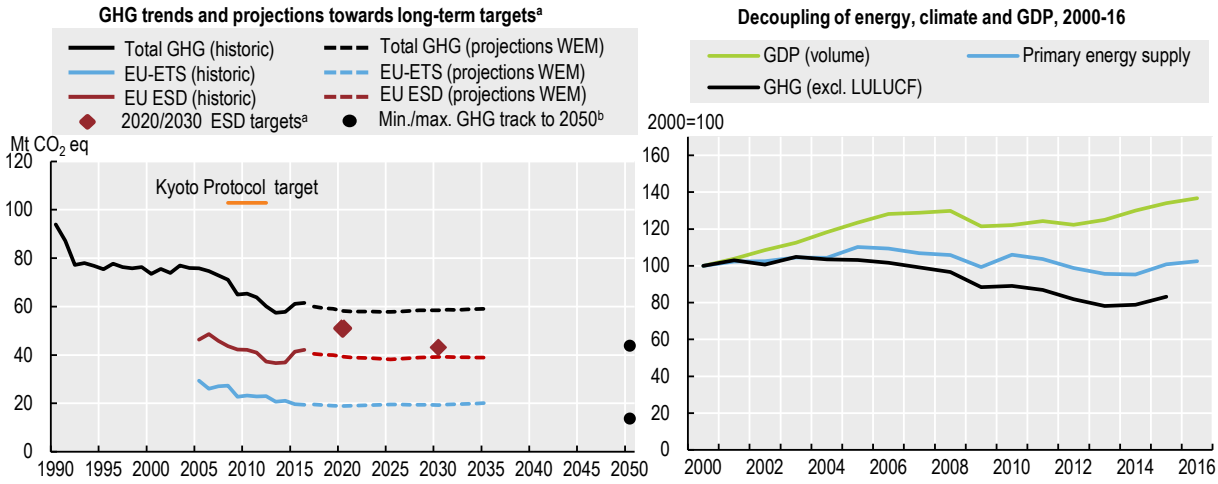
Chapter 3. supports electrification of the transport sector. As of 2016, a few municipalities have started to develop Sustainable Urban Mobility Plans and integrate them into local transport strategies, as is the case of the Budapest Balázs Mór Plan.[7]

1.3.2. Greenhouse gas emissions

Emissions profile

Hungary decoupled economic growth from domestic greenhouse gas (GHG) emissions. The economy's carbon intensity, which is in line with the average for OECD Europe, has decreased by 40% since 2000. Over 2000-16, total GHG emissions – excluding land use, land-use change and forestry (LULUCF) – decreased by about 16%, while GDP increased by 37% (Figure 1.8). Restructuring of the chemical industry, modernisation of building stock and a lower share of fossil fuels in the energy mix contributed to this decline. Yet emissions have recently started to increase. In 2015, emissions grew by almost 6% over the previous year and by an additional 1% in 2016, mainly driven by the transport sector.

Figure 1.8. GHG emissions decoupled from economic growth, but have started to increase



Note: GHG emissions exclude land use, land use change and forestry (LULUCF). Dotted lines refer to national projections with existing measures.
a) Reduction targets under the Effort Sharing Decision (ESD) cover most sectors that fall outside the scope of the EU ETS, except LULUCF and international shipping (the ESD covered 68% of total Hungarian emissions in 2015, above the EU-28 average of 60%).
b) National emissions tracks taking into account the EU Reference Scenario 2016 and the EU objectives of reducing overall GHG emissions by 80-95% by 2050 compared to 1990.
Source: EEA (2017), *Approximated EU GHG Inventory: Proxy GHG Emission Estimates for 2016*; OMSZ (2017), *National Inventory Report for 1985-2015.*

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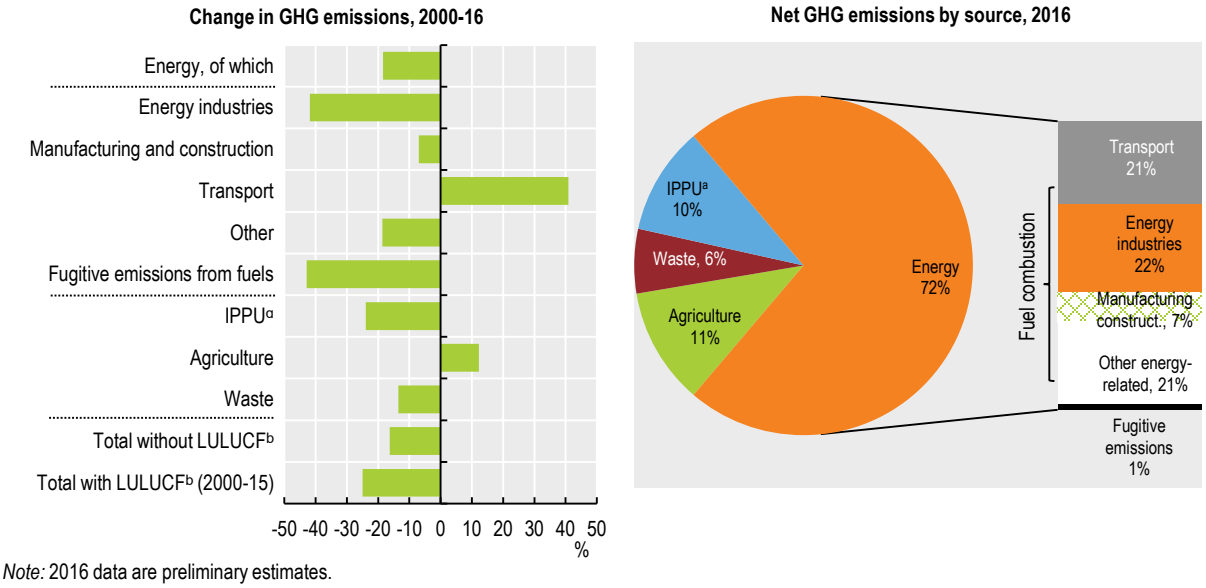
Extensive afforestation, which increased forest coverage to 23% of total land area, helped remove the country's GHG emissions. Its contribution to absorption of GHGs fluctuated over time, ranging from 5% to 11% of total gross emissions over 2006-15.

The power sector generates 22% of total GHG emissions, making it the largest emitter. About half of its emissions result from old and inefficient lignite-fired power plants. Its emissions have decreased by more than 40% since 2000 due to the economic crisis and the change in the energy mix. This decrease contributed to more than 80% of the overall reduction of GHG emissions. Transport, the second-largest contributor, accounts for 20% of the emissions. Transport emissions have increased by about 40% since 2000.

Moreover, they are predicted to increase further with the rapid growth of private vehicle ownership.

Industrial processes account for 10% of total emissions. Despite a decrease over the review period, emissions started to pick up in 2015. This is particularly apparent in the metal and mineral industries, where increased cement and lime production drove most of the increase. The agricultural sector contributes to a fairly high and increasing share of GHG emissions (12%). This puts Hungary among the top 15 OECD member countries regarding agricultural GHG emissions. Two main factors have driven the growth in agricultural emissions since 2010. First, use of urea fertilisers, an important source of nitrous oxide, has intensified. Second, Hungary has increased its livestock (Figure 1.9). Emissions from the waste sector continued to decline thanks to a reduction in the amounts of landfilled waste (OMSZ, 2017).

Figure 1.9. Transport and agriculture are the main drivers of the increase in GHG emissions



Note: 2016 data are preliminary estimates.
a) Industrial processes and product use.
b) Land use, land-use change and forestry.
Source: EEA (2017), *Approximated EU GHG Inventory: Proxy GHG Emission Estimates for 2016*; OMSZ (2017), *National Inventory Report for 1985-2015.*

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As in most OECD member countries, CO_2 accounts for the biggest share of GHG emissions. In 2016, CO_2 represented 77% of the total, followed by methane (12%), nitrous oxide (7%) and fluorinated gases (3%). The latter deserve special attention as their level, although low in absolute terms, has been steadily increasing. Hydrofluorocarbon (HFC) emissions have grown almost ninefold since 2000. The increase is due to more use of HFCs in the cooling industry (for refrigeration and air conditioning) as a replacement for ozone-depleting substances banned in the early 1990s.

Climate policies and measures

Hungary's climate regulatory framework is shaped by the EU climate and energy legislation.[8] As an EU member state, the country is part of the EU Emissions Trading System (ETS) and the Effort Sharing Decision (ESD).[9] Hungary has achieved the Kyoto

commitments for 2008-12. It is also on track to achieve the emissions reduction objectives set in accordance with the EU Climate and Energy Package, which foresees an overall 20% emissions reduction below 1990 levels by 2020 and a 40% reduction by 2030. Under the ESD, Hungary should not exceed a 10% increase in emissions for non-ETS sectors by 2020 and subsequently reduce them by 7% by 2030 compared to the 2005 base year. Hungary is on track for meeting the ESD targets. However, further efforts will be required to meet the 2050 targets set in the EU Reference Scenario 2016 and the EU Roadmap for a low-carbon economy in 2050.

Climate change is high on the national environmental agenda: Hungary was the first EU member state to ratify the Paris Agreement in October 2016. The first National Climate Change Strategy (NCCS) was approved in 2008. In April 2017, the government approved the NCCS-2 for 2017-30, with an outlook to 2050, which takes into account the objectives of the Paris Agreement. The document is based on three pillars: mitigation of GHG emissions across all economic sectors; adaptation to climate change; and implementation of the strategy by raising public awareness on climate change issues. Main areas of interventions are: energy efficiency in buildings, renewable energy use, transport and environment, and afforestation. The NCCS-2, developed with support from the National Adaptation Centre of the Mining and Geological Survey, is complemented by three other strategic documents:

- The National Decarbonisation Roadmap provides guidelines for reductions of GHG emissions in the different economic sectors. It aims to achieve medium-term and long-term reduction targets, drawing upon emission projections with an outlook to 2050.
- The National Adaptation Strategy analyses environmental risks and climate security issues posed by climate change and related impacts on rural development, water resources management, environmental health, energy policy and tourism. It examines the resilience of water infrastructure to floods and considers water scarcity problems and potential impacts in the agriculture and energy sectors.
- The Climate Awareness Plan was developed by the National Adaptation Centre (NAC) of the Hungarian Geological and Geophysical Institute. It supports implementation of the NCCS-2 through analysis, research and dissemination of information. The NAC also develops the National Adaptation Geo-information System, a multipurpose database supporting decision making in the area of climate change adaptation.

Overall, Hungary has developed a wide range of climate-related strategies falling under the responsibilities of different ministries. However, linkages among those strategies, and monitoring of their contribution to achieving the respective objectives, could be further strengthened.

Hungary is a lowland country. About one-quarter of its territory is exposed to floods, and 18% of its population lives in risk areas. As recommended by the 2008 Environmental Performance Review, Hungary has taken measures to address flood risks and reduce environmental vulnerability to extreme climatic events. These included the adoption of a national risk management plan in 2016, the completion of high-water-level riverbed management plans and construction of flood emergency storage reservoirs along the Tisza River and several smaller rivers. In accordance with the 2007/60/EC Directive on flood management, it has developed flood hazard and flood risk maps. Hungary should also continue strengthening protection measures against floods, improve rainwater

drainage systems and promote measures to retain rainwater that could be used for irrigation.

Other climate change adaptation challenges are posed by the intensification of extreme drought events (OECD, 2013a). These events resulted in financial losses worth HUF 400 billion (about EUR 1.4 billion or 1.4% of GDP) in 2012 (EC, 2017b). Hungary should develop policies for drought management and restoration of land affected by droughts.

1.3.3. Air quality management

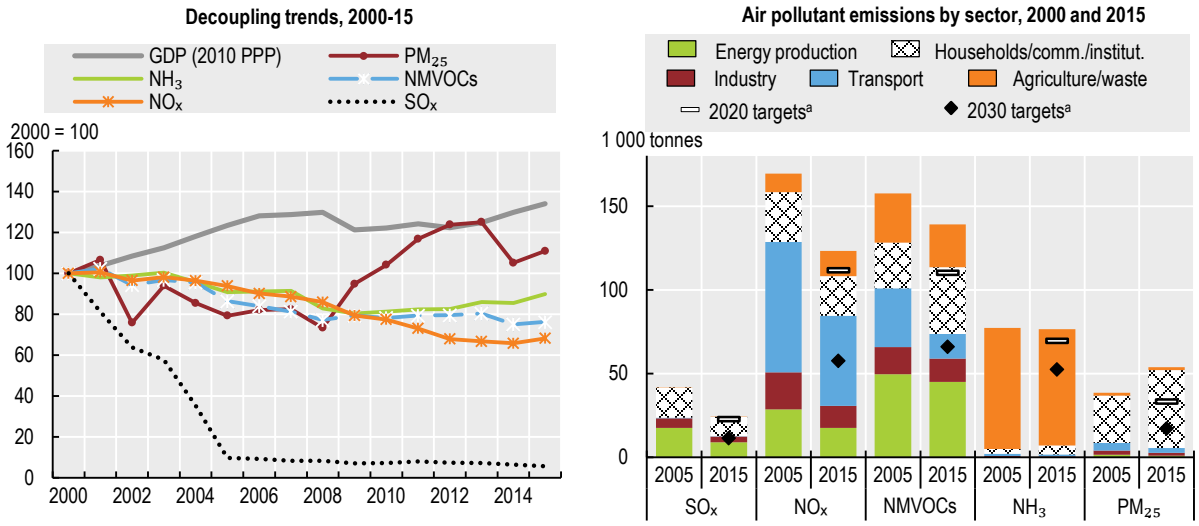
Air emissions

Air emissions decoupled from economic growth over 2000-15 and declined significantly for all key pollutants except $PM_{2.5}$ (Figure 1.10). Intensities of emissions, both per capita and per unit of GDP, are lower than the OECD average. However, local air quality has been worsening since 2000. On average, the Hungarian citizen is exposed to about 22 micrograms of $PM_{2.5}$ per cubic metre ($\mu g/m^3$). This is a value higher than the OECD average of 14 $\mu g/m^3$. It is also higher than the annual guideline limit of 10 $\mu g/m^3$ set by the World Health Organization (WHO).

Hungary has met its 2010 targets under the EU National Emission Ceilings (NEC) Directive for sulphur oxides (SO_x), nitrous oxides (NO_x), ammonia (NH_3) and non-methane volatile organic compounds (NMVOC).[10] Between 2000 and 2015, SO_x emissions plummeted by 94%. The reduction came primarily from the energy sector due to a shift from coal to natural gas and other technological improvements in power generation. In 2014, non-industrial combustion and power stations generated about 50% and 40% of SO_x emissions, respectively. NO_x releases have dropped by one-third since 2000, mainly due to reduced emissions from road transport (thanks to modernisation of the car fleet) and power generation. Emissions of non-methane volatile organic compounds (NMVOC), largely dependent on non-industrial combustion (mining and oil refining), have decreased by 12% since 2000 due to reduced activities in these sectors and to installation of catalytic converters on motor vehicles.

Ammonia emissions, generated primarily by the agricultural sector, have decreased by 10% since 2000. The sharp decrease in livestock-related emissions was counteracted by increased emissions from fertiliser use. With the economic recovery, however, ammonia emissions rebounded and were almost a quarter higher in 2015 than the previous year. This trend raises a concern about the contribution of ammonia to eutrophication of water bodies and acidification of soils, as well as to the formation of secondary PM. Recent studies indicate that NH_3 emissions from agriculture were contributing to about half of the background concentration of urban $PM_{2.5}$, the third highest value in more than 20 EU countries examined (EC, 2015c).

Figure 1.10. Air pollutant emissions decoupled from economic growth, but are starting to increase



Note: EMEP data reported under the Convention on Long-Range Transboundary Air Pollution.
a) Revised national emissions ceiling for 2020 and 2030 set by the Directive 2016/2284 on the reduction of national emissions of certain atmospheric pollutants.
Source: EMEP (2017), *WebDab* (database); OECD (2017), *OECD National Accounts Statistics* (database).

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Emissions of $PM_{2.5}$ have increased by about 10% since 2000 and by 40% since 2005. In the absence of adequate reduction measures, it will be difficult for Hungary to meet its commitments under the EU Clean Air Programme (whose legislative instrument is Directive 2016/2284/EU). Household heating is the largest emitter, followed by road transport. The residential heating sector largely relies for energy on natural gas (44% in 2015) and biomass, whose share has tripled since 2007 to about 30%. The use of lignite, despite its low share of total consumption, also increased threefold over the same period. The illegal burning of waste for heating raises concerns, particularly in poor areas. It has contributed to high concentrations of benz(a)pyrene, which exceed EU guidelines (Chapter 4.).

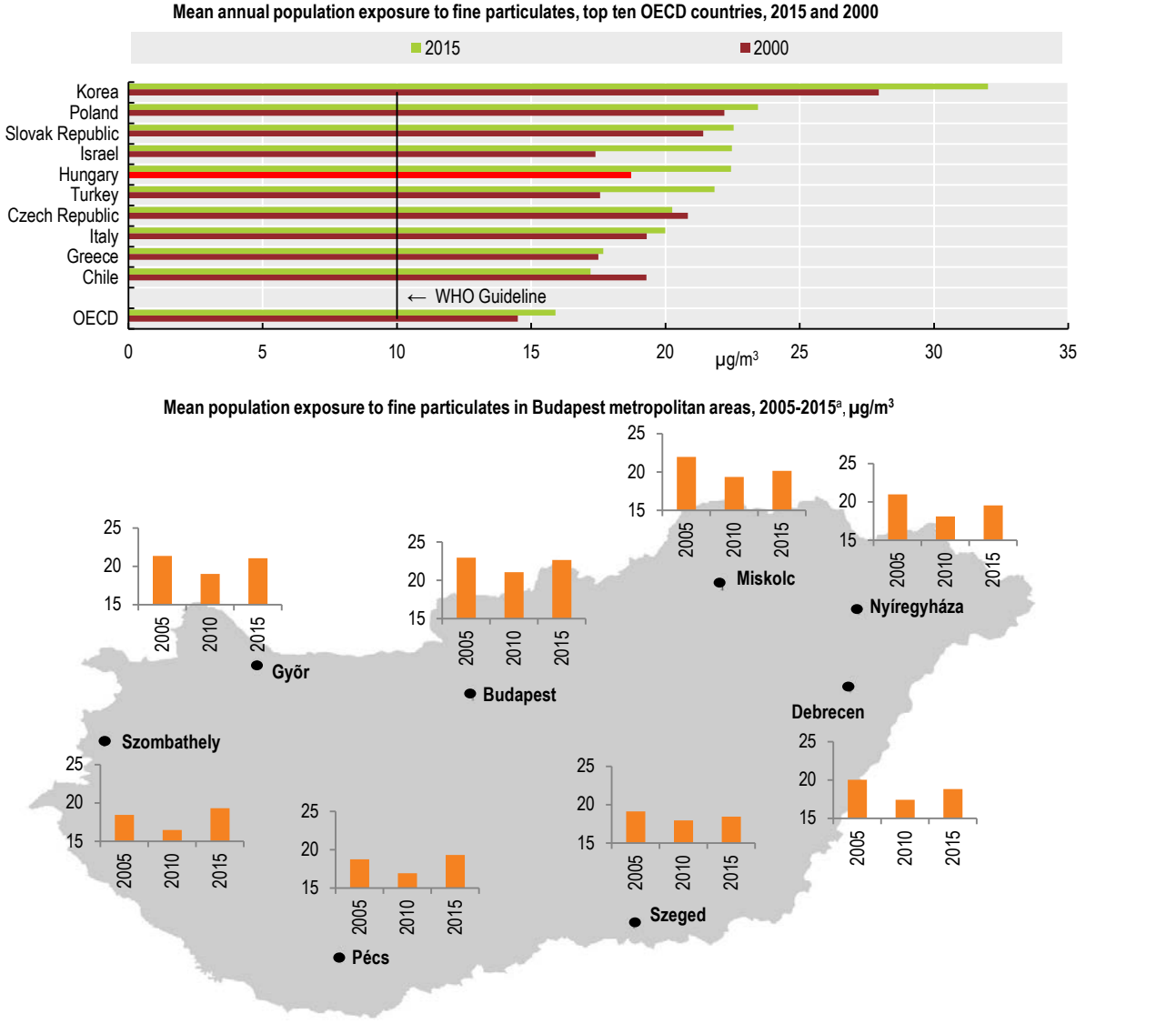
Eurostat (2016b) indicates that noise pollution is of increasing concern in Hungary as one of the most important causes of premature death after air pollution. Road, rail and aviation traffic, as well as industry and construction, are the main causes of noise nuisances. Despite some progress in this area, Hungary failed to fully comply with the EU Noise Directive 2002/49/EC. Following the European Commission's instructions, Hungary has developed action plans for main roads and railways, but has yet to produce noise maps for the Budapest agglomeration.

Air quality

Hungary is facing a growing challenge of air pollution from $PM_{2.5}$. Annual average exposure to $PM_{2.5}$ has increased considerably during the review period, with only Turkey and Israel showing higher growth rates (Figure 1.11). In 2015, the national mean concentration of $PM_{2.5}$ reached 22.4 µg/m^3, one of the highest values in the OECD and well above the WHO guideline value of 10 µg/m^3. About 83% of the population was exposed to an annual average $PM_{2.5}$ concentration of 15-25 µg/m^3. The remaining 17%

faced yearly average exposure to $PM_{2.5}$ of 25-35 µg/m³. About half of the population of Budapest is exposed to the most severe concentrations of particulates (higher than 25 µg/m³). PM_{10} and NO_2 concentrations, particularly in large urban areas, are also a concern: the European Commission has started infringement procedures against Hungary for the violation of requirements of the Air Quality Directive for these pollutants.

Figure 1.11. Population exposure to $PM_{2.5}$ is higher than the OECD average



Note: Data are derived from satellite observations, chemical transport models and ground monitoring stations. The indicator is calculated as the mean annual outdoor $PM_{2.5}$ concentration weighted by population living in the relevant area, that is, the concentration level, expressed in µg/m³, to which a typical resident is exposed throughout a year.
a) Metropolitan areas based on the OECD-EU definition of functional urban areas. Data refer to 3-year average data for the periods: 2002-05, 2008-10, 2013 and 2015.
Source: OECD (20017), "Exposure to air pollution", *OECD Environment Statistics* (database).

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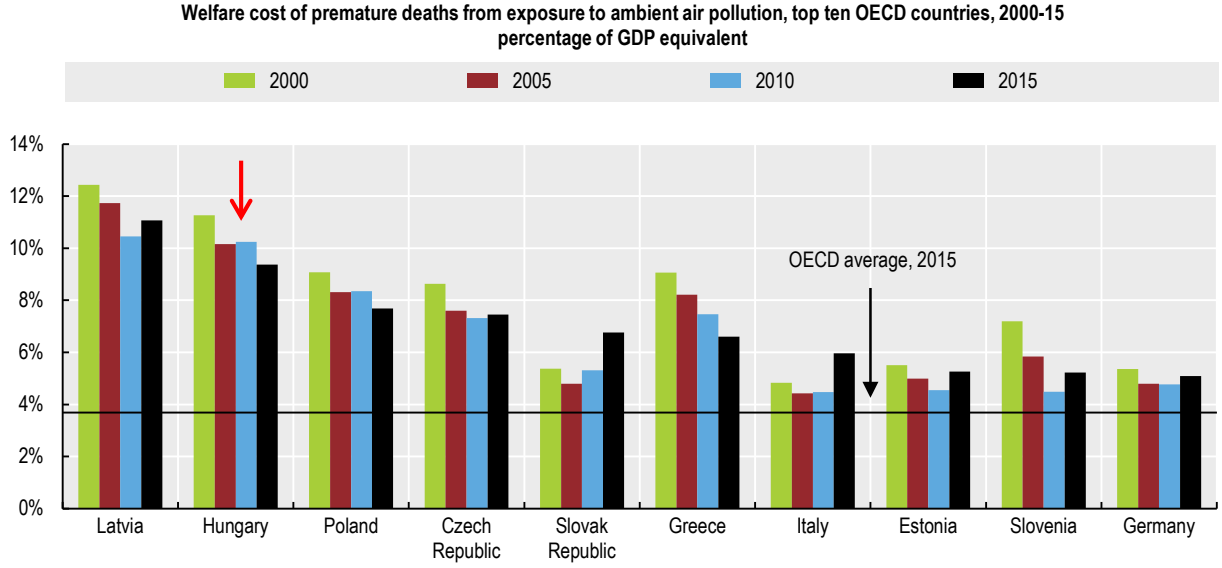
The annual average exposure of Hungary's urban population to ozone concentrations is higher than in most EU countries and has been increasing since 2000. In 2014, Hungary

registered ozone concentrations above the EU threshold for the protection of human health (EEA, 2016a). The main causes are the emissions of ozone precursors and increased summer temperatures. In addition, several air quality zones have registered exceedances for benzo(a)pyrene (EC, 2017b).

Air pollution is the single most important factor of environmental health risks. It is responsible for the premature death of an estimated 6.5 million people worldwide every year (WHO Europe, 2017). In 2013, the mortality rate for $PM_{2.5}$ in Hungary was the fifth highest in the EU-28 and the highest in European countries of the OECD (almost 13 000 premature deaths). $PM_{2.5}$ pollution caused 1 400 years of life lost per 100 000 inhabitants – the second highest such rate in the OECD Europe after Poland. (EEA, 2016a). According to recent OECD estimates, increasing concentration of $PM_{2.5}$ and ozone in Hungary are projected to lead to an economic loss equivalent to 9% of GDP, the second highest value after Latvia (Roy and Braathen, 2017).

Figure 1.12. The mortality cost of air pollution in Hungary is one of the highest in the OECD



Note: Data on mortality from exposure to fine particulate matter and ground-level ozone, and data on value of statistical life are derived from Global Burden of Disease surveys.
Source: Based on: Roy, R. and N. Braathen (2017), "The Rising Cost of Ambient Air Pollution thus far in the 21st Century: Results from the BRIICS and the OECD Countries", *OECD Environment Working Papers*, No. 124.

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Air policies and measures

Hungary has transposed EU directives on air quality and emissions, including the NEC Directive, into the national legislation (Chapter 2.). It is also pursuing efforts to meet international commitments under the Convention on Transboundary Air Pollution and associated Gothenburg Protocol, which sets emission reduction targets for 2020 based on 2005 levels. With the support of EU funding, Hungary has extended and upgraded its air quality monitoring network. The Department of Air Hygiene of the National Institute of Environmental Health has developed an Air Hygiene Index (AHI) to regularly monitor concentrations of main air pollutants. Further improvements, such as installation of more representative and better equipped monitoring stations, are planned with EU funding.

In 2011, Hungary introduced an Action Programme for reduction of PM_{10} in response to an EU infringement procedure. The programme envisages measures to reduce PM_{10} emissions by 10% to 15% by 2020. This, in turn, is backed up by investments of up to HUF 700 billion (about EUR 2.3 billion) for various measures. These include creation of low emission zones in selected urban areas, introduction of electronic tolls for heavy-duty vehicles, tax exemptions for electric and plug-in hybrid cars, along with measures to promote e-mobility. The programme also envisages further development of technologies aimed at curbing emissions in the industry sector. Other emissions reduction measures are targeting agriculture (e.g. less fertiliser use) and the residential sector (e.g. more efficient and less polluting heating systems). In 2012-16, the government spent over HUF 160 billion implementing this programme, mostly on optimising the road network and promoting cleaner vehicles. However, there is no similar programme to address $PM_{2.5}$ pollution.

1.4. Transition to efficient resource management

1.4.1. Material consumption and waste management

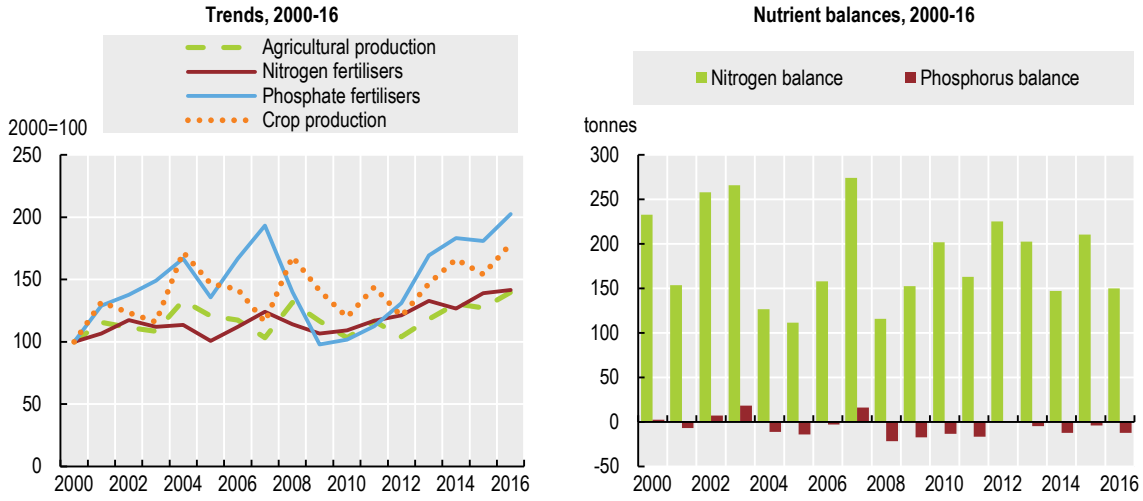
Hungary's domestic material consumption (DMC) per capita remains low (30 kg per person per day), significantly below the OECD Europe average (35 kg per person per day). Total DMC decreased by 20% between 2008 and 2016. However, Hungary is an average performer in terms of material productivity: nearly 15% of Hungary's material consumption ends up as waste (Chapter 4.).

Total waste generation decreased by 17% between 2008 and 2015. The generation of both total primary and municipal waste has been decoupled from economic growth. Despite strong annual variations, hazardous waste generation (550 000 tonnes in 2016) has also decreased substantially. Material recovery is on the rise for significant waste streams such as construction and demolition waste (63% in 2016) and municipal waste (32% in 2015). However, the landfilling of municipal waste remains the most frequent treatment option (54% of the generation volume in 2015). More information on waste and material management, and the transition to a circular economy, is found in Chapter 4.

1.4.2. Agriculture

Agricultural areas cover about 60% of the total land area, with important implications for the management of natural resources. Between 2000-02 and 2012-14, the consumption of nitrogen fertilisers increased by about 25% compared to the growth of about 40% in total crop production (Figure 1.13). On a per hectare basis, the intensity of nitrogen fertiliser use increased by about 40% over the same period, faster than in other OECD member countries. The excessive agricultural use of fertilisers and nutrients in wastewater discharges lead to eutrophication of water bodies (EC, 2017b). About 70% of the Hungarian territory has been designated as a nitrate-vulnerable zone.

Figure 1.13. Nutrient inputs are rising



Source: HCSO (2017), *STADAT* (database).

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Hungary succeeded in reducing its nitrogen surplus by about 20% between 2000-02 and 2012-14. However, the country maintained a negative phosphorus balance over the review period, which could raise concerns about losses in soil fertility (OECD, 2013b).

As recommended by the 2008 Environmental Performance Review, Hungary has developed measures to limit the use of pesticides. A 2010 government decree, for example, sets maximum levels of pesticide residues in food with plant or animal origin. The National Environmental Programme (NEP) for 2015-20 introduced several measures to reduce use of pesticides. These include promoting public awareness of the adverse environmental and health effects of pesticide use, promoting less risky pesticides and periodic revision of pesticide safety regulation. However, the intensity of pesticide use (measured in quantity of active ingredients per hectare of agricultural land) is still higher than in many other OECD member countries. Sales of pesticides have also increased (by 11% over 2011-15). It is therefore important to carry out the most relevant measures in the NEP for 2015-20 to reduce diffuse pollution from pesticides and nutrients.

1.5. Management of natural assets

1.5.1. Biodiversity and ecosystems

Over the last decade, Hungary has made several improvements related to biodiversity. It was one of the first EU member states to have its Natura 2000 network of protected areas declared complete in 2011. However, most habitats remain in an unfavourable state. Further effort is needed to reduce pressures on biodiversity from land-use change, habitat fragmentation, pollution, invasive species and climate change. Chapter 5 addresses these in more detail.

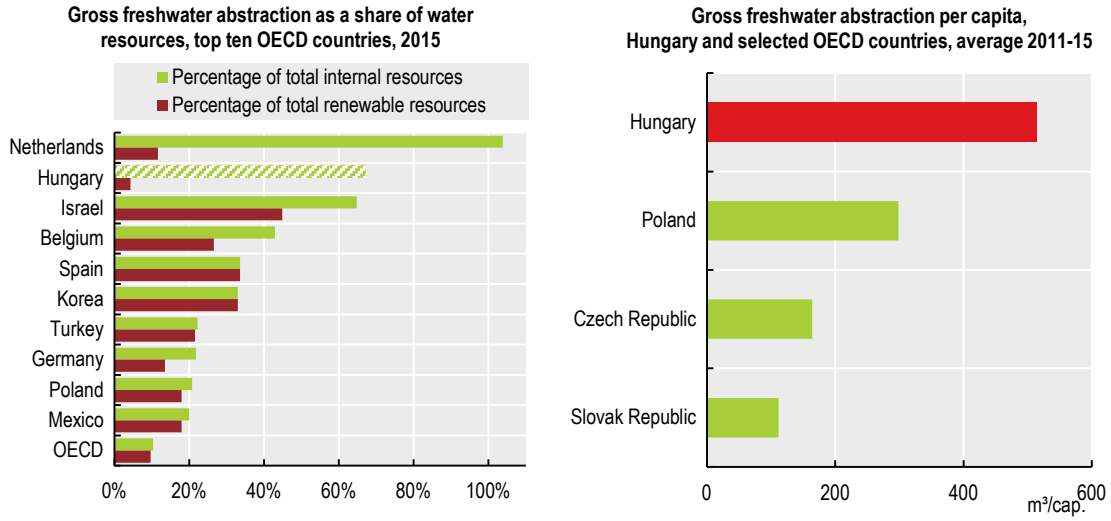
1.5.2. Water resources management

Water resources

Hungary's entire territory lies in the Danube River Basin, the second largest European basin shared by 19 countries. Over 90% of its watercourses are transboundary, making international co-operation on water resource management a cornerstone of Hungary's environmental policies.

Hungary is endowed with about 11 900 m^3 of renewable freshwater resources per capita, about one-third more than the OECD average. Freshwater abstraction, mainly for electricity cooling, amounted to 67% of internal water resources, the second highest rate in the OECD after the Netherlands (Figure 1.14). Water abstraction decreased by almost a quarter over 2000-12 due to reduced demand for electricity cooling, higher water prices, increased fees for wastewater discharges (Chapter 3.), and reliance on other sources of freshwater supply (e.g. private wells).

Figure 1.14. Freshwater abstraction is high



Note: Internal water resources: volume of river run-off and groundwater generated by precipitation minus evapotranspiration. Renewable water resources: internal water resources plus net volumes of rivers inflows and groundwater coming from neighbouring countries.
Source: OECD (2017), "Water: Freshwater abstractions", *OECD Environment Statistics* (database).

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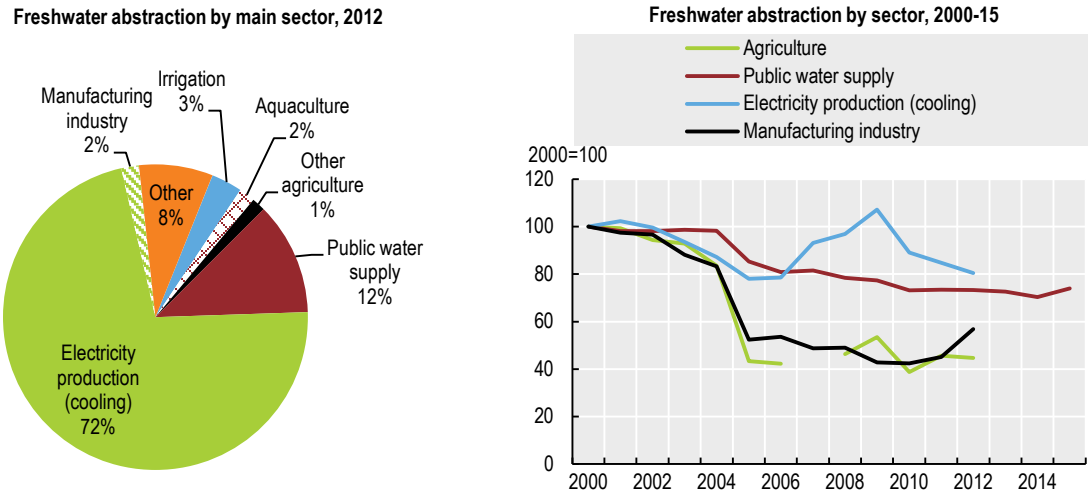
Water abstraction per capita varies significantly across counties (regions). Pest and Veszprem have rates 300% and 150% higher than the national average, while Budapest and Békés are at the bottom of the spectrum. These variations are largely explained by technological differences in water abstraction equipment, access to public facilities and water prices (HCSO, 2015). In 2012, power plants abstracted most water (for cooling purposes only), about 72% of the total. Public water supply accounted for 12% of freshwater abstraction (Figure 1.15). All sectors have reduced their water intake since 2000, with the notable exception of irrigation (4% of total abstraction).

Figure 1.15. Electricity cooling dominates freshwater abstraction



Note: Water abstraction data for irrigation purposes are not available for the period 2005-10.
Source: OECD (2017), "Water: Freshwater abstractions", *OECD Environment Statistics* (database).

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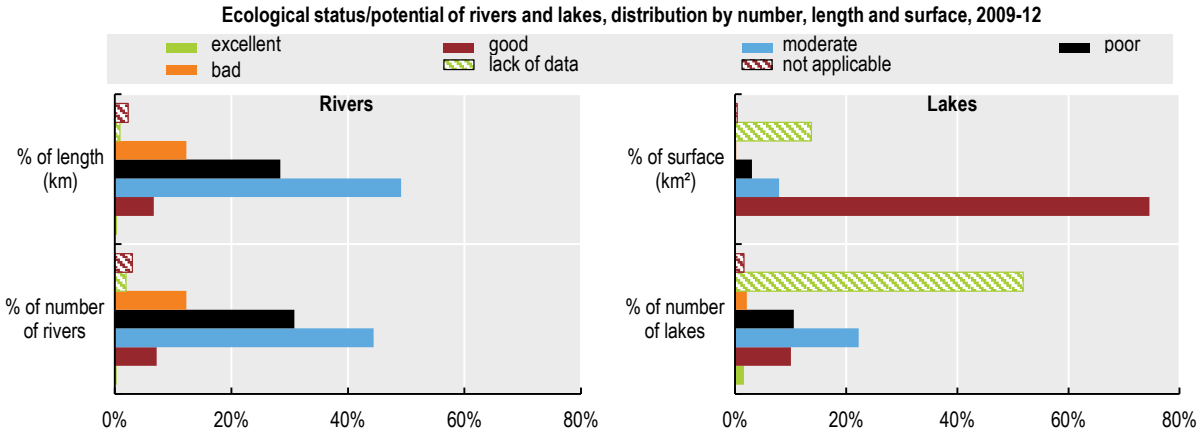
Water quality

The ecological status of Hungarian water bodies has not improved. In 2015, according to the revised National River Basin Management Plan (RBMP2)[11], 88% of Hungarian rivers had a bad to moderate ecological status. Only 7% of rivers and 12% of lakes had a good ecological status (Figure 1.16). The pressures were mainly due to flow regulation (56% of surface water bodies), followed by diffuse and point sources of pollution (26% and 19%, respectively). Bathing water quality has improved since 2013, and 71% of inland bathing waters had excellent water quality in 2016. Less than 2% of waters have poor quality (EEA, 2017). The proportion of surface water bodies with unknown status has been reduced due to an improved information base. However, it remains high (accounting for more than half of lakes, by number) and represents a challenge for interpretation of the data.

The excess of nutrients coming from agriculture and wastewater discharges poses a problem in the Danube River Basin. Despite recent improvements, the nitrogen and phosphorus loads are 30% and 20% higher, respectively, than the reference conditions of the 1950s.

The situation is better for groundwater bodies, half of which achieved good status in 2015. Groundwater quality threats stemmed mostly from diffuse pollution sources.

Figure 1.16. Water quality continues to be low



Source: Country submission; EC (2015), Assessment of Member States' progress in the implementation of Programme Measures during the first planning cycle of the Water Framework Directive - Hungary.

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Public water supply and sanitation services

The quality of drinking water has improved over time, driven by extensive EU financing. A 2011-13 assessment showed compliance with the EU Drinking Water Directive of 99.7% for microbiological parameters and 98.6% for chemical parameters. Compliance with other parameters (arsenic, boron and fluoride) will be assessed in 2018. According to national estimates, the share of population without drinking water supply of satisfactory quality decreased from 45.6% to 38.1% between 2008 and 2012. Further investment is required to rehabilitate the public water supply systems; renew existing water wells and, if necessary, drill new ones; and build new wastewater treatment plants.

The share of the population connected to public wastewater treatment has increased by 70% since 2000. It reached 78% of the total population in 2016. The improvement was driven by substantial investment in new technologies that replaced obsolete infrastructure. This included the opening of a wastewater treatment plant in Budapest in 2010. Despite the considerable progress, the percentage of the population connected to wastewater treatment remains one of the lowest in the OECD.

In 2016, the length of public sewerage network increased by 19% compared to 2008. In the same year, the percentage of dwellings connected to public sewerage reached 89% in towns and 59% in villages (HCSO, 2017). Sewerage connection rates are uneven across regions and income groups. The lowest connection rates are in the eastern part of the country (about 75%); the highest rates are in Central Hungary and Western Transdanubia (about 90% and 83%, respectively) (HCSO, 2017).

Only 94% of the citizens in the bottom 40% of the wealth distribution have access to piped water compared to the national average of 97%. At the same time, only 87% of this group have access to a flush toilet compared to the national average of 93%. The lowest shares are recorded for the lowest quintile of the population, to which the majority of Roma belongs (World Bank, 2015).

During the review period, Hungary became 100% compliant with requirements of the EU Urban Wastewater Treatment Directive (91/271/EEC) for sewerage systems. In

addition, the country reached a 95% compliance rate for secondary or biological treatment and 92% for tertiary or chemical treatment of pollution load generated in agglomerations of over 10 000 population equivalents, fully complying with the directive's requirements. However, compliance is still not achieved in 22 agglomerations, and for which the European Commission opened an infringement procedure in February 2017. Following the 2009 decision to designate the territory located in the Danube River Basin as a sensitive area, Hungary committed to more stringent treatment standards and reducing 75% of the overall load entering treatment facilities for both nitrogen and phosphorus by the end of 2018. In 2014, according to the latest available data, Hungary achieved an 80.2% reduction of the nitrogen load entering wastewater treatment and an 83.5% reduction for phosphorus in sensitive areas (EC, 2017b).

Water management policies and measures

The National Water Strategy, the pillar of water, irrigation and drought management policy, was revised in 2017. Its objectives include developing water retention measures and integrating agriculture and nature conservation issues into water resources management. In addition, a new water resources management and planning approach would include adaptation measures and reduce the vulnerability to extreme climatic effects such as damage to infrastructure and increased risk of sewer overflows.

The fourth NEP for 2015-20 includes objectives for conservation of water resources and prevention of water pollution. These are set in accordance with the EU legislation. They are also in line with Sustainable Development Goal 6 to ensure universal access to safe and affordable water and sustainable management of water and sanitation for all by 2030. In accordance with EU requirements, Hungary has developed one national river basin management plan (RBMP) for the Danube River Basin, covering the whole country. It also has four sub-basin RBMPs for Danube, Tisza, Lake Balaton and Dráva.

The State Programme for National Drinking Water Quality Improvement aims to achieve safe drinking water standards for all public water supply systems, as required by the EU Drinking Water Directive. According to the latest data review in October 2017, public drinking water supply in 337 of 365 water supply zones complies with EU requirements. More detailed analysis and targeted monitoring programmes could provide useful insights on the causes of non-compliance in the remaining 28 water supply zones and for appropriate corrective actions.

Significant parts of the catchment area are outside national borders and subject to other countries' water management systems. This makes transboundary water issues particularly relevant in Hungary. As part of the Danube region, Hungary takes part in the European Strategy for the Danube River (2011), leading priority areas on water quality and environmental risks. For example, Hungary has promoted sustainable use of pesticides to help implement the strategy. The country is also involved in several Danube River Basin co-operation programmes for 2014-20 and in bilateral water committees that manage issues related to floods, water quality and other transnational concerns.

Recommendations on climate change, air pollution and water management

Climate change

- Strengthen efforts to co ordinate the implementation, including monitoring and reporting, of energy- and climate-related strategies and action plans; develop ambitious targets for reducing domestic GHG emissions and analyse the economic, environmental and social impacts of different scenarios to achieve them.
- Integrate adaptation concerns into the National Climate Change Strategy and infrastructure investment plans; address the risk of increased flooding and resulting vulnerability of the water supply and sanitation systems through improved engineering and water management practices.

Air quality

- Significantly reduce particulate emissions from solid fuel combustion in residential heating and mitigate related adverse health impacts by introducing more efficient and less polluting heating and cooling systems and better insulation of buildings.

Water

- Reinforce measures to reduce the abstraction of freshwater through enhanced water use efficiency in irrigation and other agricultural practices.
- Reduce diffuse water pollution from agriculture by promoting sustainable use of fertilisers; complement EU funds with increased national public and private investment to upgrade wastewater treatment; increase the share of population connected to the sanitation infrastructure and improve access to drinking water fully compliant with EU requirements.

Notes

[1] Recent amendments to the Energy Act limit installation of wind turbines near populated areas and in farmed agricultural areas.

[2] The feed-in-tariff system was set up under the legal framework of the 2007 Electricity Act and the Decree 389/2007 on the compulsory purchase of energy from biomass and waste and other renewable sources (solar photovoltaic, geothermal, biogas, hydropower, biomass and wind). Its last revision was carried out in 2014. Tariffs depend on plant capacity (below 20 MW and 20-50 MW), location, time and season and are revised every year (IEA IRENE database). In January 2017, a new Renewable Energy Support Scheme (METÁR) was introduced, complementing the feed-in-tariff system.

[3] In 2017, in application of EU Regulation 431/2014, the Hungarian Energy and Public Regulatory Office revised the energy-related accounting methodology for firewood. Consequently, the 2015 share of renewable energy sources in total primary energy supply increased from 8% to 12%.

[4] The relatively high share of biofuels in TPES is partially explained by the inclusion of conversion losses in biofuels used in heat and power generation. This is not the case for other renewable sources (hydro, solar and wind) (IEA, 2017).

[5] The national shares of renewable energy sources (RES) in gross final consumption of energy are calculated according to specific provisions of Directive 2009/28/EC and Commission Decision 2013/114/EU. Gross consumption excludes all non-energy use of energy carriers (e.g. natural gas used not for combustion, but for producing chemicals). Beyond the general target of 20%, EU members have agreed to increase final consumption of energy from RES to 27% by 2030. Different sub-targets are specified for electricity generation (10.9% of electricity generated by RES), transport (10% of energy demand met by RES) and heating and cooling (18.9% of heat consumption met by RES).

[6] The 10% minimum target must be achieved by all member states for the share of biofuels in transport petrol and diesel consumption by 2020.

[7] Budapest was one of three cities selected in the context of the 5th EU Sustainable Urban Mobility Planning Award on the theme of urban freight. Among other objectives, the plan sought to increase the connection network by disseminating intelligent technologies, improving quality of services, developing attractive vehicles and promoting efficient governance.

[8] Under the 2009 EU Climate and Energy Package Directive, member states must achieve a quantified economy-wide GHG emission reduction target of 20% below 1990 levels by 2020. An additional reduction of 30% is conditional upon other comparable emission reductions agreed by developed countries and adequate contributions by developing countries. This reduction objective is divided between two sub-targets, for ETS and non-ETS sectors (transport, buildings, agriculture and waste). The EU reduction targets (compared to 2005 levels) are a 21% reduction for ETS-covered emissions and a 10% reduction for non-ETS emissions.

[9] The ESD is part of the EU Climate and Energy Package and establishes binding GHG emission reduction targets for 2013-20 for non-ETS sectors. For these sectors, individual member states' efforts have been calculated according to their GDP per capita. They vary from a 20% emissions reduction for wealthier countries to a 20% increase for several others, compared to 2005 levels.

[10] Due to a recent revision of the methodology assessing biomass use for residential heating, Hungary's NMVOC emissions appear to be slightly above the 2010 ceiling.

[11] In application of the EU Water Framework Directive, Hungary adopted the first National River Management Plan (RBMP1) in 2010. It aimed at protecting water resources and promoting their

sustainable use through measures for 2012-15. RBMP2 (the revised RBMP1), adopted in 2016, contains updated measures for 2018-21.

References

Belis, C.A. et al. (2016), Air Quality in the Danube Macro-Region, *JRC Science for Policy Report,* Publications Office of the European Union, Luxembourg, http://publications.jrc.ec.europa.eu/repository/bitstream/JRC104504/jrc104504_air%20quality%20in%20the%20danube%20final%20online.pdf.

Concerted Action for the Energy Efficiency Directive (2016), *National EED Implementation Reports* (NIR), July 2016, www.ca-eed.eu/.

EC (2017a), "Attitudes of European citizens towards the environment", *Special Eurobarometer,* No. 468, October 2017, European Commission, Brussels, http://mehi.hu/sites/default/files/ebs_468_en_1.pdf.

EC (2017b), The EU Environmental Implementation Review, Country Report – Hungary, *Commission Staff Working Document,* SWD (2017) 46 final, European Commission, Brussels, 3 February 2017, http://ec.europa.eu/environment/eir/pdf/report_hu_en.pdf.

EC (2016), *Study on Assessing the Environmental Fiscal Reform Potential for the EU28*, January 2016, Publications Office of the European Union, Luxembourg, http://ec.europa.eu/environment/integration/green_semester/pdf/Eunomia%20EFR%20Final%20Report%20MAIN%20REPORT.pdf.

EC (2015a), "Climate change", *Special Eurobarometer*, No. 435, May-June 2015, European Commission, Brussels, https://ec.europa.eu/clima/sites/clima/files/support/docs/report_2015_en.pdf.

EC (2015b), Assessment of Member States' Progress in the Implementation of Programme Measures during the First Planning Cycle of the Water Framework Directive – Hungary, European Commission, Brussels, http://ec.europa.eu/environment/water/water-framework/impl_reports.htm.

EC (2015c), *Facts and Figures on Agricultural Reductions as Proposed Under the Commission's NEC Proposal*, October 2015, European Commission, Brussels, http://ec.europa.eu/environment/air/pdf/review/Facts%20and%20figures%20agriculture%20under%20the%20NEC.pdf.

ECA (2017), "Implementing the Drinking Water Directive: Water quality and access to it improved in Bulgaria, Hungary and Romania, but investment needs remain substantial", *Special Report,* No. 12, European Court of Auditors, Luxembourg, http://publications.europa.eu/webpub/eca/special-reports/drinking-water-12-2017/en/.

EEA (2017), *Hungarian Bathing Water Quality in 2016,* Hungary May 2017*,* European Environment Agency, Copenhagen, www.eea.europa.eu//publications/european-bathing-water-quality-in-2016.

EEA (2016a), Air Quality in Europe: 2016 Report*, EEA Report*, No 28/2016, Publications Office of the European Union, European Environment Agency, Copenhagen, www.eea.europa.eu/publications/air-quality-in-europe-2016.

EEA (2016b), *Flood Risks and Environmental Vulnerability*, European Environment Agency, Copenhagen, www.eea.europa.eu/publications/flood-risks-and-environmental-vulnerability.

EGEC (2017), *EGEC Geothermal Market Report – Key Findings*, May 2017, European Geothermal Energy Council, Brussels, www.egec.org/wp-content/uploads/2017/05/EGEC-Geothermal-Market-Report_KF_final_web.pdf.

Eurostat (2017a), *Shares 2015* (database), http://ec.europa.eu/eurostat/web/energy/data/shares (accessed 15 November 2017).

Eurostat (2017b), "Passenger cars, by type of motor energy and size of engine", *Transport Statistics* (database), http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_carmot&lang=en (accessed 26 October 2017).

Eurostat (2016a), "How satisfied are inhabitants of the EU capital cities with the air quality and noise levels?", *News release*, 3 June 2016, Eurostat, European Commission, Luxembourg, http://ec.europa.eu/eurostat/documents/2995521/7427955/8-03062016-BP-EN.pdf/0d471c36-aef6-47e8-b52b-b63e4f40302f.

Eurostat (2016b), *Agriculture, Forestry and Fishery Statistics*, 2016 Edition, Publications Office of the European Union, Luxembourg, http://ec.europa.eu/eurostat/web/products-statistical-books/-/KS-FK-16-001.

Eurostat (2015), *Quality of Life: Facts and Views*, 2015 Edition, Publications Office of the European Union, Luxembourg, http://ec.europa.eu/eurostat/documents/3217494/6856423/KS-05-14-073-EN-N/742aee45-4085-4dac-9e2e-9ed7e9501f23.

FiBL and iFOAM (2017), *The World of Organic Agriculture 2017*, Willer, H. and J. Lernoud, eds., Research Institute of Organic Agriculture and Organics International, Frick, Switzerland, https://shop.fibl.org/CHen/mwdownloads/download/link/id/785/?ref=1.

Forsense Institute (2016), "A klímaváltozás az emberiség jövőjét fenyegető legnagyobb veszély, [Climate change is the greatest threat to the future of humanity]", web page, www.forsense.hu/tartunk-a-klimavaltozas-hatasaitol/ (accessed 12 September 2017).

Hungarian Academy of Science (2017), *Water in Hungary*, Water Research Coordination Group, Centre for Ecology, Budapest, http://mta.hu/data/dokumentumok/Viztudomanyi%20Program/Water_in_Hungary_2017_07_20.pdf.

HCSO (2017), *STADAT* (database), Hungarian Central Statistical Office, Budapest, www.ksh.hu/docs/eng/xstadat/xstadat_annual/i_zrk002.html (accessed 20 November 2017).

HCSO (2015), *Indicators of Sustainable Development for Hungary, 2014*, Hungarian Central Statistical Office, Budapest, www.ksh.hu/docs/eng/xftp/idoszaki/fenntartfejl/efenntartfejl14.pdf.

HCSO (2014), *Environmental Report, 2013*, Hungarian Central Statistical Office, Budapest, www.ksh.hu/docs/eng/xftp/idoszaki/ekornyhelyzetkep13.pdf.

IEA (2017a), IEA OECD Energy Statistics and Balances (database), http://dx.doi.org/10.1787/enestats-data-en (accessed 20 November 2017).

IEA (2017b), *Energy Policies of IEA Countries: Hungary 2017*, IEA, Paris, http://dx.doi.org/10.1787/9789264278264-en.

IEA (2016), *IEA World Energy Statistics and Balances* (database), http://dx.doi.org/10.1787/enestats-data-en (accessed 6 December 2017).

Ministry of Public Administration and Justice (2011), National Social Inclusion Strategy – Extreme Poverty, Child Poverty, The Roma (2011–2020), Budapest.

MoA (2017), *National Inventory Report to the UNFCCC,* Ministry of Agriculture, Budapest.

MoA (2014), *National Environmental Programme 2015-2010,* Ministry of Agriculture and Rural Development, Budapest.

MND (2015), *Hungary's National Energy Efficiency Action Plan until 2020*, Ministry of National Development, Budapest, https://ec.europa.eu/energy/sites/ener/files/documents/hungaryActionPlan2014_en.pdf.

MND (2012), *National Energy Strategy 2030*, Ministry of National Development, Budapest, http://2010-2014.kormany.hu/download/7/d7/70000/Hungarian%20Energy%20Strategy%202030.pdf.

OECD (2017a), *Hungary: Trade and Investment Statistical Note*, OECD Publishing, Paris, www.oecd.org/investment/HUNGARY-trade-investment-statistical-country-note.pdf.

OECD (2017b), "Hungary", in *Economic Policy Reforms 2017: Going for Growth*, OECD Publishing, Paris, http://dx.doi.org/10.1787/growth-2017-25-en.

OECD (2017c), *How's Life? 2017: Measuring Well-being*, OECD Publishing, Paris, http://dx.doi.org/10.1787/how_life-2017-en.

OECD (2017d), *OECD Skills Outlook 2017: Skills and Global Value Chains*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264273351-en.

OECD (2017e), *Green Growth Indicators 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264268586-en.

OECD (2016a), "Hungary", in *OECD Regional Outlook 2016: Productive Regions for Inclusive Societies*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264260245-27-en.

OECD (2016b), *OECD Economic Surveys: Hungary 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-hun-2016-en.

OECD (2016c), "Hungary" in *OECD Economic Outlook*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_outlook-v2016-1-21-en.

OECD (2016d), *Regional Well-being in OECD Countries: Hungary*, OECD Publishing, Paris, www.oecd.org/cfe/regional-policy/hows-life-country-facts-hungary.pdf.

OECD (2015a), *Climate Change Risks and Adaptation: Linking Policy and Economics*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264234611-en.

OECD (2015b), *Environment at a Glance 2015: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264235199-en.

OECD (2013a), Water and Climate Change Adaptation: Policies to Navigate Uncharted Waters, OECD Studies on Water, OECD Publishing, http://dx.doi.org/10.1787/9789264200449-en.

OECD (2013b), *OECD Compendium of Agri-environmental Indicators,* OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264186217-en.

OECD/IEA (2016), *World Energy Outlook 2016*, IEA/OECD Publishing, Paris, http://dx.doi.org/10.1787/weo-2016-en.

OMSZ (2017a), *National Informative Inventory Report for 1990-2015*, Report to the CLRTAP Convention, Hungarian Meteorological Service, Budapest.

OMSZ (2017b), *National Inventory Report for 1985-2015*, Report to the UNFCCC, Hungarian Meteorological Service, Budapest.

Roy, R. and N. Braathen (2017), "The rising cost of ambient air pollution thus far in the 21st century: Results from the BRIICS and the OECD countries", *OECD Environment Working Papers*, No. 124, OECD Publishing, Paris, http://dx.doi.org/10.1787/d1b2b844-en.

WHO (2016), *Country Profile of Environmental Burden of Disease*, World Health Organization, Geneva, www.who.int/quantifying_ehimpacts/national/countryprofile/hungary.pdf?ua=1.

WHO Europe (2017), "Air pollution: Better air for better health", *Fact Sheet 10*, World Health Organization Europe, Copenhagen, www.euro.who.int/__data/assets/pdf_file/0019/341137/Fact-Sheet-10-Better-air-for-better-health.pdf.

World Bank (2015), *Water and Wastewater Services in the Danube Region*, *A State of the Sector*, May 2015, World Bank, Washington, DC, www.danube-water-program.org/media/publications/SoS_Report.pdf.

Chapter 2. Environmental governance and management

Hungary has strengthened its regulatory framework for environmental management. However, institutional challenges impede more effective implementation of environmental law and the uptake of good regulatory practices. More needs to be done to preserve environmental democracy. This chapter analyses Hungary's environmental governance system, including horizontal and vertical institutional co-ordination, setting and enforcement of environmental requirements. It also addresses public participation in decision making and access to environmental information, education and justice.

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.

2.1. Introduction

The World Bank 2015 Worldwide Governance Indicators show that the governance score of Hungary for regulatory quality is below the European Union (EU) average and has deteriorated since 2006 (World Bank, 2017). The 2013 European Quality of Government Index ranked Hungary 21st out of 28 member states (Charron, 2015). Hungary's governance challenges, particularly in the institutional domain, have had important repercussions for the design and implementation of environmental policies.

Hungary has made its legal framework consistent with the EU environmental acquis. However, it has not been pursuing good international practices in implementation of environmental law. Despite a strong legal foundation of environmental democracy, there have been concerns in recent years in the areas of public participation and access to information.

2.2. Institutional framework for environmental governance

The environment is largely the responsibility of the central government and its territorial institutions; county and municipal levels have limited functions in this domain. The frequent changes in the institutional framework have led to fragmentation of environmental responsibilities at the national level, policy uncertainty and loss of human resource capacity. Those changes have improved inter-institutional co-operation at the national and territorial levels of government, in line with a recommendation of the 2008 Environmental Performance Review. However, enhanced co-operation occurred primarily to compensate for the break-up of the former environment ministry's functions.

2.2.1. National institutions and horizontal co-ordination

Since the 2008 Environmental Performance Review, the central environmental administration has been significantly restructured. In 2010, the government drastically reduced the number of ministries to cut down on bureaucracy. The Ministry of Environment and Water was merged into the Ministry of Rural Development (renamed Ministry of Agriculture in 2014). At the same time, the Ministry of National Development took over responsibility for climate change issues. Furthermore, water management was transferred to the Ministry of Interior in 2012.

Hungary is one of the few EU member states without a dedicated environment ministry. The environment-related responsibilities are fragmented across several large ministries:

- The Ministry of Agriculture (MoA) is responsible for most environment-related issues: air quality and noise protection, industrial pollution, environmental assessment, soil protection and remediation (excluding groundwater protection), waste management, biodiversity protection, etc.
- The Ministry of National Development oversees climate policy, transport and energy issues, as well as municipal delivery of water supply, sanitation and waste management services.
- The Ministry of Interior is responsible for water management and protection (including flood protection and water quality issues) and disaster management (including industrial safety). The General Directorate for Water Management and 12 regional water directorates (along river basin boundaries) are responsible for river basin management.
- The Ministry for National Economy handles budgetary issues and economic regulation, including economic instruments in the field of environment.

- The Ministry of Human Capacities has responsibilities for environment-related education and health issues (including drinking and bathing water quality).

The fragmentation of ministerial responsibilities is particularly significant in the water domain. While one ministry is in charge of surface water and groundwater management and protection, another one oversees pricing and operation of drinking water supply and wastewater treatment. River basin management and water permitting are handled by different agencies under the Ministry of Interior.

A 2012 government decree required the harmonisation of strategic planning documents across ministries. However, there is no environment-specific horizontal co-ordination mechanism at the national level: consultations between ministries are part of the general administrative process. An Environmental Sustainability Directorate established at the President's Office in 2015 plays only a technical support role. Except for a limited number of spatial data sets, Hungary's data policy does not allow free data sharing between public administrations. This creates an important obstacle for environmental decision making (EC, 2017).

Territorial institutions of the central government also underwent a major overhaul in 2010-14. Consolidated government offices (GOs) were created in the capital (Budapest), 19 counties and 197 districts. These GOs have subsumed previously independent authorities such as territorial environmental directorates (Box 2.1).

Box 2.1. Hungary's State Territorial Administration Reform

The State Territorial Administration Reform (STAR) was primarily triggered by lack of transparency in the structure and functioning of the territorial state administration. Other factors included significant disparities in the standards and quality of public services between more advanced and less-developed regions. STAR was among the top programmatic priorities of the government elected in 2010.

STAR has fundamentally reshaped the jurisdictional, organisational and human resource foundation of service delivery at all levels of Hungary's public sector. First, it integrated former territorial branch offices of the central government's sector agencies (the so-called deconcentrated organs) into newly established county GOs. STAR also re-established administrative districts, abolished during the Communist period, to serve as the seats of district GOs. At the same time, the new Act on Local Governments substantially changed the competences, responsibilities and tasks of local self-governments in both county cities and municipalities. The scope and pace of the reform has proven very ambitious, hindering a constructive dialogue with stakeholders.

Because of the disparate policy formulation and budgetary arrangements, the state territorial administration does not have many strategic planning, data collection, and monitoring and evaluation functions. No explicit assessment of the costs and benefits of the reform has been carried out.

There has also been lack of co-ordination between individual "professional portfolios" within GOs. The OECD's 2015 Public Governance Review recommended a thorough re-evaluation of the lines of responsibilities, reporting and co-ordination of various public bodies and government levels. At the same time, it called for adequate matching between the delegated responsibilities and the resources available to carry them out.

Source: OECD, 2015.

The institutional arrangements for environmental permitting and compliance assurance have also changed significantly. In 2014, the permitting and compliance functions related to water were shifted from the independent Environmental, Nature Conservation and Water Chief Inspectorate and respective county inspectorates to the National Directorate General for Disaster Management and its subordinate 12 Directorates for Disaster Management (and not water directorates within the same Ministry of Interior, which oversee water resources planning). These directorates are organised along the lines of river basins.

At the end of 2016, the Environmental and Nature Conservation Inspectorates were merged into GOs. The Chief Inspectorate became part of the Pest County Government Office. At present, the county GOs oversee environmental permitting, inspection and enforcement. However, district GOs conduct most day-to-day operations. Acting as a National Environment Authority, the Pest County Government Office carries out second-instance review of decisions of the county GOs. This reform has lowered the administrative burden on businesses through one-window permitting by GOs. However, it has eliminated the independence of environmental enforcement authorities. In addition, it has reduced their human and technical capacity, particularly at the district level.

2.2.2. Sub-national institutions

As of January 2016, Hungary had 3 155 communities, including 346 cities (the capital, 23 towns with county rights and 322 towns). Local governments' environment-related tasks include spatial and territorial development planning, environmental public services (water supply and wastewater and waste management) and local nature protection. Around 40 inter-municipal associations (each comprising up to six local authorities) pool resources for municipal solid waste management services. Using EU funding, these associations have joint forces in waste collection and built waste management centres, transfer stations and recycling centres (Chapter 4.).There are a few such associations in wastewater management, while inter-municipal co-ordination also exists in territorial planning.

County authorities (not to be confused with county offices of the central government) prepare regional environmental programmes, spatial and territorial development plans, and oversee municipal programmes and plans. They also have a say on draft municipal by-laws in the environmental domain.

2.3. Setting of regulatory requirements

The Fundamental Law, which came into force on 1 January 2012, contains several principles of sustainable development and environmental protection, providing important constitutional guarantees. Framework Environmental Law 53/1995 contains the basic principles of environmental protection and spells out the main environmental management responsibilities and tools. The development of issue-specific environmental laws has been heavily influenced by the transposition of EU directives.

Since 2008, there have been few changes in Hungary's environmental regulatory requirements, all of them driven by changes in the EU legislation. The EU Air Quality Directive (2008/50/EC) and the Industrial Emissions Directive (2010/75/EU) have been transposed into Hungarian legislation through updated regulations on air quality standards (2011), emissions from large combustion plants (2013), waste incineration (2014) and emissions of volatile organic compounds (2014). The 2012 Act on Waste brought the

Hungarian waste management legislation in line with the EU Waste Framework Directive (2008/98/EC) (Chapter 4.).

2.3.1. Regulatory and policy evaluation

The Act on Legislation (2010) lays down rules of preliminary (*ex ante*) impact assessment of all draft bills, government decrees and municipal regulations. This assessment, prepared by the drafting authority, covers social, economic, budgetary, environmental and health-related aspects of draft regulations. It also estimates the administrative burden on the regulated community. It is supposed to include cost-benefit analysis, but seldom carries it out.

The Act on Legislation also mentions the possibility of *ex post* impact assessment as part of the continuous revision of the legislation. The responsible minister may order one as needed to compare the actual impacts of the regulation with the ones projected by the *ex ante* analysis. However, this has happened in very few cases. One such case was the evaluation of environmental impact assessment (EIA) regulation in 2012 in the context of its harmonisation with EU Directive 2011/92/EU.

Hungary's system of strategic environmental assessment (SEA) fulfils the requirements of EU Directive 2001/42/EC and the UNECE Protocol on SEA to the Convention on Environmental Impact Assessment in a Transboundary Context. SEA is mandatory for local spatial plans and territorial development concepts (Section 2.3.3). It is systematically conducted in large- and medium-sized cities (those with county rights), but only sporadically in small municipalities. SEA is also required for policies and programmes related to agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, tourism and regional development.

The SEA procedure comprises two main steps. First, the competent authority decides on the need for an SEA and approves the scoping document of the environmental report prepared for the draft plan or programme. Second, competent authorities evaluate the full environmental report with public participation. In a recent example, SEA of the Rural Development Programme (2014-20) imposed conditions on resource efficiency, mitigation of air emissions and ecosystem conservation criteria for land use.

2.3.2. Environmental impact assessment and permitting

The Hungarian permitting system, based on a 2005 government decree, is complex. It requires an "environmental permit" tantamount to the approval of an EIA and an integrated pollution prevention and control (IPPC) permit in line with the EU Industrial Emissions Directive (2010/75/EU). The permitting authority (county or district GO) may merge the two procedures based on the operator's request; otherwise, they are conducted sequentially. Both the EIA and the IPPC permitting procedures include public participation (Section 2.5). Planning authorities (which are now part of the same GO) and disaster management directorates (responsible for water regulation) are also consulted.

If the decree does not list the activity, the operator may have to obtain permits based on requirements of medium-specific environmental legislation. County GOs issue permits for waste management (collection, transport and treatment) and nature conservation (for handling plant and animal species). Directorates for Disaster Management issue water abstraction and discharge permits. The operator may also request a "combined environmental use permit" that would consolidate single-medium permits into one document. Obtaining environmental permits is a precondition for building and/or

operational permits. Permits are available to the public through the National Environmental Information System.

For activities with a low level of environmental impact, an operator may simply notify the competent authority without requiring an environmental permit. A ministerial decree regulates the operation of small and medium-sized combustion plants. However, there are no sector-specific environmental regulations (often called general binding rules) that would cover other activities dominated by low-impact installations. This is contrary to good practices in other OECD member countries such as France, the Netherlands and the United Kingdom.

The EIA process has been brought in line with the latest EU directive on this issue (2014/52/EU). Projects listed in Annex I of the 2005 Hungarian decree, which have potentially significant environmental impact, undergo full EIA. For their part, Annex II projects are subject to thresholds and screening. Furthermore, the 2005 decree introduced – as part of EIA – the assessment of cumulative effects beyond the impact of the proposed project. However, on several occasions, competent authorities relied on a special procedure, called environmental performance evaluation, to assess an existing or ongoing project instead of carrying out an impact assessment before the project is authorised (EC, 2017).

2.3.3. Land-use planning

Land use is governed by spatial planning and territorial development instruments, which are implemented separately. At the highest level of the spatial planning hierarchy, the National Spatial Plan contains a mix of general guidelines and strategic plans. The National Spatial Plan (2003) stipulates regulations for "spatial structure" (infrastructure networks) and zoning (for the protection of natural, landscape and cultural heritage).

Spatial plans for two regions are also developed at the national level. They cover the urban agglomeration of Budapest and the tourist area around Lake Balaton. County spatial plans (elaborated every seven years) lay out details of the national plan's directions, outline areas for future development and for nature and cultural heritage protection, and determine permitted uses of areas not specified by the national plan (OECD, 2017).

At the local level, settlement structural plans combine zoning with strategic planning. They are binding for land owners. Core areas and ecological corridors are zones designated for ecosystem protection. Other zones restrict designation of urban areas based on the risk prevention principle, including areas of high-water bed and flood reservoirs (EEA, 2013). A local spatial plan requires "supporting studies" on the protection of local historic and architectural heritage, environmental protection, landscape and nature protection (including Natura 2000 areas), transport management, water supply and sanitation infrastructure, and storm water management.

Formal requirements for SEA of local spatial plans were introduced in 2005. Planning regulations require assessment of environmental consequences of local plans. However, such assessments have been conducted almost exclusively in larger, county-level cities or in municipalities that apply for EU funds (for which an integrated urban development strategy is a prerequisite). In addition, although SEA effectiveness in Hungary has not been systematically evaluated, there is evidence that most assessments fall far short of best practices (Jones et al., 2013).

Spatial plans at all three levels of government are accompanied by "development concepts". These define long-term social and economic objectives for territorial development at the respective geographical scale and guide sectoral planning. The 2014 National Development and Territorial Development Concept and county-level territorial development concepts define strategic goals, while territorial development programmes lay down operational measures. Each development concept guides preparation of spatial plans at the corresponding administrative level, within the limits provided by higher-level spatial plans (OECD, 2017). Despite their considerable influence on land-use planning, territorial development concepts are not subject to SEA.

2.4. Compliance assurance

Compliance assurance covers the promotion, monitoring and enforcement of compliance, as well as liability for environmental damage. Compliance promotion does not get the attention it deserves from Hungarian environmental authorities. Compliance monitoring and enforcement activities have been complicated by the recent institutional changes (Section 2.2.1). They do not follow international good practices such as risk-based planning of inspections or multi-factor guidance for the application of sanctions.

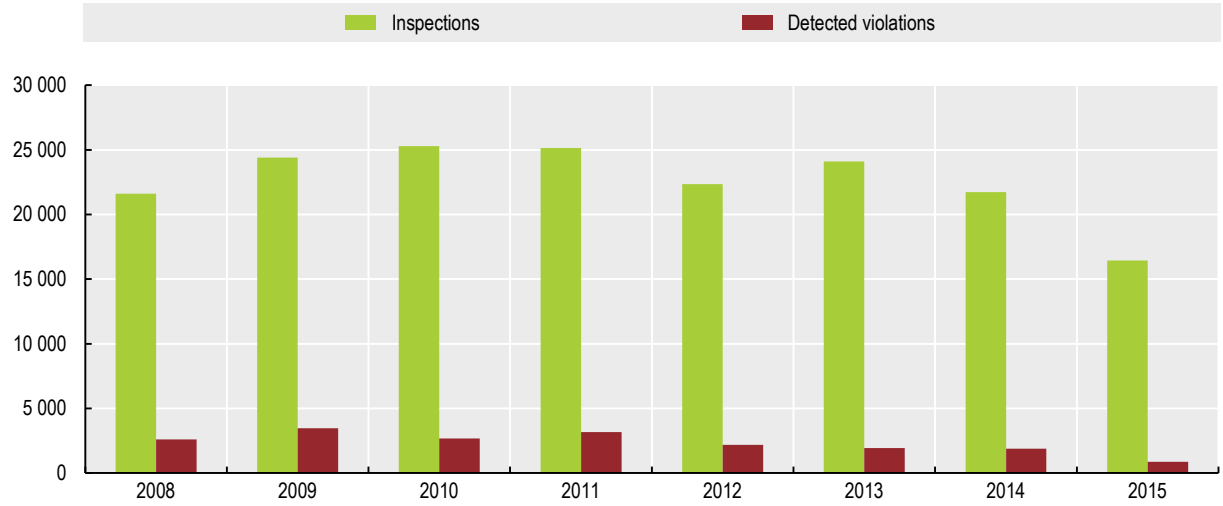
2.4.1. Environmental inspections

Each county GO produces an annual inspection master plan (including the frequency and types of inspections) for all departments. Based on this master plan, the environmental department draws up and carries out an annual programme of routine environmental inspections. The master plan is published on the office's website. However, it does not specify names of facilities to be inspected or respective inspection dates.

The relative risk level (including compliance record) of individual installations is not explicitly considered in the inspection planning. For installations that require an IPPC permit, the planning is co-ordinated with disaster management directorates as the responsible authority for water-related issues. Inspection frequency varies between annual to once every three years. The latter frequency is too low for high-risk installations in comparison with good practices in other EU member states. For non-IPPC installations, inspection priority is assigned to facilities that create nuisance in residential areas, waste handling facilities and operators who have previously received an enforcement order. The frequency of inspection of water-related permits is set in a regulation.

The overall number of inspections has been declining in recent years, leading to lower detection of non-compliance (Figure 2.1). The 2016 abolition of the environmental inspectorate is likely to aggravate this situation further.

Figure 2.1. The number of inspections and detection of violations is declining

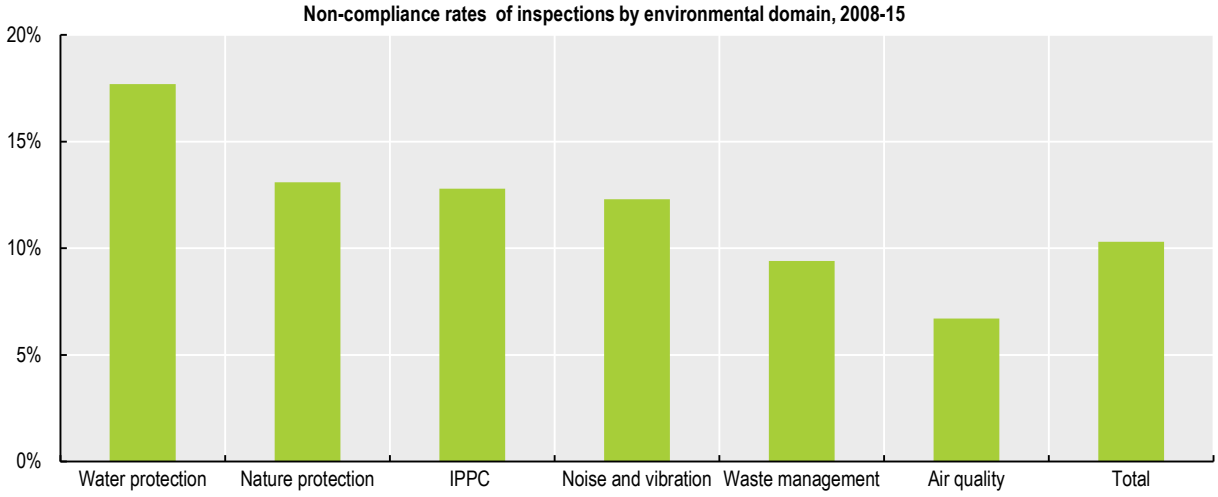


Source: Country submission.

StatLink http://dx.doi.org/10.1787/888933712377

The share of planned inspections between 2008 and 2015 was 93%, which is very high by international standards. Unplanned inspections are conducted in case of serious non-compliance incidents and complaints. However, given that there is no risk-based planning of inspections, planned inspections do not address non-compliance in the most effective way. Indeed, non-compliance rates have been rather high (Figure 2.2), especially in the water domain (almost 18% of inspected cases).

Figure 2.2. Non-compliance is highest with water and nature protection regulations



Source: Country submission.

StatLink http://dx.doi.org/10.1787/888933712396

2.4.2. Enforcement tools

Inspectors can issue compliance orders and/or impose an administrative fine. Both fixed and variable fines are stipulated in issue-specific environmental legislation. For example, the 2005 IPPC regulation provides for daily fines of HUF 50 000 to HUF 100 000, as well as fines of HUF 200 000 to HUF 500 000 per violation, depending on the seriousness of the breach. These fines do not take account of the operator's economic benefit from non-compliance. Criminal sanctions, including imprisonment, can be imposed in case of endangerment of, or significant damage to, the environment.

There are no data-collection arrangements to track the use and effectiveness of different compliance assurance interventions, even the actual use of administrative fines. It is also unclear how the Hungarian authorities ensure a proportionate response to different types of detected violations (EC, 2017). There is no guidance for competent authorities on the application of different sanctions. However, the nature of the violation, its environmental impact and recurrence of the breach are systematically considered in determining the size of the penalty.

2.4.3. Environmental liability

Liability for damage to the environment

The EU Environmental Liability Directive (ELD, 2004/35/EC) was transposed into Hungarian law in 2007. Environmental liability is strict: having an environmental permit does not provide immunity for any damage caused by the polluting activity. Over 2007-13, there were 563 reported cases of damage to the environment: around 37% of those concerned damage to surface water and groundwater, 35% damage to land and 23% damage to biodiversity. This is the highest number of any EU member state (EC, 2017). One reason for this high number is the broader liability coverage of Hungarian law (which, for example, includes damage to air) than that of the ELD. Of the total number of reported cases of damage, only 35% resulted in remediation. In other cases, ceasing the negative impact was considered sufficient. Moreover, the example of Hungary's biggest environmental disaster in recent years – the 2010 toxic "red mud" spill (Box 2.2) – shows that actual enforcement of environmental liability is lacking in many cases, with taxpayers bearing clean-up costs.

Box 2.2. The 2010 toxic sludge spill highlights the importance of industrial sector regulation

On 4 October 2010, the wall of a tailings pond at the alumina plant in Ajka burst. The incident sent 600 000 to 700 000 cubic metres of toxic red mud and water through three villages and creeks that flow into the Danube River. Red sludge is a by-product of the production of alumina from bauxite. It is highly alkaline and contains arsenic and vanadium, toxic to humans and other species.

The collapse was the largest environmental release of red sludge in history. Ten people were killed and over 120 injured. One of the worst hit villages was declared uninhabitable. In the small Marcal River, all fish died. Around 800 hectares of adjacent agricultural land were polluted. There was also concern about downstream impacts in the Danube, as it flows through or near Budapest, Croatia, Serbia, Bulgaria, Romania and Ukraine on the way to the Black Sea.

Extensive mitigation efforts by the Hungarian government costing HUF 38 billion (EUR 127 million) have helped the ecosystem to slowly recover. However, these remediation costs were not recovered from the responsible party. In February 2015, the government set up a compensation fund for the victims, with many claims still outstanding. A HUF 135 billion fine was imposed in 2011 on the MAL Zrt. company that owned the plant. However, the fine was not paid, and the company has since been nationalised. Furthermore, in 2016, the plant's former director and 14 employees were acquitted of charges of negligence, waste management violations and damage to the environment.

Source: Tran (2010); Lian Hui Lim (2014); The Guardian (2016).

Contaminated sites

The clean-up of contaminated sites (over 40% of which are abandoned waste disposal sites) is generally funded by polluters themselves. When the responsibility for contamination cannot be attributed (e.g. for contamination by former state-owned companies), remediation is funded from the national budget or the EU Cohesion Fund.

The publicly funded National Environmental Remediation Programme for the identification, assessment and remediation of environmental pollution has been in place since 1996. It has resulted in the remediation of more than 500 contaminated sites. Remediation standards for groundwater and soil have also been developed in conjunction with this programme. Data on the identification, registration and technical classification of all contaminated sites are stored in the National Environmental Information System. In addition, the Environment and Energy Efficiency Programme for 2014-20 allocates HUF 22.8 billion for environmental remediation tasks. In 2007-13, 23 sites were remediated with HUF 39.3 billion under the same programme.

Hungary has introduced a system of mandatory financial security, but it is limited to hazardous waste management. The required security may be a deposit, a bank guarantee or a liability insurance policy. In addition, it is possible to obtain environmental insurance policies on a voluntary basis. However, this rarely happens due to the shortage of appropriate insurance products on the Hungarian market. Further, there is not strong demand for insurance, which indicates insufficient enforcement of strict liability. The recent EU Environmental Implementation Review of Hungary recommended expanding the system of financial securities for environmental liability (EC, 2017).

2.4.4. Promotion of compliance and green practices

Government promotion of compliance and green practices can reduce costs for businesses by allowing them to achieve and maintain compliance as efficiently as possible. It may also reduce regulatory costs by increasing the efficiency of compliance monitoring and enforcement. Providing advice and guidance is particularly effective when targeted at small and medium-sized enterprises.

Hungarian environmental authorities do not engage in any compliance promotion activities. Although the 2015 National Action Plan on Corporate Social Responsibility (CSR) emphasises environmental performance, there are no voluntary agreements with individual economic sectors on achieving environmental targets. Several CSR initiatives emanate from the business community (e.g. Action 2020 by the Business Council for Sustainable Development, sustainable development work of the Hungarian Business Leaders Forum). However, they are not recognised or rewarded by the government.

Greening public procurement

Green public procurement (GPP) can be another tool to promote green practices, if criteria for public purchases of goods and services consider suppliers' environmental performance. Hungary has not yet adopted a national strategy for GPP. According to a 2010 study, the share of Hungarian authorities that included GPP requirements in more than half of their contracts was estimated at between 10% and 20% (Adelphi, 2011).

Eco-labelling is not integrated into GPP criteria either, even though the designation of "environment-friendly" products under both the EU Eco-label and the national eco-labelling scheme has been assessed more vigorously over the last decade. The Hungarian Eco-labelling Organisation is responsible for the assessment, while the minister in charge of the environment makes the designation.

Environmental management system certifications

The potential of environmental certifications to promote green practices is not fully used. The number of new certifications to the ISO 14001 environmental management system (EMS) standard in 2015 (1 940 certifications) was only 6% higher than in 2008. The corresponding growth in ISO 14001 certifications over the same period was 45% in Austria and 239% in Slovakia, Hungary's neighbour countries (ISO, 2016). There are no government incentives for ISO 14001 certification, and no demand from the domestic market. It is primarily export-oriented firms that obtain EMS certification; others consider that its costs outweigh benefits.

The EU Eco-Management and Audit Scheme (EMAS) is even less popular: there are only 28 EMAS-registered organisations in the country. The government has provided limited incentives for EMAS certification (registered organisations are subject to less frequent inspections), but not for ISO 14001 certification.

2.5. Promoting environmental democracy

Hungary is party to the Aarhus Convention on access to information, public participation in decision making and access to justice in environmental matters. The country has historically strong legal provisions in these domains. However, Hungary has made little progress since the 2008 Environmental Performance Review recommended that it further promote citizen participation in environmental decision making and access to justice on

environmental issues. Hungary's Deputy Commissioner for Fundamental Rights, Ombudsman for Future Generations – whose role is highly appreciated by civil society groups – has repeatedly raised concerns about environmental democracy in his annual reports (UNECE, 2017).

2.5.1. Public participation in environmental decision making

Public involvement in decision making is regulated by the Act on Legislation (130/2010) and the Act on Social Participation (131/2010). Most environmental laws require government agencies to provide opportunities for public input at an early stage in the decision-making process. Environmental non-governmental organisations (NGOs) can register as parties to the administrative process and be automatically notified of the start of official procedures in their field of work. However, government agencies are not required to seek public input on decisions relating to environmental matters. Consultations with the business community have become rarer over the last decade. In addition, the government has substantially reduced its financial support for NGOs, including environmental ones.

The National Environmental Council (OKT, established in 1996) is a consultative body for the evaluation of draft environmental legislation, policies and strategies. It includes representatives of environmental NGOs, the Hungarian Academy of Sciences and the Confederation of Hungarian Employers and Industrialists. The government must ask OKT for a formal opinion on draft environmental legislation. However, it does not have to accept the opinion or even report back to OKT on whether its position has been taken into account. Over the years, OKT has made a meaningful contribution to the development of environmental legislation (Cotta, 2015). However, consultations on draft legislation tend to be mostly non-public, informal and limited to selected stakeholders. The National Council for Sustainable Development, created in 2008 under the auspices of Parliament and chaired by the Speaker, also has a strong NGO membership. Its expert groups elaborate opinions and advice on government policy in different environmental domains. However, deadlines for comments from NGOs are unrealistically short (UNECE, 2017). There are no publicly available impact assessments underpinning legislation (EC, 2017).

As part of the EIA process, a public hearing is required if the project potentially affects more than 50 parties, or if requested by at least 5 NGOs. However, restricted public participation (with a shorter comment period) has been introduced for large infrastructure and transport projects, or those considered by the government as of significant public interest. The number of such "priority investments" has been growing steadily since 2011 (Szabó, 2017). Public consultations remain limited: the median number of days open for consultation was only 5 days in 2014 and 3.5 days in 2015 (EC, 2017). The controversial extension of the Paks nuclear power plant, where public consultations were even more limited by a special 2015 law, raised further concerns about restrictions on public participation (Antal, 2015).

2.5.2. Access to environmental information

The Act on the Right of Informational Self-determination and Freedom of Information (Freedom of Information Act, 112/2011) defines rules on the protection of personal data and the rights, range and access to data of public interest and its dissemination. The National Authority for Data Protection and Freedom of Information was established in 2012 as an autonomous administrative body. It can request (but not order) the relevant

government body to provide information based on a public complaint. However, freedom of information cases only accounted for 17% of the authority's total case load in 2015, and none of those cases was related to environmental information (NAIH, 2016). The post of Parliamentary Commissioner for Data Protection was abolished in 2011.

The Freedom of Information Act requires government bodies to respond quickly to public requests for environmental information. However, they can refuse to provide data that are claimed to be part of the ongoing decision-making process. There are also concerns that privately-held environmental information is excessively protected on the grounds of commercial confidentiality (WRI, 2017). According to Act 90/2010 on Adoption and Amendment of Certain Economic and Financial Acts, state-owned enterprises are not considered to be public bodies, which also complicates obtaining environmental information from them (Antal, 2015). Whereas access to environmental information held by government authorities was free of charge before 2011, the costs of obtaining it have increased significantly since then.

There are no specific remedies against the refusal of, or an inadequate response to, a request for environmental information. Those requesting the information may file a suit in a regular private law court, which can order the holder of information to disclose the requested data in case of a substantiated claim. However, courts do not have access to the information the disclosure of which is disputed, and the judge must decide upon the freedom of information claim practically without knowing the information in question (European e-Justice Portal, 2017).

Hungary maintains its part of the European Pollutant Release and Transfer Register. To further improve access to environmental data, the government established a data collection and processing network compatible with the European Environment Information and Observation Network. Moreover, this network has led to the creation of a national spatial data infrastructure required by the EU INSPIRE Directive (2007/2/EC) and further improvement of the National Environmental Information System. However, implementation of the INSPIRE Directive is lagging behind other EU member states: not all spatial information needed for the evaluation and implementation of EU environmental law has been made available or is accessible (EC, 2017). Environmental data are fragmented across several separate information systems. Their accessibility has been further complicated by recent institutional changes in the environmental domain (UNECE, 2017).

The last government-issued state of the environment report was published in 2013. Since then, the production of such reports has been outsourced (due to financial and staff constraints) to the Herman Ottó Institute. The latest annual report on the state of Hungary's environment was issued in December 2017. However, little polluter-specific information is available on relevant government authorities' websites, especially about administrative decisions such as permits and enforcement actions (UNECE, 2017).

For several years between 2005 and 2010, the National Network of Green Point Offices (GPOs) played an important role in disseminating environmental information to the public. GPOs operated at all regional offices of the environment ministry, offering free access to government-held environmental information in person, by phone or electronically. They also served as a conduit of environmental complaints from citizens to competent government authorities. However, the government's institutional reorganisation leading to the dismantlement of the environment ministry and its regional offices has also led to the disappearance of the GPO network. Although a few GPOs still exist, they no longer perform the same functions.

2.5.3. Access to justice

Most administrative decisions can be appealed to the superior authority. The exceptions are decisions by the head of a central administrative agency or by a minister in the first instance, which must be appealed directly to court. In environmental cases, courts review both the procedural and the substantive legality of decisions. In other words, they review whether the content of a decision is in line with the regulation, and also whether the decision was made in the proper way prescribed by law. The most prominent example of this is EIA cases where courts review whether environmental impact statements are scientifically verifiable, and involve external experts in their adjudication. To contest land-use (spatial) plans that are adopted as municipal laws or resolutions, the plaintiff must first exhaust an administrative appeal process to the local government itself and to a county GO in the second instance (European e-Justice Portal, 2017).

There are no special courts to adjudicate on environmental matters in Hungary. Therefore, environmental cases are either decided by administrative and labour courts or by regular private law courts, depending on the nature of the legal dispute. Individuals and NGOs can file a suit against a government agency only if its decision is alleged to be intentionally or negligently wrong. Appeals to the Constitutional Court on environmental matters are possible, but almost never occur.

Only individuals directly affected by the environmental impact have standing to file environment-related lawsuits. NGOs whose activity is aimed at the protection of a fundamental right or the promotion of public interest also have standing in court. However, environmental NGOs have legal standing in environmental administrative procedures only if they operate in the impact area of an activity or facility. The standing rules also differentiate between nature protection and other environmental cases, further complicating access to justice (EC, 2017).

To initiate an administrative or a court proceeding, the plaintiff must pay a duty or a court tax. For example, a duty for a judicial review of administrative decisions is HUF 300 000 (about EUR 1 000). These fees are waived for certain types of applicants, but nonetheless constitute a barrier for access to justice. Lawsuits initiated to secure public access to information or in the event of an authority's failure to execute its obligations are free of charge. While legal aid is generally available on environmental matters, there are no specific mechanisms to provide it (European e-Justice Portal, 2017).

2.5.4. Environmental education

The 2008 Environmental Performance Review recommended that Hungary pursue environmental education efforts; further develop the environmental training of elected officials, civil servants and teachers; and establish training for justice officials. This recommendation has been partly implemented. The MoA conducts environmental training for staff of national and local governments. In addition, the National University of Public Service and the Hungarian Legal Academy offer optional environmental courses for civil servants and judicial officials as part of their in-service training programme. However, the optional nature of these courses significantly limits their reach.

Several areas of learning in the National Core Curriculum deal with environmental protection and sustainability, and there are several optional teaching manuals on environmental issues. The number of certified eco-schools – recognised by the state and operating with an audited quality system – more than doubled over 2009-16 from 471 to 988, amounting to almost a quarter of all schools. The eco-school programme is managed

by the Hungarian Institute for Educational Research and Development. Similar green kindergarten, forest school and forest kindergarten programmes also exist. They receive some support from the Ministry of Human Capacities, but mostly rely on international donor funding (UNECE, 2017). The inter-ministerial committee for environmental education, created in 2008, has now been abolished.

The government organises environmental awareness campaigns and public actions to promote sustainable mobility, waste management, energy efficiency and nature conservation. However, many environmental problems (such as air pollution from residential waste burning for heating purposes, Chapter 1) still stem from the low environmental awareness of the Hungarian public. The Social Renewal Operational Programme has supported research and educational efforts on environmental and green economy issues in several Hungarian universities, although their extent remains limited.

Recommendations on environmental governance and management

Institutional and regulatory framework

- Raise the political profile of the environment by renaming the Ministry of Agriculture as the Ministry of Agriculture and Environment; reduce the fragmentation of policy and regulatory responsibilities in the water domain by consolidating them within that ministry; continue to integrate environmental aspects into other ministries' mandates and enhance horizontal co ordination at the national level; merge all environmental compliance assurance functions at the territorial level within respective government offices.
- Build capacity of government staff, particularly at the local level, on best practices in implementation of environmental law; enhance the technical resources in support of their functions.
- Streamline and simplify the environmental permitting regime for installations not subject to integrated pollution prevention and control permits; consider introducing sector-specific, cross-media regulations for facilities with low environmental impact.
- Strengthen the implementation of SEA by applying it systematically to all spatial plans and territorial development concepts, as well as to all government policies and programmes with a potential environmental impact.

Compliance assurance

- Introduce risk-based planning and targeting of environmental inspections; enhance the use of economic sector-specific guidance, certifications and recognition awards to promote compliance and green business practices.
- Evaluate the deterrent effect of administrative fines and consider reforming them to account for the economic benefit of non-compliance; develop enforcement policies and guidance for inspectors on proportionate application of sanctions; expand use of financial security instruments such as insurance, security deposits and letters of credit to help enforce liability for damage to the environment.

Environmental democracy

- Enhance opportunities for meaningful public participation as part of environmental rule-making and EIA; restore government funding for environmental NGOs; remove restrictions for individuals and NGOs to access justice on environmental matters and ensure that it is free of charge.
- Make environmental information, including facility inspection records, more accessible to the public online; remove all restrictions and fees for public access to environmental information held by public bodies and review confidentiality-related restrictions of access to enterprise data.
- •Strengthen vocational environmental training for public officials; step up environmental awareness-raising campaigns on energy- and climate-related issues, as well as biodiversity protection, and increase budgets for them.

References

Adelphi (2011), "Strategic use of public procurement in Europe", final report commissioned by the European Commission, MARKT/2010/02/C, https://publications.europa.eu/en/publication-detail/-/publication/05d1e581-571e-43ad-8597-649a7b655bd9/language-en.

Antal, A. (2015), "Environmental and energy democracy in Hungary", presentation to ECPR General Conference, Université de Montréal, Montreal, 26-29 August 2015, https://ecpr.eu/Filestore/PaperProposal/f34c84b8-3049-4c3b-9d3a-c818e2cc0736.pdf.

Charron, N. et al. (2015), "Mapping the regional divide in Europe: A measure for assessing quality of government in 206 European regions", *Social Indicators Research*, Vol. 122/2, Springer Netherlands, pp. 315-346.

Cotta, B. (2015), "Wasted compliance strategies? The policy-making styles of Hungary and Poland in the implementation of European Environmental Directives", *Working Paper-LPF*, No. 3, 2015, Centro Einaudi, Laboratorio di Politica Comparata e Filosofia Pubblica, Torino, www.centroeinaudi.it/images/abook_file/WP-LPF_3_2015_Cotta.pdf.

EC (2017), The EU Environmental Implementation Review, Country Report – Hungary, *Commission Staff Working Document,* SWD (2017) 46 final, European Commission, Brussels, 3 February 2017, http://ec.europa.eu/environment/eir/pdf/report_hu_en.pdf.

EEA (2013), "Land planning and soil evaluation instruments in EEA member and cooperating countries", final report commissioned by the European Environment Agency, European Topic Centre on Spatial Information and Analysis, 12 December 2013, Malaga, Spain, www.eea.europa.eu/themes/landuse/document-library/land-planning-and-soil-evaluation/view.

European e-Justice Portal (2017), Access to Justice in Environmental Matters – Hungary website, https://e-justice.europa.eu/content_access_to_justice_in_environmental_matters-300-hu-en.do?member=1 (accessed 10 February 2017).

ISO (2017), *ISO Survey 2016,* International Organization for Standardization, www.iso.org/the-iso-survey.html (accessed 22 December 2017).

Jones, C. et al., eds. (2013), Strategic Environmental Assessment and Land Use Planning: An International Evaluation, Earthscan, New York.

Lian Hui Lim, K. (17 October 2014), "Hungary's rivers in recovery after red mud disaster", Chemistry World News blog, www.chemistryworld.com/news/hungarys-rivers-in-recovery-after-red-mud-disaster/7867.article.

NAIH (2016), *Annual Report*, National Authority for Data Protection and Freedom of Information, 2015, Budapest, www.naih.hu/files/NAIH-Annual-Report-2015-EN-2016.06.pdf.

OECD (2017), *Land-use Planning Systems in the OECD: Country Fact Sheets*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264268579-en.

OECD (2015), Hungary: Reforming the State Territorial Administration, OECD Public Governance Reviews, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264232921-en.

Szabó, G. (3 July 2017), "The media in Hungary – the example of environmental journalism", Hungarian Spectrum blog, http://hungarianspectrum.org/2017/07/03/gabor-szabo-the-media-in-hungary-the-example-of-environmental-journalism/.

The Guardian (2016), "Outrage as plant bosses acquitted over fatal toxic spill in Hungary", The Guardian, 28 January 2016, www.theguardian.com/world/2016/jan/28/outrage-plant-bosses-acquitted-fatal-toxic-spill-hungary.

Tran, M. (2010), "Hungary battles to keep toxic sludge from polluting Danube: Fish wiped out as red mud enters Hungarian river", The Guardian, 8 October 2010, www.theguardian.com/world/2010/oct/07/hungary-sludge-spill-reaches-danube.

UNECE (2017), Aarhus Convention National Implementation Reports: Hungary website, http://apps.unece.org/ehlm/pp/NIR/listnr.asp?YearID=2017&wf_Countries=HU&Quer_ID=&LngIDg=EN&YearIDg=2017 (accessed 18 April 2017).

World Bank (2017), *Worldwide Governance Indicators,* http://databank.worldbank.org/data/reports.aspx?source=Worldwide-Governance-Indicators (accessed 25 February 2017).

WRI (2017), *Environmental Democracy Index*, World Resources Institute, Washington, DC, www.environmentaldemocracyindex.org/country/hun (accessed 10 April 2017).

Chapter 3. Towards green growth

Hungary has managed to decouple several environmental pressures from its sustained economic growth, although challenges remain. This chapter reviews Hungary's efforts to promote green growth and sustainable development. It analyses progress in using economic and tax policies to pursue environmental objectives and in reforming environmentally harmful subsidies. The chapter also examines the country's eco-innovation performance, and discusses public and private investment in low-carbon energy, transport, and water infrastructure and services. Finally, the chapter briefly reviews the country's progress in mainstreaming environmental considerations into international trade and development co-operation.

3.1. Introduction: Hungary's economy, society and the environment

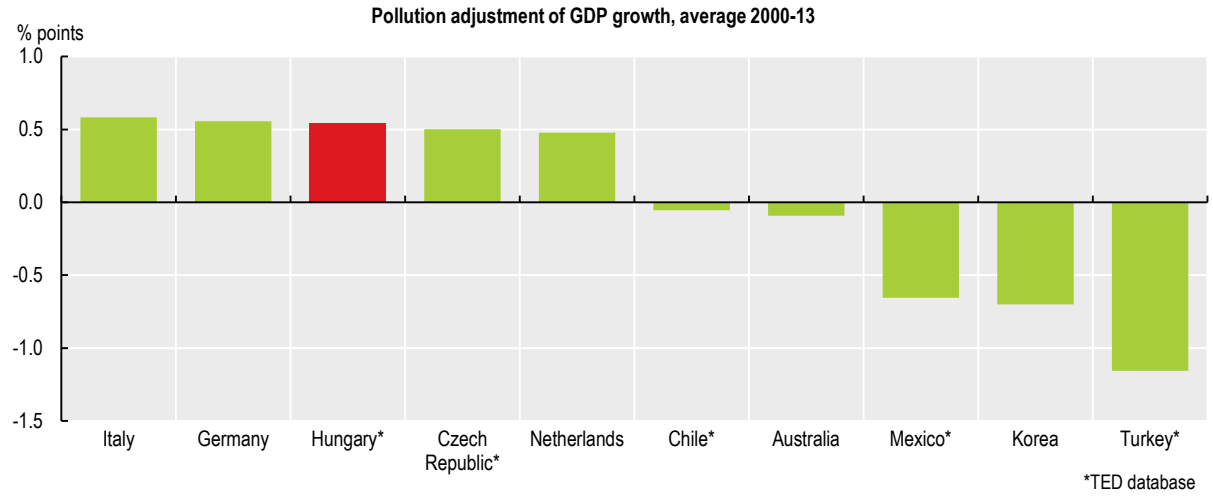
3.1.1. Decoupling environmental pressure from economic growth

Hungary's small open economy was severely hit by the global economic crisis in 2008/09, but has grown faster than the OECD as a whole since 2012 (Figure 1.1; Chapter 1.). Key drivers of growth over this period include macroeconomic stimulus (tax cuts, increased expenditure and lower interest rates) and investment funded by the European Union (EU). These helped raise real incomes and spurred private consumption and exports (OECD, 2016a). As new EU-funded infrastructure projects are launched, economic growth is expected to continue (OECD, 2017a). However, sustaining growth in the long term will require boosting labour productivity via enhanced investment in the business sector, innovation, and education and training (OECD, 2016a).

Hungary has continued to make progress in decoupling its economic growth from environmental pressures in the last decade. It has also improved its performance towards most of the 17 Sustainable Development Goals (SDGs).[1] On most goals, Hungary is still lagging behind the European Union as a whole. However, it is doing better than the other Visegrád Four countries (Czech Republic, Poland, Slovak Republic) on others, such as "Sustainable cities and communities", "Responsible production and consumption" and "Climate action" (Annex 3.A).

According to a 2016 OECD study, growth in Hungary's gross domestic product (GDP) would increase by about 0.5 percentage points on average per year over 2000-13 if adjusted for the cost of total pollution abatement (Cárdenas Rodríguez, Haščič and Souchier, 2016; Figure 3.1).[2] This is the third highest value in the OECD. It suggests that Hungary has managed to grow, while protecting its environmental quality. The country has invested in abating pollution either directly or through a restructuring of the economy towards less polluting activities and more energy and resource-efficient production processes.

Figure 3.1. Economic growth in Hungary is higher when accounting for pollution abatement



Note: The chart compares the five countries at the top and at the bottom of the range.
The indicator shows to what extent a country's GDP growth should be corrected for pollution abatement efforts. It adds what has been undervalued due to diversion of resources to pollution abatement, or deduces the "excess" growth that is generated at the expense of environmental quality.
Source: Cárdenas Rodríguez, M., I. Haščič and M. Souchier (2016), "Environmentally adjusted multifactor productivity: Methodology and empirical results for OECD and G20 countries", *OECD Green Growth Papers*, No. 2016/04; Conference Board (2014), *The Conference Board - Total Economy Database* (TED database), www.conference-board.org/data/economydatabase/.

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However, Hungary needs to remain vigilant and to strengthen implementation of environmental policy. Recent and projected economic trends are exerting pressures on the environment, including growing energy consumption and emissions of greenhouse gases (GHGs) and air pollutants from road transport. While municipal waste generation has decreased, waste recycling and recovery remain low (Chapter 4.). Water contamination and pressures on ecosystems remain of concern (Chapters 1 and 5).

3.1.2. Improving social inclusion and access to basic services

At the same time, Hungary needs to make sure that the benefits of economic growth are well distributed, and that sufficient investment extends access to environment-related services (Section 3.5). While Hungary's per capita income has considerably increased in the last decade, it is still one-third below the OECD average. Income inequality and poverty have been increasing (Chapter 1. ; Basic Statistics); rural areas in eastern and southern Hungary face widespread poverty. Regional disparities persist with regards to access to drinking water supply and wastewater treatment services, as well as gas and electricity networks. About 10% of housing stock is substandard accommodation with no or limited modern amenities. Further, 80% of buildings fail to meet energy efficiency standards (Chapter 1.).

The Roma population represents about 7.5% of the total. It tends to live in disadvantaged rural areas with poor housing conditions and lack of access to drinking water and basic amenities (EC, 2017a). Roma people have a higher probability of poverty, poor health and worse labour-market outcomes than the non-Roma population (OECD, 2016a).

Several programmes have targeted these issues, but results have been limited (Ministry of Public Administration and Justice, 2011). These programmes have largely failed to reach

the most disadvantaged groups, partly because they lacked a coherent policy. Co-operation among the institutions responsible for the various sectoral programmes (education, housing, social services, environment) needs to be improved. The lack of reliable data, particularly about the Roma population, makes it challenging to monitor and evaluate measures targeting disadvantaged groups. The National Strategy on Social Cohesion for 2011-20 aims to reduce and prevent poverty and social exclusion of all vulnerable groups, including the Roma population. However, it is not clear to what extent Hungary is on track to meet the strategy's objectives.

3.2. The sustainable development and green growth framework

Hungary has strengthened the institutional arrangements for pursuing the goals of sustainable development. In 2008, it established a multi-stakeholder National Council of Sustainable Development (Chapter 2.). A year later, it signed the OECD Declaration on Green Growth together with all other OECD member countries and several partner countries. Since then, a cross-party consensus on green growth and its economic benefits for the country has emerged (Biró Nagy and Boros, 2012). As part of the European Union, Hungary committed to achieve 17 SDGs by 2030, which are set out in the 2030 Agenda for Sustainable Development. It will undergo the voluntary national review of SDGs in 2018.[3]

In 2013, Parliament approved the second National Framework Strategy on Sustainable Development (NFSSD) for 2012-24 based on the Council's report on Hungary's "sustainability status". Preparation included a strategic environmental assessment and a wide-ranging consultation process (ESDN, 2016).

The strategy diagnoses the state and tendencies of the four key resources for Hungary's sustainability – human, social, natural and economic – as well as the pressures they face. It indicates policy objectives, the necessary strategic responses to achieve them and the indicators to measure progress. The strategy also outlines the responsibilities of the national and local governments, businesses, households and local communities. The government reports to Parliament on implementation of the strategy every two years. In 2017, the government's second biennial review recommended harmonisation of the NFSSD with the SDGs. In addition, the State Audit Office will start its own review of SDG implementation in 2018.

In line with the OECD Green Growth Strategy (OECD, 2011), the NFSSD highlights that green economy reforms require regulatory, taxation and funding instruments. These would help improve efficiency in resource use, reduce environmental pollution and price use of material appropriately. It recommends shifting the tax burden from labour to natural resource use, assessing the "environmental sustainability performance" of funding, reviewing energy-related funding and taxation, improving the energy certification of buildings, developing green public procurement and possibly streamlining environmental regulations.

The Central Statistical Office has developed more than 100 sustainable development indicators, larger than in most other Central and Eastern European countries (Lepuschitz and Berger, 2014). Hungary would benefit from a more targeted framework for monitoring progress towards green growth objectives. This framework should be based on sound indicators that link economic activity with environmental performance. It should include indicators on the effectiveness of policy in addressing environmental challenges and in generating eco-innovation and green business opportunities. Hungary

could build on the OECD green growth indicators framework. It could also draw on the experience of 28 other countries (including emerging and developing economies) that have customised it to their national circumstances (e.g. Chile, Denmark, Germany, Korea, the Netherlands) (OECD, 2017b, 2014).

The NFSSD has had limited ability to guide policy action and provide a long-term vision for the transition of Hungary to a low-carbon, resource-efficient and greener economy.[4] Hungary has a wide array of general and sectoral strategies that set the desired directions of the economy, society and environment. In 2012, the government approved a decree requiring harmonisation of strategic planning documents and monitoring of their implementation. However, decisions are still often not in line with the principles articulated within these strategic documents (EIO, 2016).

3.3. Greening the system of taxes, charges and prices

In line with recommendations of the 2008 OECD Environmental Performance Review, Hungary has extended the use of economic instruments to put a price on environmental externalities and encourage efficient use of natural resources. Like many OECD member countries, Hungary applies energy and vehicle taxes. It has also long applied a wide range of levies on pollution and resource use, including on air emissions, water abstraction and water/soil pollution, and has introduced or extended some new environmentally related taxes, namely the landfill tax and environmental product fees (Chapter 4.). However, as the following sections discuss, tax rates are generally low and provide weak incentives to change production and consumption behaviours. In addition, Hungary participates in the EU Emissions Trading System (ETS) (Section 3.3.3).

3.3.1. Environmentally related taxes: An overview

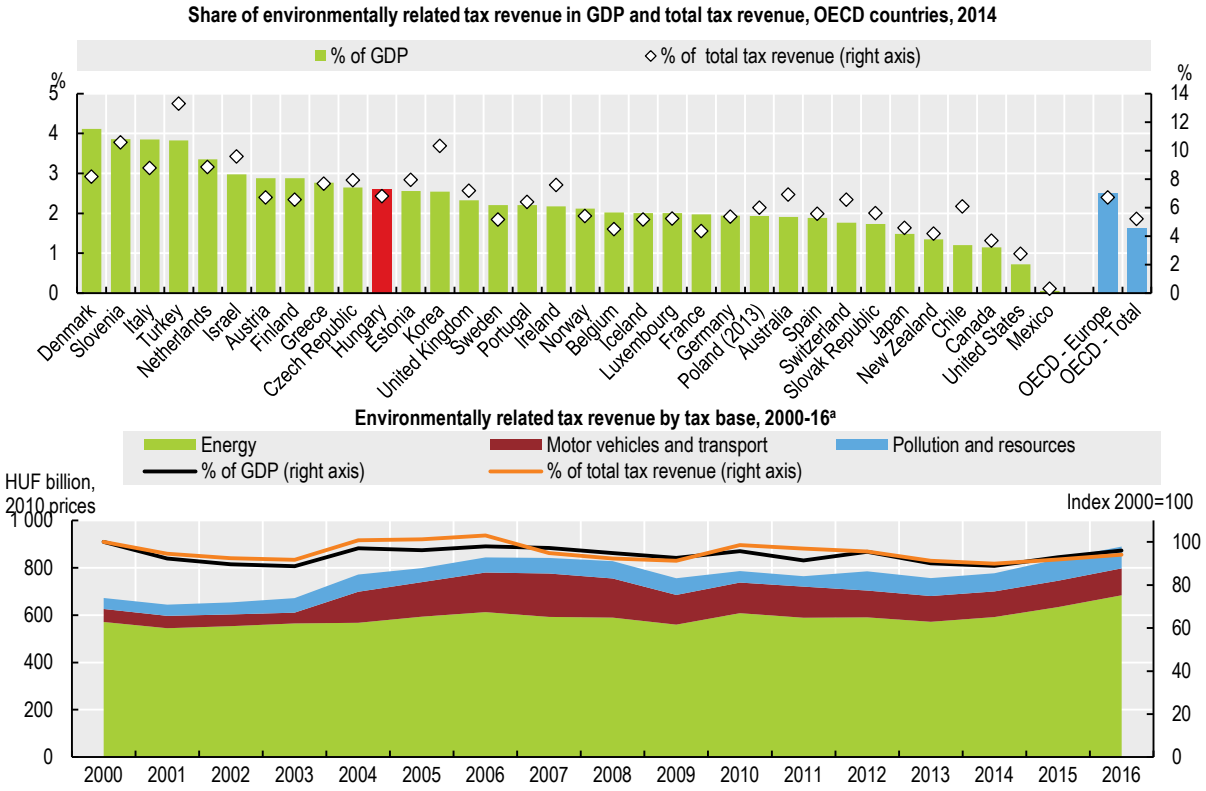
Hungary has a complex and frequently amended taxation system, which implies high compliance costs. Tax-to-GDP ratio stood at 39% in 2015. This was in line with the EU average, but above the OECD average of 34% and the ratio in the other Central and Eastern European members of the OECD. The government is committed to reduce the ratio to below 36% of GDP by 2019. As in the other Visegrád Four countries, Hungary collects over three-quarters of tax revenues through consumption taxes and social security contribution, which is high in international comparison. Still, the government has continued shifting the tax burden from labour to consumption, including by increasing environmentally related taxes (OECD, 2016a).

Revenue from environmentally related taxes is relatively high in international comparison.[5] In 2016, it accounted for 7.4% of total tax revenue and 2.9% of GDP, well above the OECD averages of 5.2% and 1.6%, respectively (data 2014) (Figure 3.2). As in all other OECD member countries, Hungary collects most environmentally related tax revenue through taxes on consumption of energy products (77%) and vehicle ownership and use (13%). Compared to many other countries, Hungary relies more on energy taxes and pollution and resource taxes than on vehicle taxes (OECD, 2017b). Taxes on pollution and resource use include the landfill levy (Chapter 4.), an air emission charge and water-related levies (Section 3.3.5).

The environment-related tax burden in the economy has been declining in recent years. With the economic recovery and recent tax hikes, environmentally related tax revenue (in real terms) has increased by about 13% since 2010. Overall, the revenue from environmentally related taxes has grown at a lower rate than GDP and total tax revenue

since the early 2000s (Figure 3.2). Two main factors may explain this trend. First, registrations of new passenger cars have declined sharply, while registration and ownership vehicle tax rates decrease with car age (Section 3.3.4). The latter provides an incentive to keep a car in use for longer than with age-neutral taxes and to purchase used cars. With a growing stock of cars that are over ten-years-old, revenue from vehicle taxes has declined. Second, use of road fuel declined sharply between 2009 and 2013, especially petrol, which is taxed at a higher rate than diesel. Increasing excise duties since 2011 have helped stabilise revenue from energy-related taxes despite lower road fuel consumption (Figure 3.3).

Figure 3.2. Revenue from environmentally related taxes is high in international comparison



a) This chart includes revenues from the hydrocarbons stockholding fee (about 3% of environmentally related tax revenue in 2016). Data include partial data, preliminary data and estimates.
Source: OECD (2017), "Environmental policy instruments", *OECD Environment Statistics* (database); HCSO (2017), *STADAT* (database); OECD (2017), "Revenue Statistics: Comparative tables", *OECD Tax Statistics* (database); country submission.

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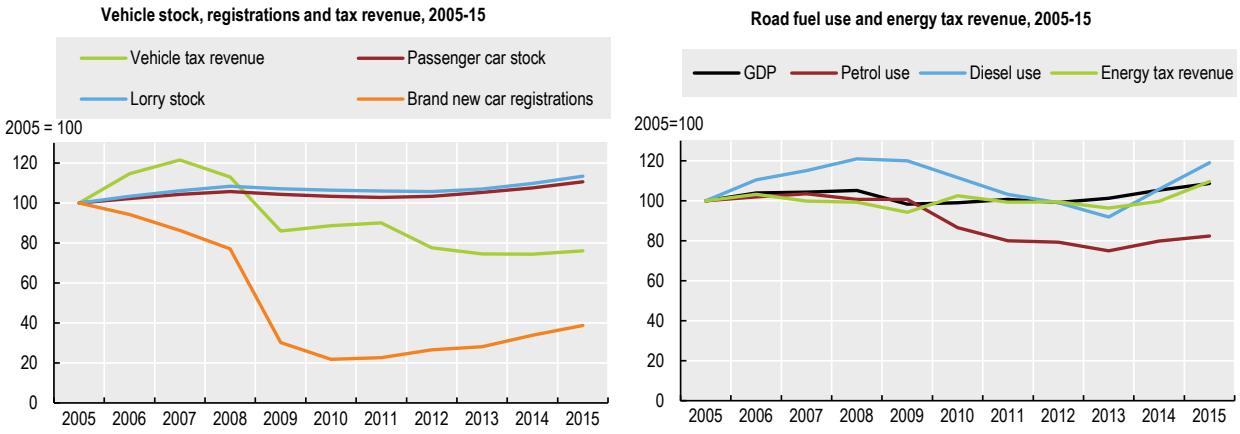
Hungary could further boost environmentally related taxes and charges, and regularly adjust their rates, including for inflation. It could also improve design of these taxes and charges to maintain their ability to provide incentives for more efficient resource use and to raise revenue. This could also help the government achieve its goal of bringing the debt-to-GDP ratio down to 50%. While Hungary has made progress in reducing the public debt, it remains high compared to most other Central and Eastern European countries (OECD, 2016a). Public spending is high (half of GDP) with a large share going to general public services. According to OECD (2017a), fiscal policy should re-prioritise public spending towards infrastructure investment that supports productivity growth.

Investment in infrastructure, education and health (among others) requires high spending, but the government aims to reduce taxes on labour and businesses. As a result, additional and less distortive revenue sources such as environmentally related taxes may be needed.

Figure 3.3. Declining vehicle sales and fuel use have lowered tax revenue



Source: ACEA (2017), Vehicle Statistics; HCSO (2017) Stock of road vehicles (database); IEA (2017), *IEA Energy Balances and Statistics* (database); OECD (2017), "Environmental policy instruments", *OECD Environment Statistics* (database); OECD (2017), *National Accounts Statistics* (database).

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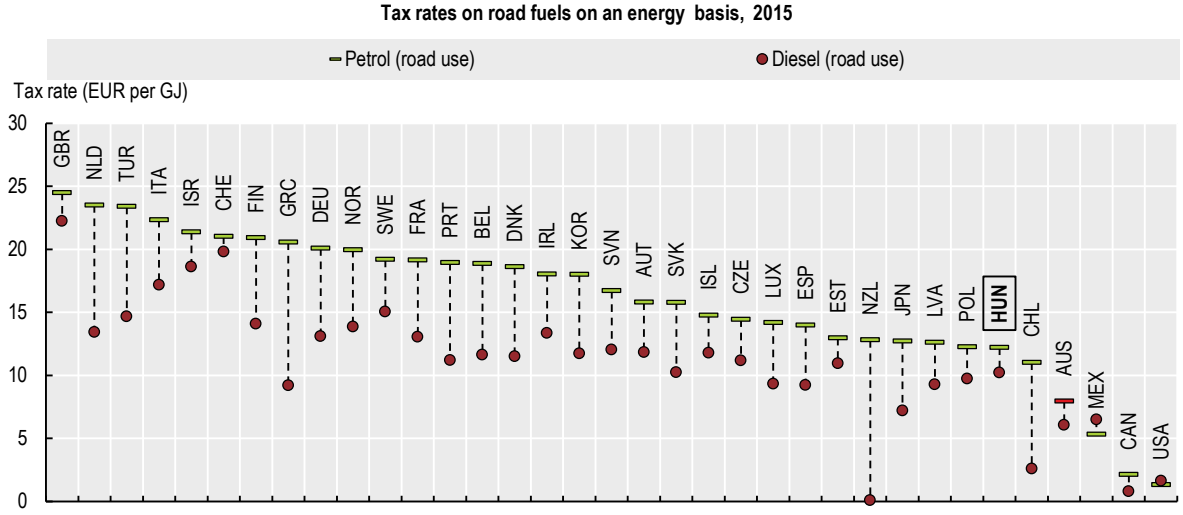
In this context, a 2016 study suggests considerable potential for shifting taxes from labour (namely social contribution) to environmentally related taxes. Under a best case scenario, these could generate additional revenue equivalent to 0.56% and 0.8% of GDP in 2018 and 2030, respectively. At the same time, they could generate environmental benefits equivalent to 0.08% of GDP by 2030. The largest potential sources of revenue would come from raising the annual motor vehicle tax and introducing a pesticide tax (EC, 2016).[6] Other options include: adjusting fuel tax rates; introducing a carbon tax on sectors outside the EU ETS; raising the rates of levies on air pollution, water abstraction, water pollution and landfilling of waste; introducing a weight or volume-based tax on extracted raw construction materials to complement the current royalty;[7] include external costs such as air and noise pollution in road tolls for passenger and heavy goods vehicles; and introducing congestion charges in major cities.

3.3.2. Taxes on energy use

Hungary applies an energy tax on all fuels used at stationary facilities (such as coal, electricity and natural gas) and an excise duty on road fuels (petrol, diesel, liquefied petroleum gas). The government raised all tax rates on energy used for stationary purposes in 2015, bringing them in line with minimum rates required by EU regulations. Excise rates on road fuels have been repeatedly raised since 2011. The duty on liquefied petroleum gas has doubled, and a tax on compressed natural gas has been introduced. The government has raised the excise duty on diesel by about 13% to reduce the gap with the excise rate on petrol. This increase reflects the higher environmental costs (CO_2 and air pollutant emissions) associated with diesel use. As of January 2017, the standard rate for diesel was still 8% below that for petrol, however.[8]

In 2016, the government partly linked the excise duty on petrol and diesel to the world market price of crude oil: the tax rates temporarily increase when the price of oil is below USD 50/barrel. According to the government, this measure aims to balance out the potential decline in consumption tax revenue due to extremely low oil prices (IEA, 2017). Despite the tax hikes, the petrol tax rate remains low by international standards, when tax rates are converted per unit of energy (Figure 3.4).

Figure 3.4. Tax rates on road fuels are among the lowest in the OECD



Note: Data for CAN and USA include only federal taxes. NZL applies a road-user charge to diesel that is not included in the figure.
Tax rates as of 1 April 2015, using IEA conversion factors; energy use is based on IEA data for 2014.
Source: OECD Centre for Tax Policy calculations.

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Overall, when expressed in terms of energy content of fuels, Hungary applies higher tax rates on transport fuels than on those for heating and process purposes. This is common to all OECD member countries (OECD, 2015a). Hungary taxes 57% of CO_2 emissions from energy use, the fourth lowest share in OECD Europe (OECD, 2016b). Tax rates on energy products do not fully reflect the estimated environmental costs of carbon emissions for several reasons: tax rates on transport fuels are relatively low; rates on other fuels are set at or only slightly above the EU minimum rates; rates are not systematically adjusted for inflation; and fuel use in some sectors is fully tax exempt. All this puts Hungary among the ten OECD countries with the lowest effective tax rate on energy on an economy-wide basis (OECD, 2015a). This does not consider the carbon price emerging from the EU ETS, discussed in Section 3.3.3.

Hungary should consider reducing tax exemptions and further raising energy and excise tax rates to adequately reflect the environmental damage from energy use. Low world oil prices experienced since end-2014 provide an opportunity to permanently increase the energy taxation. This would be a step beyond adjusting petrol and diesel rates based on oil prices, as is currently the case. Higher fuel tax rates would provide an incentive for drivers to reduce fuel consumption. To the extent that this happens through reductions in distance travelled, other social costs (e.g. local air pollution, congestion, accidents and noise in transport) may also decrease (Harding, 2014a).[9] In raising fuel tax rates, Hungary needs to assess and address the potential for fuel tourism. This is especially true for

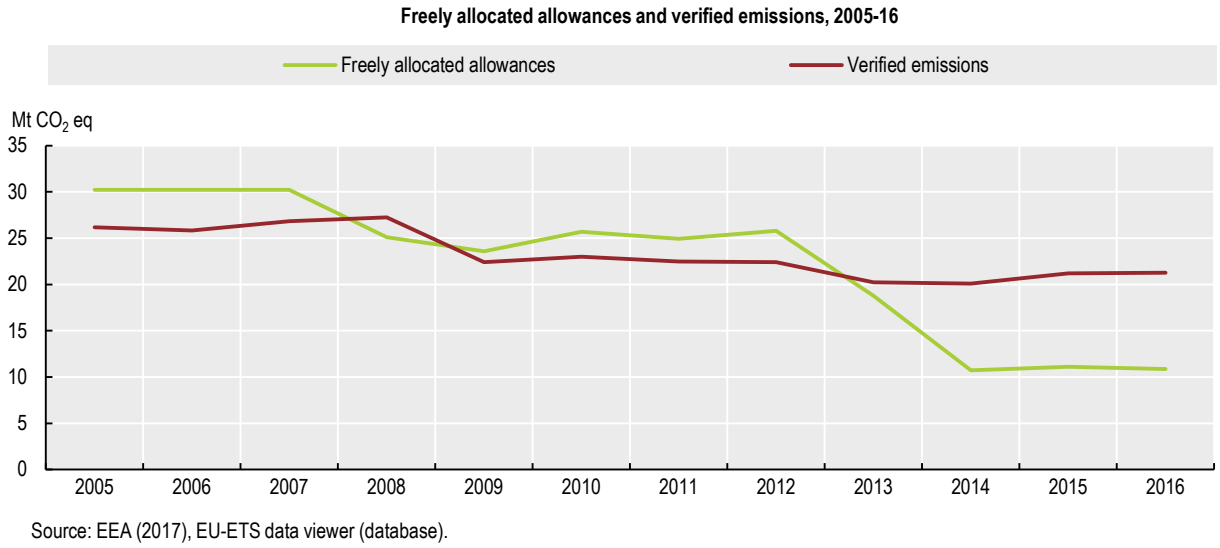
neighbouring non-EU countries (e.g. Ukraine), which do not have to meet minimum energy tax rates (EC, 2016). Any adverse impact on vulnerable population groups could be addressed with targeted benefit schemes (Box 3.3).

3.3.3. Carbon pricing

In addition to putting a price on carbon via energy taxes (Section 3.3.2), Hungary participates in the EU ETS. Thirty-four percent of CO_2 emissions from fuel combustion (those from power generation, energy-intensive industry and aviation) are subject to the carbon price that emerges in the EU ETS. This compares to 36% in the Slovak Republic, 44% in the Czech Republic and 53% in Poland (OECD, 2016b).

In the first two trading periods (2005-12), emission caps were determined at the national level. At that time, Hungary was granted more emissions allowances than the actual emissions from sectors covered by the EU ETS (Figure 3.5). Companies located in Hungary have been among the major allowance sellers in the system. The supply of allowances dropped in the third period (2013-20), with the introduction of an EU ETS-wide emission cap, the extension of auctioning and the back-loading of allowances.

Figure 3.5. Hungary has long benefited from a surplus of EU ETS allowances



Source: EEA (2017), EU-ETS data viewer (database).

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As in all countries, Hungary's manufacturing sectors continue to receive a share of allowances for free to address carbon leakage concerns (EEA, 2016a).[10] However, evidence from carbon pricing systems around the world indicates that the impact of such systems on competitiveness is generally limited. It does not substantially differ between the firms that benefit from preferential treatment (such as free allocations) and those that do not (Arlinghaus, 2015). In addition, free allocations can create windfall profits for carbon-intensive industries and can skew investment decisions towards carbon-intensive technologies (OECD, 2017c).

Due to this over-supply of allowances, free allocations and low carbon prices in the market, the effects of the EU ETS on low-carbon investment in Hungary's energy and

manufacturing sectors have been limited. Since 2011, energy use and related CO_2 emissions in the manufacturing sectors have been growing faster than prior to the 2008/09 recession. Emissions from power generation have declined steadily since the mid-2000s, with a shift to nuclear power and, to a lesser extent, renewables. Other factors than the EU ETS have likely played a major role (Chapter 1.).

Hungary has been among the largest sellers of international carbon credits. The government has collected revenue from these sales, as well as those for auctioning EU ETS allowances, in green investment funds. It has used them to finance investment in renewables, energy efficiency, and related research and development (R&D) (Section 3.5.4). Earmarking revenue to funds for environmental purposes may be necessary to secure reliable, sufficient resources. However, this can reduce the flexibility of fiscal decisions and, therefore, the efficiency of revenue allocation.

OECD (2016b) estimates that, when accounting for both energy taxes and the emission allowance price, 70% of CO_2 emissions from energy use face a carbon price signal in Hungary. However, this share is still below that of CO_2 energy-related emissions priced in many other OECD member countries (Figure 3.6). Throughout the OECD, the effective carbon price on road fuels is higher than on energy products for other uses. More than 95% of emissions from fuels used in road transport face a carbon price (via the energy tax) above EUR 30 tCO_2 (which represents a low-end estimate of the climate cost of CO_2 emissions; OECD, 2016b). However, the average effective carbon rate faced by road transport was EUR 143.4 tCO_2 in 2012, which is among the lowest in the OECD (Figure 3.6). This is because fuel taxes have remained relatively low (Section 3.3.2). In all sectors other than transport, CO_2 emissions are either priced below EUR 30 tCO_2 or not at all. Indeed, 77% of CO_2 emissions from energy use in the residential/commercial sector and 22% in industry are unpriced (OECD, 2016b). As IEA (2017) recommended, Hungary could consider an explicit carbon tax on the sectors not covered by the EU ETS, which include primarily road transport and smaller industrial and commercial facilities.

Figure 3.6. A relatively low share of CO_2 emissions from energy use faces a carbon price signal

Notes: CO_2 emissions from biomass included. Effective carbon rates resulting from specific energy taxes, carbon taxes and emissions trading systems (ETS). Tax rates are as of 1 April 2012, based on OECD (2015), *Taxing Energy Use 2015: OECD and Selected Partner Economies*. ETS prices are from several years (2012, 2014 and 2015).
Source: OECD (2016), *Effective Carbon Rates: Pricing CO_2 through Taxes and Emissions Trading Systems*.

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3.3.4. Transport-related taxes and charges

Hungary applies taxes on the acquisition, registration and ownership of vehicles. The acquisition of a new or used vehicle is subject to a property acquisition fee, which increases with the vehicle power. A tax must also be paid upon first registration of a passenger car in Hungary. The rates are based on the engine type (higher for diesel), cylinder capacity and environmental feature of the car in accordance with EU emission standards. The owner of the vehicle pays an annual motor vehicle tax. The tax varies with the vehicle power for passenger cars; it varies with weight for heavy goods vehicles. All these vehicle taxes decrease with the age of the vehicles.

Vehicle taxes do not fully consider environmental performance of vehicles. They discourage renewal of the vehicle fleet and encourage acquisition of second-hand cars, which are often more polluting. Partly due to these incentives, the car fleet in Hungary is outdated and more carbon intensive than on average in the European Union. The average age of passenger cars was 14.5 years in 2015. This was in line with the average in some

other Central and Eastern European countries, but well above the EU average of 10.7 years. While their fuel economy has improved, newly registered cars in Hungary still emit 129.6 g/km of CO_2. This level is above the average recorded in other Central and Eastern European countries and well above the EU average of CO_2 119 g/km (EEA, 2016b). CO_2, NO_x and $PM_{2.5}$ emissions from road transport have been increasing in recent years. The number of cars per capita is among the lowest in the OECD (Chapter 1.), but is expected to increase with rising income levels. Vehicle taxes could be, therefore, used to foster the renewal of the fleet towards more fuel efficient and less emitting vehicles.

Some steps have been taken in this direction. Since 2016, electric vehicles (EVs) have been exempted from the registration tax, vehicle and company car tax, and motor vehicle duty. Heavy duty vehicles with lower emissions also benefit from tax discounts on the vehicle tax. Since 2011, the amount of the company car tax (paid by the company providing the car to the employee) considers the emission category of the car (Section 3.4.2). However, more could be done by linking the rates of all vehicle taxes to the EU emission standards and vehicles' CO_2 emissions, and by delinking the rates from the vehicles' age.

Different toll systems apply to heavy goods vehicles and passenger cars. Only the tolls for heavy goods vehicles are based on distance travelled and take account of the vehicles' emission category (Box 3.1). Hungary is the only EU country among those implementing the time-based electronic road toll system (so-called e-Vignette) not to differentiate the vignettes by vehicles' Euro emission class (Ricardo-AEA, 2014).

Box 3.1. Road tolls in Hungary

Two electronic road-user charging systems are in place depending on the type of vehicle:

- The time-based electronic road toll system (so-called e-Vignette) applies to all passenger vehicles and small commercial vehicles (with gross weight up to 3.5 tonnes). There are daily, weekly, monthly and annual tolls.
- The network-wide distance-based electronic road toll system applies to heavy goods vehicles circulating on all motorways and most main roads, excluding the main road sections within urban areas. Tolls depend on road type (motorway or main road), vehicle axles and emission classes based on the EURO emission standards (vehicles equipped with Euro III or cleaner engines; vehicles equipped with Euro II engines; and vehicles equipped with Euro I or higher emission engines).

Hungary should consider adjusting road tolls for passenger and heavy goods vehicles to include external costs such as air and noise pollution, as indicated in its National Energy Strategy 2030. In addition, introducing congestion charges in major cities would help place a cost on travel during peak periods and encourage more use of public transport. In areas poorly serviced by public transport, or where concerns over equity arise, social transfers could be used to partly compensate for the charge costs.

3.3.5. Taxes and charges on pollution and resource use

Hungary figures among the five EU member states that have introduced or increased levies (taxes and charges) on pollution and resources (EC, 2017b). It applies a wide range of levies on pollution and resource use, including on air emissions, water discharges to soil and surface water, water abstraction and landfilling of waste. It also applies levies to a wide range of products considered harmful to the environment (Box 3.2). These levies account for 9% of environmentally related tax revenue, well above most other OECD member countries.

Box 3.2. Main pollution and resource levies in Hungary

The **air load charge** applies to the emissions of NO_x (HUF 120/kg) and SO_x (HUF 30/kg) from installations subject to a permit. The charge is halved if the operator installs abatement equipment. The charge does not apply to households, district heating providers and transport.

The **soil load charge** amounts to HUF 1 200/m³ of domestic sewage and other wastewater discharged to the soil (i.e. on disposal of wastewater by means other than the local public sewerage system). The charge is proportional to the wastewater discharged into the soil, as well as to the sensitiveness of the areas. It aims at encouraging households to use available public infrastructures. It may have contributed to the increase of the population connected to public sewerage (OECD, 2008).

The **water load charge** has applied to facilities that discharge polluting wastewater into surface water since 2004. The rate depends on the type of polluting substance, its concentration in the wastewater, the characteristics of the recipient water body and the water quality category of the area concerned. Rates range from HUF 90/kg for chemical oxygen demand to HUF 220 000/kg of mercury. Intermediate rates are charged for inorganic nitrogen, phosphorus, cadmium, chrome, nickel, lead and copper. The charge does not apply if wastewater recycling is in place. Further, the charge is halved if the discharger puts in place pollution reduction measures.

The **water abstraction charge** is paid on groundwater and surface water withdrawals for all purposes. The amount of the charge is proportional to the amount of abstracted water. It also depends on the source (i.e. groundwater or surface), type (karstic, porous or thermal), quality and use for which water is abstracted. In January 2017, the water abstraction charge was extended to water used for irrigation, fish farming and rice production. Rates are generally higher for water used for industry and agriculture.

The **landfill tax** on non-hazardous waste was introduced in 2013 at a rate of HUF 3 000 (or EUR 10) per tonne of waste. It is to be progressively raised to EUR 40/t by 2016. By 2014, the rate had increased to EUR 20/t. Non-hazardous municipal solid waste, construction and demolition waste, hazardous waste and sewage sludge are all charged at the same rate. Waste from recovery operations benefits from a 50% discount (Chapter 4.).

The **environmental product charges** are paid by the economic entity that places products on the market, with rates based on mass (in kilograms) of the product. Products subject to charges include batteries, packaging products, electric appliances and electronic equipment, tyres, commercial printing paper, some plastic and chemical products, and paper stationery. Several deductions and exemptions apply (Chapter 4.).

Some of these levies, such as the water-related ones, have quite a sophisticated design. However, their impact has been generally limited in Hungary. Rates are relatively low and not systematically adjusted, and the exemptions and rebates may hinder their effectiveness. The discount granted to operators that install pollution abatement equipment is not in line with the polluter pays principle. Overall, these levies have been used mainly as a revenue source, rather than as incentives to reduce pollution and use resources more efficiently.

3.4. Removing potentially perverse incentives

As do other countries, Hungary provides several subsidies that could harm the environment. These subsidies, in the form of direct support or preferential tax treatment, exist primarily in the energy, transport, agriculture and fishing sectors. As part of the European Union, Hungary's support to agriculture and fisheries follows the EU frameworks; it is largely decoupled from production or input use. To receive support, farmers also need to comply with environmental regulations and best agricultural practices. However, farmers benefit from fuel subsidies. In the energy and transport sectors, most subsidies are provided implicitly through tax reductions, as well as regulated electricity and gas prices.

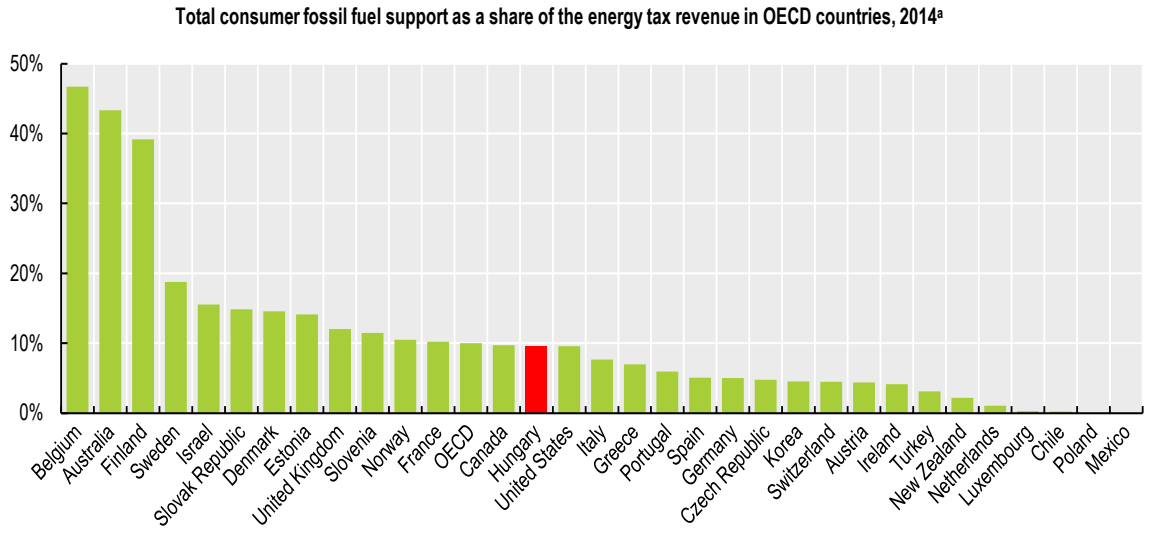
In general, such subsidies contravene the polluter-pays and user-pays principles. They distort competition, lock in inefficient technology, lead to inefficient allocation of resources and weigh on public finances. As recommended to other OECD member countries, Hungary should establish a process for the systematic review of environmentally harmful subsidies. In addition, it should consider introducing a mechanism to screen new subsidy proposals (and subsidy removals) against their potential environmental impact. This would improve the transparency of the tax and public expenditure system. It could be the basis for subsequent reforms of subsidies and special tax treatment that are not justified on economic, social and environmental grounds.

3.4.1. Fossil fuels subsidies and subsidies for energy use

Hungary's level of support for fossil fuel consumption is in line with the OECD average. This can be seen in Figure 3.7, which expresses total consumer support for fossil fuels as a share of the revenue from energy-related taxes. Total revenue foregone has declined to around HUF 80 billion annually since 2012 or about 10% of the revenue collected through taxes on energy products (OECD, 2016c).

Several measures support the consumption of fossil fuels. A reduced value-added tax (VAT) rate applies on sales of district heat, which is nearly entirely produced using fossil fuels. Up to 70% of the excise tax for diesel used off-road for agriculture is refunded. Commercial hauliers receive a lower tax rate on diesel. The government also pays an explicit subsidy to public heat suppliers. They, in turn, pass the subsidy to final consumers via heat bills, with a view to reducing final prices paid by households and improving energy affordability (Box 3.3). The subsidy is paid on a per household basis, with no regard for composition of households.

Figure 3.7. Fossil fuel support is in line with the OECD average



Note: Expenditures, which represent the majority of the support mechanisms, are not fully comparable across countries and need to be interpreted with caution, bearing in mind that tax regimes can differ substantially.
Source: OECD (2017), "Green Growth Indicators", *OECD Environment Statistics* (database).

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In addition, to address increasing energy affordability risks (Box 3.3), the government mandated several price cuts for electricity, gas and heat in favour of households in 2013. These cuts are partly compensated by higher prices for industrial users. As a result, pre-tax prices of electricity, natural gas and heat for residential end-users are set at levels below costs and are lower than prices in neighbouring EU countries.

Box 3.3. Energy affordability in Hungary

Energy affordability, defined as a household's ability to pay for necessary levels of energy use, has been a rising concern in Hungary. The number of individuals with debts owed to electricity, gas and district heating service providers has doubled since the early 2000s (Ministry of Public Administration and Justice, 2011). Between 48% and 60% of population in Hungary have arrears in accounts (Pye and Dobbins, 2015). Nearly 30% of households spend more than 10% of their income on heating fuels and electricity. Further, nearly 25% of households fall under the poverty line (defined as 60% of the median income) due to their energy bills, among the highest shares in the OECD. Overall, more than 20% of Hungarian households spend more than 10% of their income on energy and fall under the poverty line after expenditure on energy (Figure 3.8).

Figure 3.8. Energy is not affordable for many households

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Energy affordability is a common issue in Central and Eastern European countries. The economic and political changes of the early 1990s led to liberalisation of energy markets,

rising energy prices and reduced household incomes. Energy affordability risks seem to be more acute in Hungary (Figure 3.8), where they particularly affect some vulnerable population groups such as the Roma people and elderly people in urban areas (Tirado Herrero and Ürge-Vorsatz, 2010). Inadequate levels of electricity and heating use may compromise health and normal activity patterns (Flues and Van Dender, 2017). The use of solid fuels, including waste, for heating and cooking is widespread, with severe air pollution and health consequences (Chapter 1.).

The low efficiency of residential housing built before 1990 is also a driver of energy affordability risks. More than three-quarters of the dwellings connected to district heating are prefabricated buildings in suburban areas, which host low-income families or individuals, often elderly. These buildings have low thermal efficiency, are often inefficiently overheated and do not usually allow for individual heat metering. Instead, the heat supplied to the building is billed to individual apartments in proportion to their size, which leads to unnecessarily high heating bills (Tirado Herrero and Ürge-Vorsatz, 2012).

This type of price regulation represents a barrier to entry in the highly-concentrated energy market, as well as for companies using renewables to provide power and heat (IEA, 2017). Below-cost end-use prices have resulted in financial losses for energy providers and lower returns on investment in the energy sector (EC, 2017a). The energy price regulation and the subsidies for heat consumption undermine the government's efforts to improve energy efficiency. They contravene the recommendations of the National Energy Strategy to help households use energy more efficiently rather than offering them lower energy prices. They also conflict with the recommendation of the 2008 OECD Environmental Performance Review to "ensure that incentives for energy efficiency provided by relatively high energy prices are not undermined by unjustified exemptions and subsidies". In addition, the energy price regulation and the subsidies for heat consumption are not an effective way of fighting the rising energy affordability concerns (Box 3.3). Support to household energy bills locks households into fuel poverty, as artificially low prices do not provide any incentives to save energy or improve energy efficiency. This type of support does not target the people most in need: price cuts benefit all users, including well-off households. Subsidies to heat consumption mostly benefit people living in urban areas, where the natural gas and district heating networks are developed (Tirado Herrero and Ürge-Vorsatz, 2012).

The government should introduce market-based energy prices and give responsibility for regulating prices to the sector regulator, using clear, competition-friendly pricing principles. As the 2016 OECD Economic Survey indicated, public service obligations should be met through explicit and transparent compensation to providers. In addition, energy providers should be given appropriate incentives to promote energy efficiency in end-users. Low-income households should be compensated through social benefits that are not linked to energy consumption, such as income-tested cash transfers. These can be associated with existing protection for registered vulnerable customers.[11] Such customers, for example, can pay energy bills in instalments, receive extended payment deadlines or benefit from pre-payment metering devices (Pye and Dobbins, 2015). The government could use money saved from removal of the heat subsidy, or additional revenue from increased fuel taxes, for this purpose. In this way, it could reduce energy affordability risks more effectively (Flues and Van Dender, 2017).

3.4.2. Tax treatment of company cars and commuting expenses

More than 40% of all registered cars are company cars in Hungary, among the highest shares in the OECD; these cars tend to be bigger and more CO_2-intensive (Harding, 2014b). This is partly because the benefits from personal use of company cars are not taxed. Consequently, the tax treatment of employees' compensation in the form of a company car is more favourable than that of cash wage income (Harding, 2014b). According to an OECD study of 25 OECD member countries, most countries provide favourable tax treatments of company car benefits. However, Hungary is one of the few countries (together with Portugal and Mexico) that do not tax these benefits at all. A company car tax based on emission levels of the vehicle does apply at the company level instead. This provides an incentive to businesses to choose less emitting vehicles for their company car fleets.

This tax treatment results in an estimated annual subsidy of more than EUR 2 100 per year, one of the highest among the OECD member countries surveyed. Therefore, it is attractive for employees to be paid part of their salary in the form of company cars. In addition, the fuel costs paid by employers do not increase the employee's taxable income. As a result, there is no incentive for employees to limit the use of company cars. In 2012, this favourable tax treatment led to revenue forgone in the range of EUR 164 to EUR 255 million, depending on the assumption (Harding, 2014b). This corresponds to about 40% to 60% of the tax revenue from vehicle-related taxes, in the same year.

Employees cannot deduct expenses related to commuting between home and work from their taxable income. Public transport expenses paid by employers are considered as taxable income for employees only if commuting occurs within the administrative area of the workplace. Otherwise, they are exempt. This system is neutral with respect to driving in cities and does not encourage long driving distances that can trigger additional peak-hour traffic. On the other hand, it encourages the use of long-distance public transport. However, free or subsidised parking spaces provided on the employer's premises are not considered to be taxable income for employees. Given the increasing financial cost of parking, this can be a benefit of substantial value. Specifically, it decreases the cost of driving to work relative to other forms of transport. In so doing, it distorts decisions about the form of commuting (Harding, 2014b).

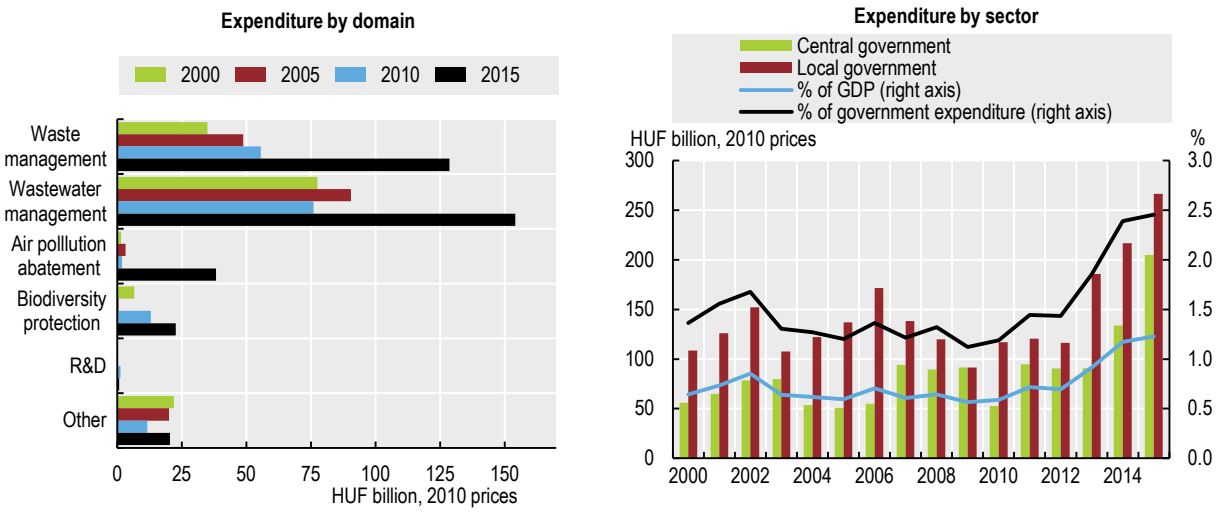
In addition to weighing on the public budget, the favourable tax treatment of company cars and parking lots tends to encourage private car use and long-distance commuting. It can result in increasing fuel consumption, emissions of GHGs and local air pollutants, noise, congestion and risk of accidents (Roy, 2014). This policy runs against Hungary's objectives of climate mitigation and air quality improvement in major cities. Hungary should, therefore, reconsider the taxation system of company cars, commuting expenses and parking spaces.

3.5. Investing in the environment to promote green growth

3.5.1. Overview of public expenditure for environmental protection

Public environmental expenditure (current expenditure and investment) has considerably increased since 2000, at both the central and local levels. In 2015, it amounted to 1.2% of GDP and 2.5% of total government expenditure, twice as much as in the mid-2000s (Figure 3.9). The increased expenditure in 2013-15 reflects accelerated spending of the EU funds allocated for 2007-13, which had to be spent by 2015.

Figure 3.9. Public spending in environmental protection has increased



Note: General government expenditure according to the COFOG classification.
Source: OECD (2017), *OECD National Accounts* (database).

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As in many other OECD member countries, local governments have major responsibilities in providing environment-related infrastructure and services. On average, local governments spent 1.6 times as much as the central government for environment-related issues in 2000-15 (Figure 3.9). Expenditure has increased in all environmental domains. In Hungary, as in many other countries, it mostly targets wastewater and waste management, also thanks to the use of EU funds (see below).

However, local authorities generally lack financial resources and are heavily indebted. They largely rely on EU funds for their capital expenditure. Despite the technical assistance provided by the central government, smaller local authorities continue to lack human resources and adequate skills to plan and manage large, complex infrastructure projects.

Despite more investment and tangible progress in expanding environment-related infrastructure such as wastewater treatment, investment needs remain high. The quality of infrastructure is perceived to be low relative to local expectations. Firms surveyed continue to report inadequate infrastructure as the most important barrier to doing business (World Economic Forum, 2015). More innovative approaches could be adopted to finance infrastructure and involve the private sector. For example, public-private partnerships, which are little developed in Hungary, could lead to higher investment efficiency (OECD, 2015b). Also, user fees for energy and water supply, wastewater discharges and waste management have been either frozen or cut in recent years. These fees need to be revised to better cover the costs of these services. This would also help Hungary reduce its reliance on EU funds for financing environment-related investment.

European Structural and Investment Funds

Hungary has benefited from considerable financial support from the European Union in the framework of the EU cohesion, rural development and fishery policies. These funds

have represented a large share of public investment, especially in environment-related infrastructure.[12]

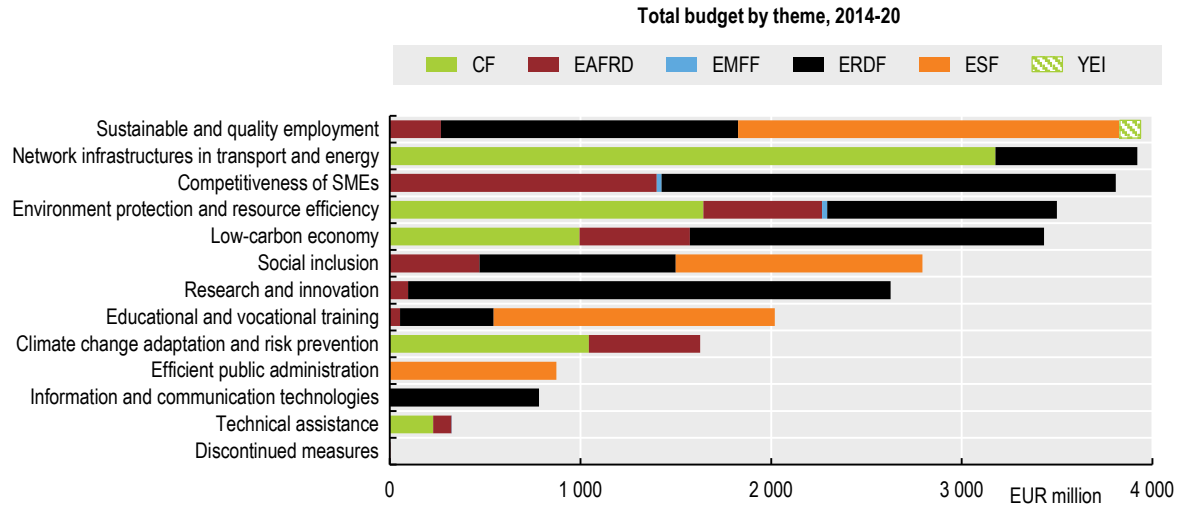
Over 2007-13, Hungary received support of EUR 21 billion from the Cohesion Fund and the European Regional Development Fund. This represented on average 3% of annual GDP, equivalent to 57% of government capital expenditure in the period. Investment in transport received the largest share of the allocated funds (31%), followed by environmental infrastructure (20%). While most of the transport-related investment focused on the road network, it also helped extend and improve the urban transport network in Budapest and Szeged. Environment-related investment focused on the water sector and, to a lesser extent, waste management, with the aim of ensuring compliance with the related EU directives. Nearly 480 000 people were connected to new or upgraded wastewater treatment facilities because of these investments (Applica et al., 2016).

Hungary will receive EUR 21.5 billion under the EU Cohesion Policy for 2014-20, as well as EUR 3.45 billion for rural development and EUR 39.1 million for the fisheries sector. This is equivalent to 3% of annual average GDP over 2014-17 and nearly 40% of expected national public investment (EC, 2017a). The largest Operational Programme (OP) is Economic Development and Innovation OP with an allocation of EUR 7.73 billion of the EU Cohesion Policy fund (EC, 2017b).[13]

In 2014-20, EUR 3.22 billion, or nearly 14% of the total allocation under the Cohesion Policy, is to be allocated to environmental investment. It will be spent through the dedicated Environment and Energy Efficiency Operational Programme (EEEOP). The planned investment focuses on flood protection and climate adaptation; infrastructure in the water, wastewater and waste sectors; improved nature protection; and increased energy efficiency (Figure 3.10).[14] In addition, the Rural Development Programme (RDP) allocates 15% of its total to agri-environmental-climate measures, and finances water saving investments (EC, 2017b).[15] Disbursement of EU Funds over 2014-20 is conditional on fulfilling certain *ex ante* requirements. These include co-ordinating environmental investments with water basin management plans or developing the transport plan (EC, 2017a).

EU-funded investment programmes have been proceeding at a relatively fast pace. As of mid-2017, Hungary had committed more than 60% of the total available resources for 2014-20 to selected projects compared to the EU average of 36%. It had spent 7% of total available resources on completed projects compared to 5% in the European Union as a whole. Implementation of EEEOP has been somewhat slower. It has allocated 82% of funds to projects, but spent 2% of available resources on completed projects (EC, 2017c). As indicated by OECD (2016a), Hungary should increase financing for public infrastructure investment to complement the EU funds and promote agglomeration effects in high growth areas. It should use these funds more effectively to invest in environment-related infrastructure, improve environmental performance and comply with EU environmental acquis, especially in the water, waste, renewable energy and energy efficiency sectors (EC, 2017a, 2017b).

Figure 3.10. A large share of EU funds is allocated to environment and climate-related investment



Note: CF: Cohesion Fund; EAFRD: European Agricultural Fund for Rural Development; EMFF: European Maritime and Fisheries Fund; ERDF: European Regional Development Fund; ESF: European Social Fund; YEI: Youth Employment Initiative.
Source: EC (2017), "The EU Environmental Implementation Review – Country Report: Hungary".

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3.5.2. Business investment

Hungary's business environment is not conducive to investment. Businesses face a higher administrative burden than on average in the European Union (OECD, 2015c). Frequent and unpredictable changes to regulations worsen investor perceptions. Despite legal requirements, proposed new legislation and regulations are not systematically subject to *ex ante* impact assessments. Little time is allowed for stakeholder consultation (EC, 2017a).

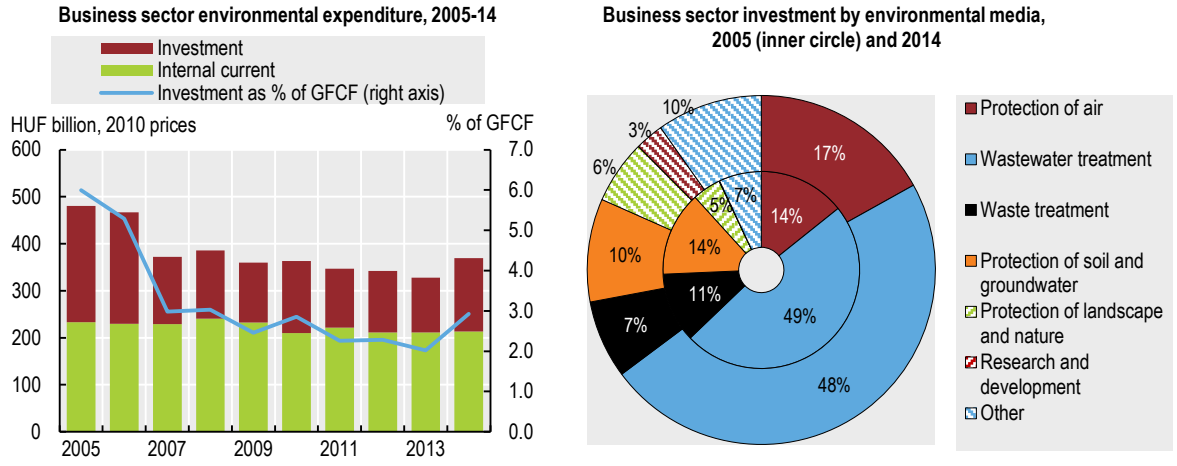
Environmental expenditure from businesses (large and small) has declined since the mid-2000s, especially in terms of investment (Figure 3.11). Between 2013 and 2014, however, businesses did increase investment in pollution prevention and reduction by 34%, reaching EUR 564 million. While integrated environmental investment increased, more than 80% of businesses focused on direct end-of-pipe environmental investments. Such investments do not modify manufacturing processes (EIO, 2016). Nearly half of business investment focuses on wastewater treatment (Figure 3.11).

According to a 2015 Eurobarometer survey, around 59% of Hungary's small and medium-sized enterprises (SMEs) have invested up to 5% of their annual turnover in resource efficiency actions. This is above the EU-28 average of 50%.[16] In line with EU averages, 59% of Hungary's SMEs took measures to save energy and 44% acted to save water. These actions helped reduce production costs in half of Hungary's SMEs (EC, 2017b).

The public sector remains the main driver of environment-related investment in contrast to trends in more advanced EU countries. This indicates that the current mix of market incentives (EU ETS carbon price, fuel taxes, pollution and resource use taxes) and tax

credits for energy efficiency (Section 3.5.4) and environmental projects, have not stimulated investment effectively. Like public investment, business investment largely relies on EU funding. Businesses have an incentive to postpone investment to wait for funding opportunities. There is, therefore, a risk that EU funds are used also for investment that would be conducted without public support, rather than being used on additional, more productive and growth-inducing investment (EC, 2017a).

Figure 3.11. Business environmental investment has declined



Source: HCSO (2017), "Environmental Industry", *STADAT* (database).

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3.5.3. Water investment

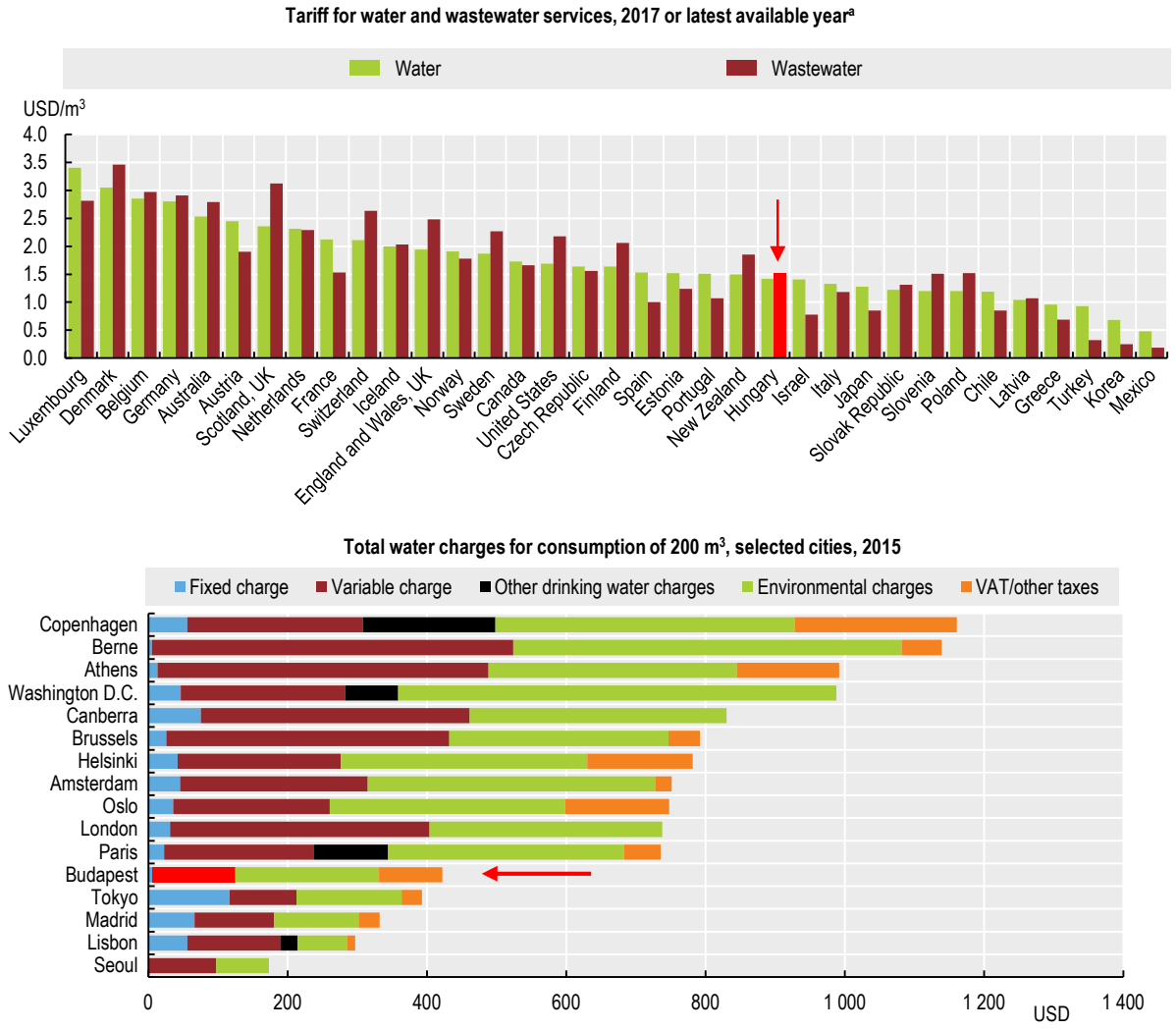
Investment in water supply and wastewater networks has increased in the last decade, driven by EU funds. As a result, Hungary has increased access to piped water and sewerage networks. However, additional significant national public and private investments are needed to extend access to good quality water, as well as to ensure adequate maintenance of infrastructure put in place by EU funds (ECA, 2017). While the drinking water supply network is complete, about a quarter of the population is served by drinking water that does not meet EU requirements for quality. The wastewater network, which covers 77% of the population, bypasses many small settlements, leaving wide regional disparities (Chapter 1.). Infrastructure is ageing, and its average condition is slowly declining (World Bank, 2015).

Tariffs for water and wastewater services are low in Hungary in international comparison (Figure 3.12). They cover 89% of operating costs, although with wide variability across utilities. On average, the cost recovery ratio is less than in other countries in the Danube region (96%) and in the European Union as a whole (110%). Water tariffs are, therefore, not sufficient to fund asset renewal. Investment needs are mainly financed by government transfers and EU funds. Government subsidies are available to support the tariffs of municipalities where service costs are above a certain threshold. Such a mechanism does not encourage utilities to improve their efficiency (World Bank, 2015).

Since water and sewerage tariffs were frozen in 2012 and were decreased by law in 2013, revenues collected by utilities have been decreasing. As a result, utilities have even lower financial reserves than before, and maintenance has become problematic for many

operators. In addition, the future maintenance costs of recent development projects have not yet been included in the price of services (World Bank, 2015). Investment needed to improve water quality in Hungary up to 2020 is estimated at EUR 415 to EUR 460 million. This is more than double the EU fund allocation to water supply networks for 2014-20 (ECA, 2017). Hungary should consider revising water supply and sanitation tariffs to ensure better recovery of costs and reduce reliance on EU funds to finance water infrastructure in the long term.

Figure 3.12. Water prices are low in international comparison



a) Average tariff based on a consumption of 15m³ per month. Data for Hungary refer to the period 2012-15.
Source: The International Benchmarking Network for Water and Sanitation Utilities (2017), *IBNET (*database); International Water Association (2016), *International Statistics for Water Services - Brisbane 2016.*

StatLink http://dx.doi.org/10.1787/888933712624

3.5.4. Investing in renewable energy and energy efficiency

Investment in renewable energy sources and energy efficiency improvements are at the core of Hungary's strategy to reduce GHG emissions (Chapter 1.). Several financing

schemes are in place. These are either state-financed, using revenue from sales of carbon emission allowances and from the state budget, or financed with EU funds.

Half of the revenue from EU ETS allowance auctions is divided equally between the Economy Greening Scheme (EGS) under the Ministry of National Economy and the Green Economy Financing Scheme (GEFS) under the Ministry of National Development (IEA, 2017). GEFS can support a broad set of measures to reduce GHG emissions or adapt to climate change. It focuses on renewable energy generation and energy efficiency projects, especially in the residential sector. Revenue from selling emission units under the Kyoto Protocol has fed the Green Investment Scheme, which focuses on energy efficiency measures in the building sector. About one-quarter of the total EU cohesion and structural funds allocation for 2014-20 is planned for renewable energy and energy efficiency measures through EEEOP and other programmes (IEA, 2017). However, the budgets of these different programmes have frequently changed, which has hampered stability for investment decisions (IEA, 2017). Regular monitoring of activities of environment- and energy-related financing schemes and programmes is needed to keep them in line with policy priorities, as well as transparent and cost-effective.

Renewable energy sources

Investment in renewables has increased in the last decade, resulting in significant growth of their use. Hungary is likely to exceed its target of 14.65% renewable energy in gross final consumption for 2020 set by the 2011 National Renewable Energy Action Plan (NREAP), as well as the respective EU target of 13%. In 2015, renewables already accounted for 14.5% of gross final energy consumption. The NREAP estimates that the planned measures to achieve this target will cost about EUR 2 450 million over 2010-20.

More use of biomass for heat and power production has been the main driver of growth in renewables, although this growth has levelled off in recent years (Chapter 1.). As the potential for biomass use is reaching its limit, Hungary should focus on other energy sources and remove barriers to their development. Solar power has been a fast- growing sector, but a high environmental product fee on solar panels hampered future growth. Its rate was halved in 2018. Given Hungary's geographical context and the available wind potential, the development of wind energy is subject to challenging technical requirements. For example, wind farms must be installed far from settlements and capacity shall not exceed 2 MW. Geothermal heat and power is still underdeveloped, although the country has the third largest installed capacity of geothermal district heating in the European Union (EGEC, 2017).

In addition to various forms of financial assistance for capital investment, Hungary has promoted renewable energy through feed-in tariffs. The system in place until 2016 had not always promoted scale effects in the provision of renewable energy (OECD, 2016a). A new renewable energy support scheme (METÁR) took effect in 2017 (Box 3.4). It will be financed by a surcharge to be paid by final non-household customers. IEA (2017) considers that the new system represents significant progress following several years of reform delays. In addition, Hungary is preparing network development plans to enable the connection of increasing renewable generation (IEA, 2017). The planned extension of the cross-border lines with the Slovak Republic and Slovenia will facilitate renewable generated electricity flows within the Central Eastern European region (IEA, 2017).

There is a potential misalignment of the energy price regulation and the corporate income tax code with Hungary's promotion of investment in renewable electricity generation. As discussed in Section 3.4.1, energy prices for households have been repeatedly cut to

levels below costs. This practice lowers returns on investment in the energy sector. As such, it is a barrier to entry in the energy market, including for companies using renewables to provide power and heat (IEA, 2017). In addition, while variable costs of new investment are immediately expensed from the corporate income tax base, capital costs need to be depreciated over time. This feature of the tax code inadvertently discourages investment in carbon-neutral electricity generation technologies, which feature relatively high capital and low variable costs compared to their carbon-intensive counterparts (OECD, 2017c).

A biofuel blending obligation is Hungary's main measure to promote biofuels in transport. Fuel suppliers are required to blend at least 4.9% of biofuels in petrol and diesel until 2019. This requirement will be raised to 6.4% in 2019-20. The old age of the car fleet makes it technically difficult to further increase the share of biofuels (IEA, 2017). Although the share of renewable fuels in transport reached 7.4% in 2016, the country is unlikely to meet its EU target of 10% by 2020 (Chapter 1.).

Box 3.4. METÁR, the new renewable energy support system

According to METÁR, small renewable energy plants (with capacity below 0.5 MW) will continue enjoying the mandatory offtake regime and feed-in tariffs of the old system. For generating capacities between 0.5 MW and 1 MW, a premium will be paid above the reference price. Larger capacities (over 1 MW) and wind installations will require competitive bidding. For biomass and biogas generating capacities, a so-called brown premium will be introduced to keep biomass-firing competitive in relation to fossil fuels.

The system was launched under a transitional regime, pending approval of the state aid scheme by the European Commission. As of the end of 2017, more than 200 METÁR applications were received. They were all solar power plants, mainly below 0.5 MW, with a total capacity of over 100 MW. No tender for larger plants has been launched.

Energy efficiency

There is scope to improve energy efficiency. The energy intensity of the economy has considerably decreased since 2000 and is below the OECD average, but it is still above the average of OECD European countries (Chapter 1.). In its fourth National Energy Efficiency Action Plan, adopted in 2015, Hungary set an energy-saving target of 73 petajoules by 2020. Over half of these savings are expected to be achieved in the residential sector. The IEA (2017) believes this target could be more ambitious.

In addition to energy efficiency support via GEFS, EEEOP and other programmes, the main policies for industrial energy efficiency are tax credits and energy auditing requirements. Companies can benefit from corporate tax credits for investment to comply with energy efficiency targets. There is a risk that such tax discounts are given for investment that would occur without support; tax credits would be more cost-effective if they were granted for going beyond the targets. Hungary should encourage SMEs to perform energy audits.

Nearly four in five Hungarian homes and public buildings fail to meet modern energy and thermal requirements. The energy efficiency of buildings built between 1946 and 1980 is particularly poor (MND, 2015). Heat generation accounts for more than 80% of

household energy consumption. Coal and wood used for household heating and cooking are a considerable source of emissions of GHGs and air pollutants. Heating with waste is prohibited, but often occurs in energy-poor households.

Hungary has acted to address the relatively poor energy performance of the building stock through public funding, local tax incentives, awareness-raising and energy certification of buildings. The Warmth of Home programme 2014-17 aimed to reduce household energy costs and address energy poverty. Among other things, the programme helped replace outdated and inefficient household boilers, a measure that also contributes to fewer air emissions. GEFS and the Green Investment Scheme provided large funding for modernisation of the building stock. According to IEA (2017), these investments have been effective in reducing the energy intensity of residential sectors, especially space heating needs.

Despite progress, there is still large potential for improving the energy performance of buildings. Authorities should consider strengthening the energy efficiency standards for new buildings. The government could also demonstrate leadership by committing to improve energy efficiency in public buildings.

Additional measures may be needed to encourage investment, and incentives for energy efficiency in buildings should be better aligned. On the one hand, the government provides financial support and incentives to improve energy efficiency, including for replacement of old boilers with cleaner and more efficient ones. On the other, it has cut retail energy prices at below-cost levels and subsidises heat consumption (Section 3.4.1). As IEA (2017) recommended, the government should reconsider such pricing policy. Specifically, it should ensure that retail prices for residential customers reflect the full cost of energy supply and delivery, including environmental costs, and provide the correct signal to consumers (IEA, 2017). At the same time, it should introduce well-targeted mechanisms to provide low-income households and vulnerable population groups with the means to switch from burning coal or waste towards cleaner fuels.

As several energy efficiency measures are only starting to be systematically monitored via a National Energy Efficiency Advisors Network in government offices, it is difficult to evaluate their cost-effectiveness. A comprehensive package of policy measures is needed to complement the EU ETS carbon pricing. This should address non-pricing barriers that block investment in low-carbon energy sources and adoption of energy-efficient technology in industry, transport and buildings.

3.5.5. Investing in low-carbon transport modes

Energy consumption and GHG emissions from the transport sector have grown quickly. These are projected to continue to rise as the vehicle fleet expands with rising income levels (Chapter 1.). Transport-related GHG emissions have been stimulated in part by significant investment in road infrastructure and insufficient support for less carbon-intensive modes of transport. The composition of the vehicle fleet, which is among the oldest and carbon-intensive in Europe (Section 3.3.4), also increases emissions.

Hungary developed a Transport Energy Efficiency Improvement Action Plan. This plan foresees developing bicycle lanes, improving energy efficiency in rail transport (railway electrification and network modernisation) and improving facilities to combine different ways of commuting. It also foresees introducing road taxes, a bus-replacement

programme and eco-driving training. These initiatives, if fully implemented, could help reduce emissions (IEA, 2017).

Hungary should ensure investment priorities for transport infrastructure and related financing are consistent with long-term climate and environmental objectives. While additional investments in road infrastructure will be needed to meet increasing demand, further measures to reduce emissions and improve energy efficiency in transport should be a priority.

Funding of national and local infrastructure should aim to recover the full costs of the investment, maintenance, use, and associated environmental and social impacts. This would help ensure competitive neutrality between transport modes. Hungary has put in place a distance-based electronic road toll system for heavy goods vehicles and a time-based electronic toll system for passenger and small commercial vehicles (so-called e-Vignette) (Box 3.1). As in many other EU countries, road tolls do not recover full infrastructure costs, especially when environmental and social costs are included. This is mainly due to a lack of reliable data and guidelines to calculate infrastructure costs, as well as the complexity of recovering costs in a revenue-neutral way. Only the tolls for heavy goods vehicles take account of the vehicles' emission category (Section 3.3.4).

Electric vehicles

The National Energy Strategy sets a target of 9% of energy consumption in transport to be electric or hydrogen-based by 2030. Uptake of EVs in Hungary has been growing fast, thanks to several incentives. However, it remains limited. There were around 3 200 EVs and hybrid vehicles at the end of 2017 (less than 1% of the car fleet), compared to the government's target of 30 000 environmentally friendly vehicles by 2020. The main barriers to greater adoption have been the high capital costs of the vehicles and a lack of widespread public charging infrastructure. As of mid-2017, Hungary had about 170 charging stations compared to the government target of 3 000 by 2020.

In line with these targets, the government launched the E-mobility Programme (the Jedlik Ányos Plan) in 2015. The programme provides incentives for EVs and announces plans to increase the number of charging stations. Several incentives for EVs have already been introduced, including "green licence plates" allowing free parking for EVs and exemptions from the registration tax and the motor vehicle duty. In addition, the government subsidises up to 21% of the purchasing price of new EVs. All these measures encourage users to switch to EVs, complementing the existing fuel efficiency and emissions standards. However, they tend to benefit mostly well-off people who could probably afford to buy an EV without public support. Other measures would likely encourage the switch to newer and cleaner cars, including EVs, in a more cost-effective and equitable way. These include adjusting the current vehicle tax and toll systems to take account of emission standards (Box 3.1) and removing the tax depreciation for old vehicles.

The E-mobility Programme also suggests using taxi and bus lanes for EVs, introducing road toll discounts, requiring public bodies to purchase EVs for a proportion of their vehicle fleets, and investing public funds in charging stations. In addition, it foresees amending the Electricity Act to enable charging equipment operators to sell their electricity, as well as simplifying the administrative procedures for the installation of charging points. Further measures could be considered, including supporting e-car sharing systems and the use of EVs for public transport.

Overall, Hungary should review and clarify the investment needs and financing sources for fully implementing the E-mobility Programme, as well as its impact on the electricity generation and distribution systems. It should assess the cost-effectiveness and feasibility of the programme against other options to reduce GHG emissions from transport.

3.6. Promoting eco-innovation and markets for environmental goods and services

3.6.1. Overview of Hungary's innovation system and performance

Hungarian authorities have increasingly emphasised innovation in recent years. They have made considerable efforts to improve the country's innovation system, which lags behind many OECD member countries. Hungary has a low rate of both private and public R&D investment (OECD, 2016d). At 1.38% of GDP in 2015, Hungary's gross domestic expenditure on R&D was still significantly below the OECD average. It also remains below the national goal of 1.8% of GDP by 2020 (as set by the 2030 National Reform Programme). More resources should be devoted to higher education to improve the skill base, as relatively few adults have tertiary education (OECD, 2016a).

While government R&D spending declined in real terms between 2008 and 2015, R&D spending in the business sector has increased since the mid-2000s. Business innovation capacity is mostly concentrated in foreign-owned companies and some large domestic companies. SMEs tend not to be competitive. Most have not integrated production chains of foreign companies into their operations effectively, and show a low interest in innovation. Indeed, SMEs account for less than 60% of the R&D undertaken by businesses (OECD, 2016d).[17] Most enterprises introduced new products or processes by purchasing machinery, equipment and software rather than through R&D (HCSO, 2016). The patenting performance is low by OECD standards, which is also due to lack of co-operation between industry and public research. The commercialisation of public research results could be improved (OECD, 2016d).

In 2014, Hungary established the National Research, Development and Innovation Fund (NKFI), merging and streamlining two pre-existing funds to improve efficiency. Public support for business R&D was above the OECD average in 2014, with a roughly equal mix of tax incentives and direct government funding (OECD, 2017d). R&D financing, especially in SMEs, depends heavily on EU funds and other external sources (EC, 2017a).

The new Economic Development and Innovation Operative Programme, which defines development priorities for 2014-20, recognises the need for greater public investment in research infrastructure. The National Research and Development and Innovation Strategy 2013-20, along with the National Smart Specialisation Strategy, indicate the priority sectors of health care, environment, clean energy, education and transport/logistics.

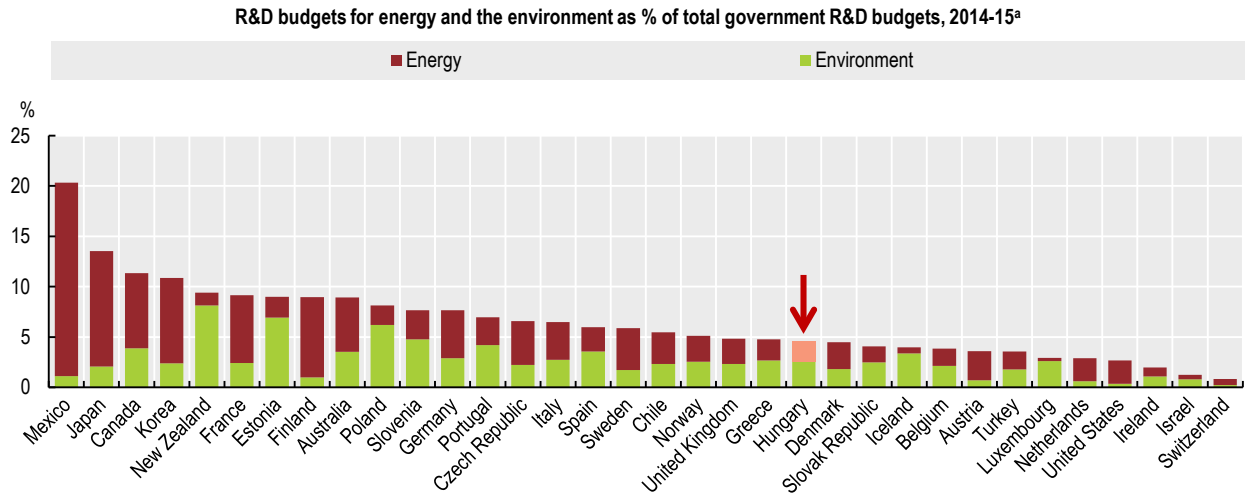
In 2015, the government established the National Research, Development and Technology Innovation Office. This move aimed to overcome institutional fragmentation, which had long been considered a barrier to better innovation performance (OECD, 2016d). However, co-ordination is still not strong enough to ensure funds are used efficiently and in a complementary way to avoid duplication. The use of funds is not systematically monitored or evaluated (EC, 2017a).

3.6.2. Focus on eco-innovation

Hungary has made progress in targeting eco-innovation in its strategic innovation framework. In 2011, the country adopted its first National Environmental Technology Strategy 2011-20, which sets objectives, policy measures and indicators to monitor progress. In 2014, Hungary enacted legislation to ensure that projects receiving NKFI funds contribute to solving social, environmental or economic challenges (OECD, 2016d). A specific energy technology strategy is under development. A new Research, Development and Innovation Action Plan for the energy sector is expected in 2018.

Eco-innovation performance does not match the increased policy focus. As for other research fields, the government is the main source of funding for environmental research. Hungary spends 4.6% of its government R&D budget on environment- and energy-related research. This is among the bottom half of OECD member countries (Figure 3.13). Environment-related R&D accounted for 2.6% of government R&D outlays in 2014-15, down from 3.5% in 2008. Energy efficiency and renewables have accounted for over 98% of the government energy R&D budget since 2008. This is the highest share in the OECD, although overall funding for energy R&D remains limited to around 2% of public R&D spending (Figure 3.13).

Figure 3.13. A modest share of public R&D spending goes to environmental research



a) Government budget appropriations or outlays for R&D; breakdown according to the NABS 2007 classification.
Source: OECD (2017), *OECD Science, Technology and R&D Statistics* (database).

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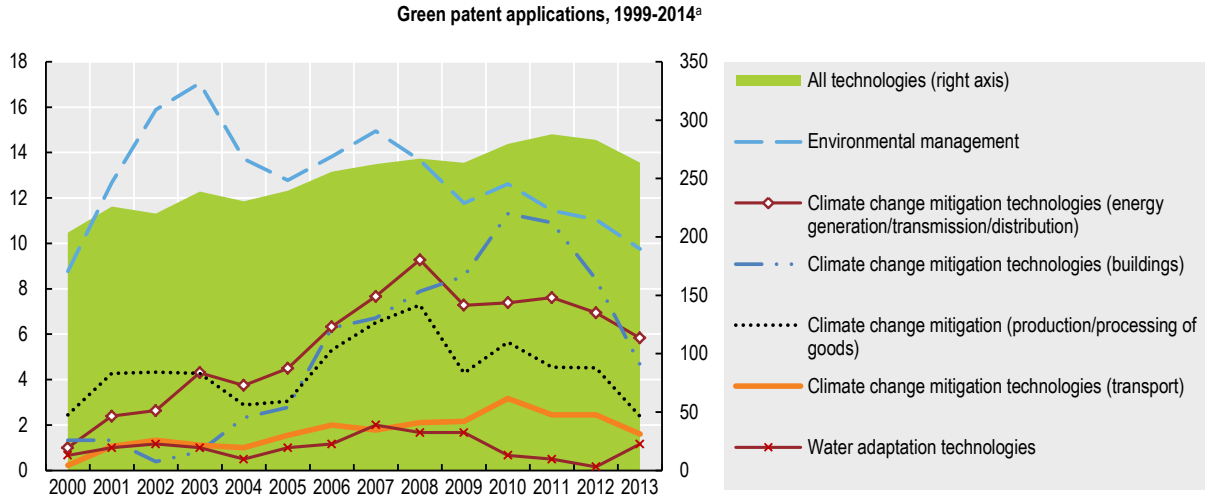
With reduced public R&D funding, patent applications related to environmental management technologies have declined. Applications related to some climate change mitigation technologies increased in the first half of the 2000s, but have been slowing down since the economic crisis of 2008/09 (Figure 3.14). These trends contrast with those observed in many other countries, where patenting in environment- and climate-related technologies has grown faster than in all technology domains. This has been partly driven by global climate mitigation commitments (Figure 3.14; OECD, 2017b). Environment-

and climate-related technologies made up about 7% of all patent applications in 2012-14. This is among the lowest shares in the OECD and below the shares in the other Visegrád Four countries. Hungary has not yet developed a specialisation and a competitive advantage in environmental technology (OECD, 2017b, 2016e).[18] There is no Hungarian verified technology in the EU Environmental Technology Verification system (EIO, 2016).

Overall, the policy mix for innovation and eco-innovation is biased towards supply side measures such as R&D funding. This is common to most (if not all) OECD member countries. More efforts are needed on demand-side measures such as green public procurement and aligning market incentives with environmental objectives. For example, regulated electricity and gas prices for households (Section 3.4.1) do not reflect costs. This results in financial losses for service providers and fewer incentives for greener investments (EC, 2017a). Environmental product fees were extended to photovoltaic panels, which runs counter to the renewable energy goals (EIO, 2016). In addition, most environmentally related taxes are poorly designed or their rates are too low to stimulate eco-design and innovation (Section 3.3). Hungary needs to swiftly adopt and implement its national action plan for green public procurement. This would help stimulate demand for greener products and services, and encourage innovation.

Figure 3.14. Green patent applications have been declining in the 2010s



Note: Patent statistics are taken from the Worldwide Patent Statistical Database (PATSTAT) of the European Patent Office (EPO), with algorithms developed by the OECD. Data refer to patent applications filed in the inventor's country of residence according to the priority date and apply solely to inventions of high potential commercial value for which protection has been sought in at least two jurisdictions.
a) Three-year moving average data.
Source: OECD (2017),"Patents", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933712662

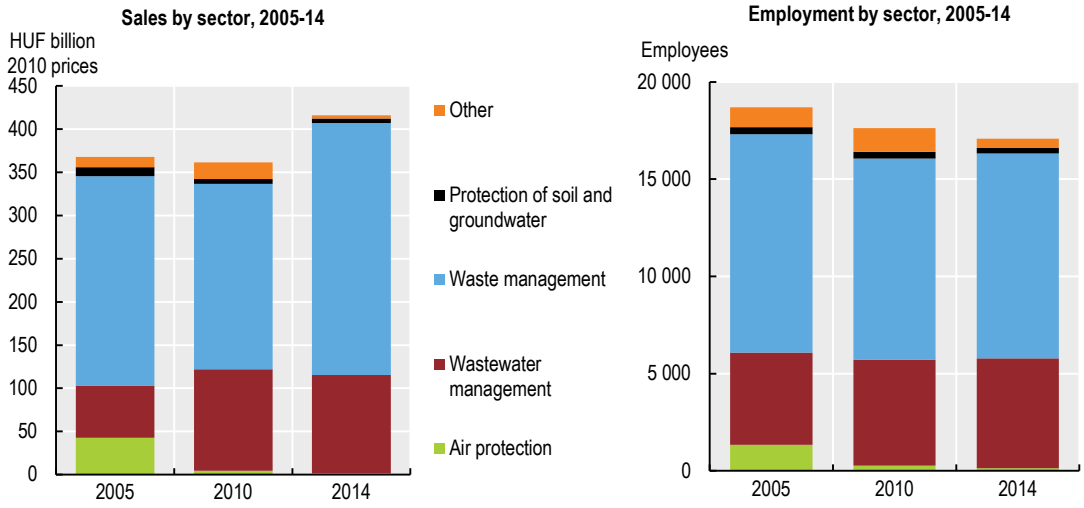
Making progress on innovation and eco-innovation remains challenging. While Hungary streamlined innovation responsibilities, environmental responsibilities remain fragmented across several ministries (Chapter 2.). This hampers co-ordination and entails relatively high administration and transaction costs. Legislation, including on innovation, has been often changed suddenly, but investors need stability to make decisions. The highest educated people are increasingly leaving the country. The economic efficiency of the environment-related innovation policy and its contribution to improved environmental

performance, resource productivity and energy efficiency are not systematically evaluated.

3.6.3. Promoting the green industry

The environmental goods and service sector has grown in Hungary, but seems to be less developed than in most EU countries. Revenue from selling products and services related to waste and wastewater management has increased in real terms since the mid-2000s. In 2014, businesses providing environmental products and services employed about 17 000 people, a slight decline since the mid-2000s (Figure 3.15). About 0.6% of total employment is in the wastewater treatment, waste management and remediation activities, among the highest shares in the OECD. However, these activities generate lower value added than in many other OECD member countries (OECD, 2017b).

Figure 3.15. Revenue from EGS has grown, but employment has decreased



Source: HCSO (2017), "Environmental Industry", *STATDAT* (database).

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Hungary's SMEs have a lower propensity to produce greener products than the average of EU firms. According to a 2015 Eurobarometer survey, 18% of SMEs in Hungary offer green products and services (the EU average is 26%). Meanwhile, 14% have taken steps to design products that are easier to maintain, repair or reuse (the EU average is 22%). Similarly, 22% of SMEs in Hungary have one or more full-time employee working in a "green job"[19] at least some of the time, compared to the EU average of 35% (EC, 2017b).

There are opportunities to make the green industry more competitive, enlarge environmental markets and catch up to other EU countries. For instance, full implementation of the existing EU waste legislation could create more than 13 300 jobs in Hungary and increase the annual turnover of the waste sector by EUR 1.4 billion (EC, 2017b). According to Hungary's National Renewable Energy Action Plan 2010-20, the implementation of the plan could create more than 50 000 new jobs.

The government acknowledges these opportunities, and plans to develop a strategy to promote green industry in 2018. The strategy would be part of the 2016

re-industrialisation plan (so-called Irinyi Plan). This plan aims to increase the share of manufacturing in GDP from 23.5% to 30% over 2015-20 and to differentiate the manufacturing output that depends on the motor vehicle supply chain.

3.7. Contributing to the global sustainable development agenda

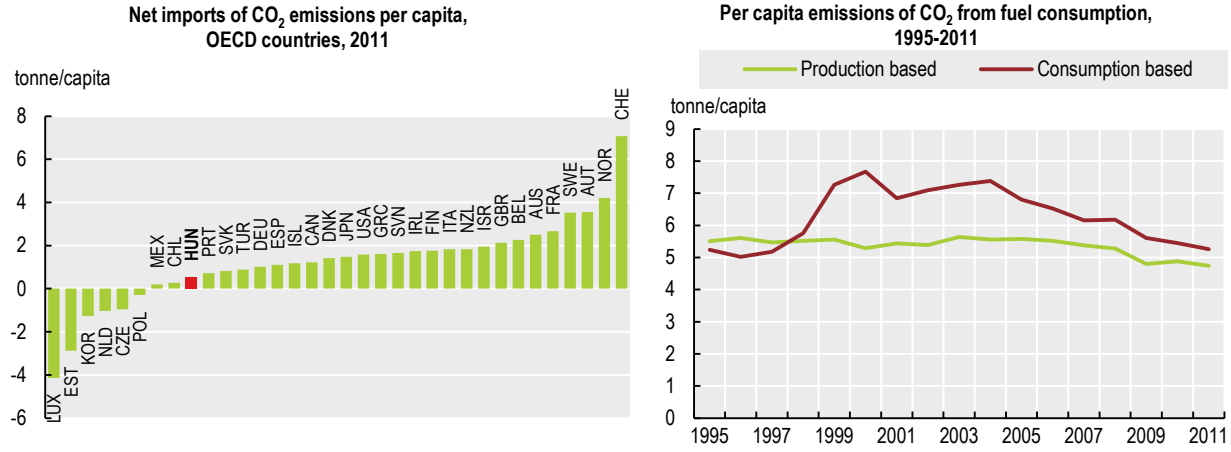
Hungary has a long tradition of international co-operation in the environment field, especially at the regional level to address transboundary issues related to the Danube River Basin. Hungary has an excellent record in signing and ratifying environmental international agreements involving the European Union (EC, 2017b). For instance, it was the first EU member state to ratify the Paris Agreement on climate change.

3.7.1. Mainstreaming environmental considerations into international trade

Hungary's participation in global value chains is one of the highest in the OECD. This is due to large inflows of foreign direct investment and high integration of foreign-owned companies in the national economy, particularly in the electrical, vehicle and chemicals industries (OECD, 2016a). An export-oriented economy, Hungary's performance on facilitating trade has improved in the first half of the 2010s. However, it needs to progress further to take advantage of the trade flow increase and the potential for facilitating trade to reduce costs (OECD, 2016e).[20]

As in all other OECD member countries, the consequences of Hungary's domestic and trade policies can go – intentionally or unintentionally – beyond the country's borders. For example, Hungary became a net importer of CO_2 emissions in 1998. Consumption-based CO_2 emissions from fuel use quickly increased at the turn of the century. In 2000, they were 45% higher than the conventional measure of production-based CO_2 emissions (Figure 3.16; Wiebe and Yamano, 2016). Many factors underlie this trend, including reduced reliance on fossil fuels for electricity generation; modernisation of the industrial structure; and an increasing share of imports from CO_2-intensive trade partners. Nonetheless, with the delocalisation of industrial production to Hungary, the difference between demand-based and production-based emissions has declined since 2000. Overall, Hungary's net imports of CO_2 emissions are relatively modest compared to most other OECD countries.[21]

Figure 3.16. Hungary has become a net importer of CO_2 emissions



Source: OECD (2015), OECD production- and consumption-based CO_2 emission estimates, based on IEA CO_2 emissions from fuel combustion.

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Hungary participates in the free trade agreements involving the European Union. All bilateral trade agreements concluded by the European Union with non-EU member countries include environmental provisions. The European Union regularly monitors the implementation of these provisions in co-operation with its partner countries.

Hungarian authorities have developed strategies to limit the potentially negative international environmental effects of exports. For example, the Hungarian import-export bank (Eximbank) has developed screening and monitoring procedures. These assess the environmental, social and human rights impact of supported projects, in line with the OECD Recommendation on officially supported export credits.[22] A project is eligible for export credits if the risks involved are acceptable or if appropriate mitigation measures are put in place. So far, no project has been refused export credit support because of the screening. Hungary's screening practice does not go beyond the scope defined by the OECD Recommendation.

3.7.2. Mainstreaming environmental considerations into development co-operation

In December 2016, Hungary joined the OECD Development Assistance Committee (DAC). It pledged to fulfil obligations of this membership, including the need to develop systems for evaluating its development co-operation activities.

Hungary has developed its legislative and institutional frameworks to provide more effective development co-operation. Since 2004, when it joined the European Union, Hungary has almost doubled the volume of its official development assistance (ODA). This volume reached nearly USD 160 million in 2016 or 0.13% of the country's gross national income (GNI). This is in line with the ODA effort of the other Visegrád group countries. However, it is considerably below the average effort of OECD DAC member countries (0.3% in 2015). It also falls below the target of 0.33% of GNI by 2030 common to all member states that have joined the European Union since 2002 (OECD, 2017e). With its good economic and fiscal performance, Hungary has an opportunity to increase

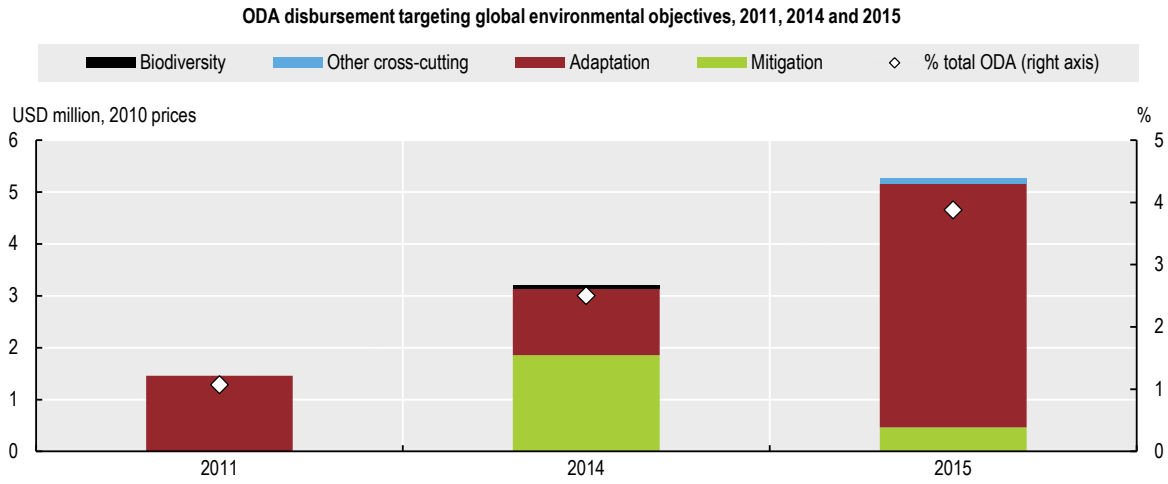
ODA volume in line with international goals, notably the 2030 EU target. It should consider increasing its aid programme, particularly its bilateral ODA activities, consistently with this purpose.

Hungary provides most of its ODA via multilateral channels, particularly through the European Union (OECD, 2017e). Its bilateral assistance is concentrated in European and Asian countries. Hungary's projects focus on building democratic institutions and a market economy, as well as on promoting social, economic and infrastructure development.

The International Development Cooperation Strategy and Strategic Concept for International Humanitarian Aid of Hungary 2014-20 identifies environmental protection and climate change as priorities. Cross-cutting principles, notably gender equality and environmental sustainability, are still to be incorporated into Hungary's development co-operation strategy and activities in a systematic way (OECD, 2017e). The Ministry of Foreign Affairs and Trade should use the opportunity of the ongoing mid-term review of the strategy to integrate the SDGs and the other cross-country principles into it.

Bilateral and multilateral ODA for global environmental issues such as climate change and biodiversity increased to more than USD 5 million in 2015. This represented nearly 4% of total ODA disbursements. As a rough comparison, the share of committed bilateral aid for the environment was 17% in the Czech Republic, 6% in Poland and 14% in the Slovak Republic. For their part, DAC members committed on average more than 30% towards the environment (OECD, 2017e).[23] Hungary supports projects focusing on adaptation to climate change (Figure 3.17), mainly on water management infrastructure and flood management. In addition, the country allocated up to HUF 2 billion (USD 8 million) in 2015 to participate in international climate finance efforts, and pledged half of this to the Green Climate Fund. Hungary should increase the share of ODA devoted to the environment, particularly for bilateral co-operation.

Figure 3.17. Environment-related aid has increased, but remains low



Note: Data refer to bilateral and multilateral ODA disbursements, excluding small amounts disbursed in 2012-13.
Data exclude a loan for a water supply and sanitation project in Indonesia (about USD 36 million committed in 2015), for which the ODA component and related disbursements are unknown.
Source: OECD calculation based on data submitted by the Ministry of National Development.

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Recommendations on green growth

Strategic framework

- Ensure alignment of the National Framework Strategy on Sustainable Development with sectoral strategies; develop a framework for monitoring their implementation and progress towards green growth objectives, based on a targeted set of indicators linking economic activity and social welfare with environmental performance.

Price signals

- Improve the design of environmentally related taxes to reinforce their incentive function: i) take advantage of the low world oil price to permanently raise the tax rates on petrol and diesel to levels that reflect the environmental costs of driving; ii) consider introducing a carbon tax on sectors outside the EU ETS; iii) link vehicle taxes to fuel economy and air emission standards and progressively untie them from the age of vehicles; iv) gradually raise the rates of pollution and resource taxes to align them with the environmental costs of pollution and resource use; v) regularly adjust tax rates for inflation.
- Remove incentives to private car use and long-distance commuting; reform the tax treatment of the personal use of company cars and parking spaces; link road tolls for passenger vehicles to the vehicles' emission standards; consider introducing congestion charges in major cities.
- Establish a process for systematic review of environmentally harmful subsidies and regularly evaluate proposals for new subsidies and subsidy removals against their potential environmental, social and economic impacts.
- Re-introduce market-based energy prices and gradually phase out the heat subsidy, while compensating vulnerable groups through social benefits that are not linked to energy consumption.

Green investment and innovation

- Increase, better prioritise and enhance the transparency and cost-effectiveness of national public spending on environment-related infrastructure while reducing reliance on EU funds; leverage private funding and revise tariffs for energy and water to ensure better cost recovery.
- Align transport infrastructure investment with long-term environmental objectives; identify investment needs and financing sources for implementing the E-mobility Programme; analyse its impact on electricity generation; compare its cost-effectiveness with other options to reduce GHG emissions from transport.
- Strengthen energy efficiency standards for new buildings; set rules for dividing the costs and benefits of energy efficiency improvements between tenants and landlords; scale up investment in raising energy efficiency of public buildings; develop energy networks to connect additional renewable generation capacity.
- Reduce transaction and administrative costs to facilitate investment decisions in green technology; increase public R&D funding for environment-related innovation and evaluate the efficiency and effectiveness of its allocation; swiftly adopt and implement a national action plan for green public procurement.

Notes

[1] The UN adopted the SDGs within the framework of the 2030 Agenda for Sustainable Development in September 2015. They replace and further refine the Millennium Development Goals. The SDGs provide a baseline against which to measure how countries are progressing in achieving sustainable and inclusive growth, eradicating poverty, and protecting ecosystems and human health. These objectives are classified according to 17 goals and 169 targets; some targets are directly linked to environmental protection, while others have only indirect linkages.

[2] Without adjusting for pollution abatement, GDP growth would be underestimated in countries that divert scarce resources to abating pollution rather than to producing material goods. Conversely, growth would be overestimated in countries that rely on heavily polluting activities to generate GDP growth.

[3] The 2030 Agenda for Sustainable Development foresees regular national voluntary reviews of progress towards the SDGs. The UN High-Level Political Forum on Sustainable Development conducts the reviews together with the reviewed country and multiple stakeholders.

[4] In response to a survey for the European Sustainable Development Network, the Secretary General of Hungary's National Sustainable Development Council stated that Hungary has "lots of good strategies, but when a minister of a government takes a decision, the national sustainable development strategy might have little impact on concrete decisions" (Lepuschitz and Berger, 2014).

[5] Environmentally related taxes are defined as any compulsory, unrequited payment to general government levied on tax bases deemed to be of environmental relevance. Taxes are unrequited in the sense that benefits provided by government to taxpayers are normally not in proportion to their payments.

[6] In a best case scenario, revised or new environmentally related taxes could add revenue for EUR 0.65 billion in 2018, rising to EUR 1.21 billion in 2030 (in real 2015 terms). Raising the annual motor vehicle tax would yield EUR 0.46 billion in 2030 (at 2015 prices) or 0.3% of GDP. Introducing a pesticide tax would add revenue for EUR 0.19 billion in 2030 (at 2015 prices) or 0.13% of GDP (EC, 2016).

[7] Under Hungary's Mining Act, a 5% royalty is charged on the value derived from non-metallic mineral raw materials obtained from open cast excavations.

[8] As of January 2017, the standard excise duty on diesel was HUF 110.35/litre. It would be raised to HUF 120.35/litre if the world market price of crude oil is USD 50/barrel or less. The standard excise duty on petrol was HUF 120/litre. It would be raised HUF 125/litre if the world market price of crude oil is USD 50/barrel or less.

[9] Fuel taxes can help account for local air pollution and other social costs directly or indirectly linked to energy use (e.g. congestion, accident and noise costs in transport). However, other instruments may theoretically be more appropriate. Congestion, noise and accident costs are a function of the amount, location and timing of vehicle traffic. Thus, they are only indirectly linked to fuel use, as greater fuel use generally reflects increased distance driven. The impact on local air pollution also partly depends on the location of vehicle use or emitting facility. In remote or rural regions, for example, higher pollution may have lower health effects than in more populated or urban regions, but a higher impact on natural resources and vegetation (Harding, 2014a). Country-wide, time- and location-specific road pricing would generally be more cost-effective to address congestion, accidents and noise.

[10] In addition to the free allocations to manufacturing sectors, until 2013, Hungary was eligible for transitional free allocation to the power generation sector. This was conditional upon investing the value of freely allocated allowances in the modernisation of electricity generation.

[11] According to Hungarian legislation, vulnerable customers are defined as those household customers in social need (indigent) and receiving certain social benefits, as well as customers receiving disability allowances. To be entitled to benefits, vulnerable customers need to renew their application every year.

[12] In 2014-20, the EU Structural and Investment Funds include: European Regional Development Fund, Cohesion Fund, European Social Fund, European Agricultural Fund for Rural Development, European Maritime and Fisheries Fund and the Youth Employment Initiative.

[13] There are seven national Operational Programmes and one covering only the more developed central region. They are all funded by the European funds for cohesion, regional development and social development. In addition, there are two specific programmes for rural development and the fishery sector, funded by the EU funds dedicated to these sectors (EC, 2017b).

[14] EEEOP is expected to help reduce GHG emissions by 1.5 Mt CO_2eq. per year. It plans to install 940 MW of renewables and improve energy performance of nearly 52 000 homes. It is expected to give access to improved water supply and wastewater treatment to an additional 340 000 and 800 000 people, respectively. Further, EEEOP plans to install capacity for recycling 60 000 tonnes of solid waste per year and provide flood protection measures to 1.1 million people.

[15] The RDP finances water-retention measures and irrigation investments with a 5% or 10% minimum potential water savings, provided water metering systems are in place (EC, 2017b).

[16] The share of SMEs that acted to minimise waste (48%), save materials (49%), recycle by reusing material or waste within the company (18%), and sell their scrap material to another company (20%) are all below the EU28 averages.

[17] Companies in the pharmaceutical industry, the production of chemicals and chemical products, and the manufacture of road vehicles appear as the most innovative in the manufacturing sector (MNE, 2014).

[18] The revealed technological advantage index measures the share of an economy's patents in a specific technology relative to the share of total patents owned. The index is equal to zero when the economy has no patents in a given field; it equals one when the economy's share in the technology field is equivalent to its share in all fields (no specialisation); and it rises above one when specialisation is observed. The index is based on patents filed at the European Patent Office or the US Patent and Trademark Office that belong to patent families within the Five IP offices, by earliest filing date and inventor's location.

[19] The Flash 426 Eurobarometer defines "green job" as one that directly deals with information, technologies or materials that preserve or restore environmental quality. This requires specialised skills, knowledge, training or experience. These could include, for example, verifying compliance with environmental legislation, monitoring resource efficiency within the company, and promoting and selling green products and services.

[20] Performance on facilitating trade is measured through the OECD Trade Facilitation Indicators such as information availability, streamlining of border procedures, border agency co-operation, involvement of the trade community, and information about fees and charges (OECD, 2016e).

[21] This means that the share of goods imported and consumed in Hungary – that embed CO_2 emissions generated in other countries – is only marginally above the share of goods produced and generating CO_2 emissions in Hungary, but exported.

[22] Recommendation of the Council on Common Approaches for Officially Supported Export Credits and Environmental and Social Due Diligence (The "Common Approaches"), adopted by the OECD Council on 6 April 2016.

[23] Data are not fully comparable for several reasons, including that Hungary's data are still partial, they refer to disbursements (and not commitments), and most of Hungary's ODA is channelled through multilateral organisations, which may not use the funds to support environment-related projects.

References

Applica, Ismeri Europa and Cambridge Economic Associates (2016), "Country report Hungary – *ex post* evaluation of cohesion policy programmes 2007-2013, focusing on the European Regional Development Fund and the Cohesion Fund", report commissioned by the European Commission, European Union, Luxembourg.

Arlinghaus, J. (2015), "Impacts of carbon prices on indicators of competitiveness: A review of empirical findings", *OECD Environment Working Papers*, No. 87, OECD Publishing, Paris, http://dx.doi.org/10.1787/5js37p21grzq-en.

Biró Nagy, A. and T. Boros (2012), *Resource Efficiency Gains and Green Growth Perspectives in Hungary*, Friedrich Ebert Stiftung, Berlin, http://library.fes.de/pdf-files/id-moe/09350.pdf.

Cárdenas Rodríguez M., I. Haščič and M. Souchier (2016), "Environmentally adjusted multifactor productivity: Methodology and empirical results for OECD and G20 countries", *OECD Green Growth Papers,* No. 2016/04, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlr2z7ntkf8-en.

EC (2017a), Country Report Hungary 2017, Commission Staff Working Document accompanying the document "Communication from the Commission to the European Parliament, the Council, the European Central Bank and the Eurogroup 2017 European Semester: Assessment of progress on structural reforms, prevention and correction of macroeconomic imbalances, and results of in-depth reviews under Regulation (EU) No 1176/2011", *Staff Working Document*, SWD (2017) 82 final/2, European Commission, Brussels, https://ec.europa.eu/info/sites/info/files/2017-european-semester-country-report-hungary-en_1.pdf .

EC (2017b), The EU Environmental Implementation Review, Country Report – Hungary, *Commission Staff Working Document,* SWD (2017) 46 final, European Commission, Brussels, 3 February 2017, https://ec.europa.eu/info/sites/info/files/2017-european-semester-country-report-hungary-en_1.pdf .

EC (2017c), *European Structural and Investment Funds Open Data Platform* (database), https://cohesiondata.ec.europa.eu/ (accessed 25 September 2017).

EC (2016), *Study on Assessing the Environmental Fiscal Reform Potential for the EU28*, January 2016, Publications Office of the European Union, Luxembourg, http://ec.europa.eu/environment/integration/green_semester/pdf/Eunomia%20EFR%20Final%20Report%20MAIN%20REPORT.pdf.

ECA (2017), "Implementing the Drinking Water Directive: Water quality and access to it improved in Bulgaria, Hungary and Romania, but investment needs remain substantial", *Special Report,* No. 12, European Court of Auditors, Luxembourg, http://publications.europa.eu/webpub/eca/special-reports/drinking-water-12-2017/en/.

EEA (2016a), Trends and Projections in the EU ETS in 2016 – The EU Emissions Trading System in Numbers, *EEA Report*, No. 24/2016, European Environment Agency, Copenhagen, www.eea.europa.eu/publications/trends-and-projections-EU-ETS-2016.

EEA (2016b), Monitoring CO_2 Emissions from New Passenger Cars and Vans in 2015, *EEA Report*, No. 27/2016, European Environment Agency, Copenhagen, www.eea.europa.eu/publications/monitoring-co-2-emissions-from.

EGEC (2017), *EGEC Geothermal Market Report – Key Findings*, May 2017, European Geothermal Energy Council, Brussels, www.egec.org/wp-content/uploads/2017/05/EGEC-Geothermal-Market-Report_KF_final_web.pdf.

EIO (2016), "Eco-innovation in Hungary", *EIO Country Profile 2014-15,* Eco-Innovation Observatory, European Commission, Brussels, https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/hungary_eco-innovation_2015.pdf.

ESDN (2016), "Country profile: Hungary", 12 April 2016, European Sustainable Development Network, Vienna, www.sd-network.eu/?k=country%20profiles&s=single%20country%20profile&country=Hungary.

Eurostat (2017), *Sustainable Development in the European Union – Monitoring Report on Progress towards the SDGs in an EU context*, 2017 edition, European Union, Luxembourg, http://ec.europa.eu/eurostat/documents/3217494/8461633/KS-04-17-780-EN-N.pdf/f7694981-6190-46fb-99d6-d092ce04083f.

Eurostat (2016), Sustainable Development in the European Union – A Statistical Glance from the Viewpoint of the UN Sustainable Development Goals, European Union, Luxembourg.

Flues, F. and K. Van Dender (2017), "The impact of energy taxes on the affordability of domestic energy", *OECD Taxation Working Papers*, No. 30, OECD Publishing, Paris, http://dx.doi.org/10.1787/08705547-en.

Harding, M. (2014a), "The diesel differential: Differences in the tax treatment of gasoline and diesel for road use", *OECD Taxation Working Papers,* No. 21, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jz14cd7hk6b-en.

Harding, M. (2014b), "Personal tax treatment of company cars and commuting expenses: Estimating the fiscal and environmental costs", *OECD Taxation Working Papers*, No. 20, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jz14cg1s7vl-en.

HCSO (2016), "Research and development 2015", *Statistical Reflections*, Hungarian Central Statistical Office, Budapest, www.ksh.hu/docs/eng/xftp/idoszaki/tudkut/etudkut15.pdf.

IEA (2017), *Energy Policies of IEA Countries: Hungary 2017*, IEA, Paris, http://dx.doi.org/10.1787/9789264278264-en.

Lepuschitz, K. and G. Berger (2014), "National sustainable development strategies in eight CEE countries: Experiences, challenges and opportunities 10 years after EU accession", *ESDN Quarterly Report*, No. 34, European Sustainable Development Network, Vienna, http://www.sd-network.eu/quarterly%20reports/report%20files/pdf/2014-October-National_Sustainable_Development_Strategies_in_eight_CEE_countries.pdf.

Ministry of Public Administration and Justice (2011), National Social Inclusion Strategy – Extreme Poverty, Child Poverty, The Roma (2011–2020), Budapest, http://romagov.kormany.hu/hungarian-national-social-inclusion-strategy-deep-poverty-child-poverty-and-the-roma.

MND (2015), Hungary's National Energy Efficiency Action Plan until 2020, Ministry of National Development, Budapest, https://ec.europa.eu/energy/sites/ener/files/documents/hungaryActionPlan2014_en.pdf

MNE (2014), *National Smart Specialisation Strategy*, Ministry of National Economy, Budapest, http://nkfih.gov.hu/policy-and-strategy/national-strategies/s3/national-smart.

OECD (2017a), *OECD Economic Outlook*, Vol. 2017/1, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_outlook-v2017-1-en.

OECD (2017b), *OECD Green Growth Indicators 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264268586-en.

OECD (2017c), *Investing in Climate, Investing in Growth*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264273528-en.

OECD (2017d), "R&D Tax Incentives Country Profiles 2016: Hungary", webpage, http://oe.cd/rdtax (accessed 31 March 2017).

OECD (2017e), *Development Co-operation Report 2017: Data for Development*, OECD Publishing, Paris, http://dx.doi.org/10.1787/dcr-2017-en.

OECD (2016a), *OECD Economic Surveys: Hungary 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-hun-2016-en.

OECD (2016b), *Effective Carbon Rates: Pricing CO_2 through Taxes and Emissions Trading Systems*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264260115-en.

OECD (2016c), *Fossil Fuel Support Country Note – Hungary*, September 2016, www.oecd.org/site/tadffss/data/.

OECD (2016d), *OECD Science, Technology and Industry Outlook 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/sti_in_outlook-2016-en.

OECD (2016e), Trade Facilitation Indicators website, www.oecd.org/trade/facilitation/indicators.htm (accessed 24 May 2017).

OECD (2015a), *Taxing Energy Use 2015: OECD and Selected Partner Economies*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264232334-en.

OECD (2015b), *Fostering Infrastructure Investment: Lessons Learned from OECD Investment Policy Reviews*, OECD Publishing, Paris, www.oecd.org/daf/inv/investment-policy/Fostering-Investment-in-Infrastructure.pdf.

OECD (2015c), Hungary: Towards a Strategic State Approach, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264213555-en.

OECD (2014), Green Growth Indicators 2014, OECD Green Growth Studies, OECD Publishing, Paris, www.oecd.org/environment/green-growth-indicators-2013-9789264202030-en.htm.

OECD (2013), *Inventory of Estimated Budgetary Support and Tax Expenditure for Fossil Fuels 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264187610-en.

OECD (2011), *Towards Green Growth*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264111318-en.

OECD (2008), *OECD Environmental Performance Reviews: Hungary*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264049284-en.

Pye, S. and A. Dobbins (2015), "Energy poverty and vulnerable consumers in the energy sector across the EU: Analysis of policies and measures", *Insight_E Policy Report*, Insight_E Observatory, www.insightenergy.org/static_pages/find_resources#?publication=15.

Ricardo-AEA (2014), Evaluation of the Implementation and Effects of EU Infrastructure Charging Policy since 1995*, Final Report* to DG MOVE, http://ec.europa.eu/smart-regulation/evaluation/search/download.do?documentId=10296156.

Roy, R. (2014), "Environmental and related social costs of the tax treatment of company cars and commuting expenses", *OECD Environment Working Papers*, No. 70, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jxwrr5163zp-en.

Tirado Herrero, S. and D. Ürge-Vorsatz (2012), "Trapped in the heat: A post-communist type of fuel poverty", *Energy Policy*, Vol. 49, Elsevier, Amsterdam, pp. 60-68, https://econpapers.repec.org/article/eeeenepol/v_3a49_3ay_3a2012_3ai_3ac_3ap_3a60-68.htm.

Tirado Herrero, S. and D. Ürge-Vorsatz (2010), "Fuel poverty in Hungary: A first assessment", report commissioned by Ve´degylet – Protect the Future Society, Center for Climate Change and Sustainable Energy Policy (3CSEP), Budapest.

Wiebe, K.S. and N. Yamano (2016), "Estimating CO_2 emissions embodied in final demand and trade using the OECD ICIO 2015: Methodology and results", *OECD Science, Technology and Industry Working Papers*, No. 2016/05, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlrcm216xkl-en.

World Bank (2015), Water and Wastewater Services in the Danube Region – Hungary Country Note, May 2015, World Bank and International Association of Water Supply Companies in the Danube River Catchment Area, Washington, DC, http://documents.worldbank.org/curated/en/653681467998782643/Water-and-wastewater-services-in-the-Danube-region-Hungary-country-note.

World Economic Forum (2015), *The Global Competitiveness Report 2015–2016*, World Economic Forum, Geneva, http://reports.weforum.org/global-competitiveness-report-2015-2016/.

Annex 3.A. Progress towards the Sustainable Development Goals

SDGs	Indicators	Hungary			EU28 average	Visegrád Four average (a)
		2010	2015	Direction of change	2015	2015
1. No poverty	People at risk of poverty or social exclusion (% of the population)	29.9	28.2	+	23.8	21
2. Zero hunger	Area under organic farming (% of utilised agricultural area)	2.4	2.4	--	6.2	7.4
	Gross nitrogen balance on agricultural land (kg per ha)	38	39	-	51 (c)	44.25 (b)
3. Good health and well-being	Life expectancy at birth, women (years)	78.6	79	+	83.3	80.6
	Life expectancy at birth, men (years)	70.7	72.3	+	77.9	73.6
4. Quality education	Tertiary educational attainment (% of the population aged 30-34) (d)	26.1	33	+	39.1	35.5
5. Gender equality	Gender pay gap in unadjusted form (%)	17.6	14	+	16.3	15.9
	Proportion of seats held by women in national parliaments (single/lower house) (%) (e)	9.1	9.5	+	29.4	19.6
6. Clean water and sanitation	Population having neither a bath, nor a shower, nor indoor flushing toilet in their household (% of total population)	4.2	3.4	+	2.4	1.7
7. Affordable and clean energy	Share of renewable energy in gross final energy consumption (%)	12.8	14.5	+	16.7	13.6
	Energy productivity (purchasing power standard per kg of oil equivalent)	6.2	7.7	+	9.1	7.3
	Population that cannot afford to keep home adequately warm (% of total population)	10.7	9.6	+	9.4	7.0
8. Decent work and economic growth	Real GDP per capita average annual growth rate, 2000-16 (%)	n.a.	2.2	n.a.	1	3.0
	Employment rate, age group 20-64 (%)(d)	59.9	71.5	+	71.1	71.8
	Young people neither in employment nor in education or training (% of population aged 18-24) (d)	16.7	14.2	+	15.2	13.2
9. Industry, innovation and infrastructure	Gross domestic expenditure on R&D (% of GDP) (b)	1.15	1.36	+	2.04	1.29
	Eco-innovation index (EU-28 = 100) (d)	72	60	-	100	79
	Employment in high- and medium-high technology manufacturing (% of total employment) (d)	8.2	9.5	+	5.8	9.4
10. Reduced inequalities	Real adjusted gross disposable income of households per capita (Euros, purchasing power standards)	11 501	13 551	+	21 682	15 239 (f)
	Inequality of income distribution (income quintile share ratio)	3.4	4.3	-	5.2	4.05

SDGs	Indicators	Hungary			EU28 average	Visegrád Four average (a)
		2010	2015	Direction of change	2015	2015
11. Sustainable cities and communities	Urban population exposure to air pollution by PM_{10} (micrograms per cubic metre) (b)	22.3	20.2	+	15.2	21.2
	Urban population exposure to air pollution by $PM_{2.5}$ (micrograms per cubic metre) (b)	31.3	28.2	+	22.5	29.7
	Recycling rate of municipal waste (%)	19.6	32.2	+	45	29.8
	Share of population with high and very high difficulty in accessing public transport (%) (f)	n.a.	12.9		20.4	17.1
12. Responsible consumption and production	Resource productivity (purchasing power standards per kg)	1.6	1.8	+	2.2	1.6
	Domestic material consumption (tonnes per capita)	10.0	11.2	-	13.1	14.1
	Generation of waste excluding major mineral wastes (kg per capita) (b)	1 156	1 214	-	1 716	1 369
13. Climate action	Greenhouse gas emissions (1990 = 100)	70.1	65.3	+	77.9	67.1
15. Life on land	Sufficiency of terrestrial sites designated under the EU Habitats Directive (%) (c)	86	99	+	92	85
	Artificial land cover (built-up and artificial non built-up areas in % of total land cover) (g)	3.6 (h)	3.8	-	4 (i)	3.6
16. Peace, justice and strong institutions	Trust in the legal system (rating 0-10) (c)	n.a.	5.1		4.6	4.2
	Trust in the political system (rating 0-10) (c)	n.a.	4.5		3.5	3.8
17. Partnership for the goals	Official Development Assistance (% of gross national income)	0.19	0.13	+	0.46	0.11

Notes: a) the Visegrád Four countries are: Czech Republic, Hungary, Poland and Slovak Republic; b) 2014; c) 2013; d) 2016; e) 2017; f) 2014 data for the Czech Republic; g) 2012; h) 2009; i) EU 27;. +: positive change/improvement; -: negative change/deterioration; --: stable.
Source: OECD calculations based on Eurostat data, Eurostat (2017, 2016), country submission.

Part II. Progress towards selected environmental objectives

Chapter 4. Waste, material management and circular economy

Hungary has improved its waste and material management by increasing recycling and recovery. However, its efforts to foster the transition to a circular economy have so far been limited. This chapter provides an overview of trends in material consumption and waste management, as well as related policy and institutional frameworks. It discusses the country's main objectives for waste and material management over the last decade and assesses performance in these areas. The chapter also examines Hungary's progress in promoting a circular economy.

4.1. Introduction

Hungary has a well-developed policy and legal framework for waste management, mainly driven by EU requirements and supported by quantitative targets and economic instruments. It has taken steps to improve material management, but has so far shown limited efforts to foster the transition to a circular economy. There are positive waste management trends: decoupling of waste generation from economic growth, increased recycling and recovery rates, and decreased use of landfilling. However, Hungary remains an average performer and in some aspects – such as glass recycling – lags behind its European neighbours.

The transition to a circular economy requires new policies, new business models and new ways of working with businesses and society. Hungary's recent institutional instability, re-centralisation of waste-related governance and lack of collaborative mechanisms for a circular economy may undermine progress in this field.

4.2. Trends in material consumption and waste management

4.2.1. Material consumption

Sustainable material management is a challenge in Hungary since the country is poor in raw materials, relying on energy and material imports (EEA, 2016a). Hungary's economy is less resource-intensive than that of other European countries of the OECD. Domestic material consumption (DMC) per capita amounted to 10.9 tonnes (30 kg per person per day) in 2016. This is below the OECD Europe average (35 kg per person per day).

In terms of material productivity (defined as the amount of economic value generated per unit of material used, or gross domestic product [GDP] per unit of DMC), Hungary is below the OECD Europe average (Figure 4.1). This indicates that the country could use material resources more efficiently to produce wealth. However, its performance is similar to that of neighbouring Central European countries such as Slovenia, the Czech Republic or the Slovak Republic.

Figure 4.1. Material productivity remains below OECD Europe average

a) Material productivity designates the economic output (in terms of GDP) generated per unit of domestic material consumption (DMC), calculated as the sum of domestic extraction of raw materials used by an economy and the physical trade balance (imports minus exports of raw materials and manufactured products).
Source: Eurostat (2017), *Material Flows Accounts*, (database); OECD (2017) *National Accounts Statistics* (database).

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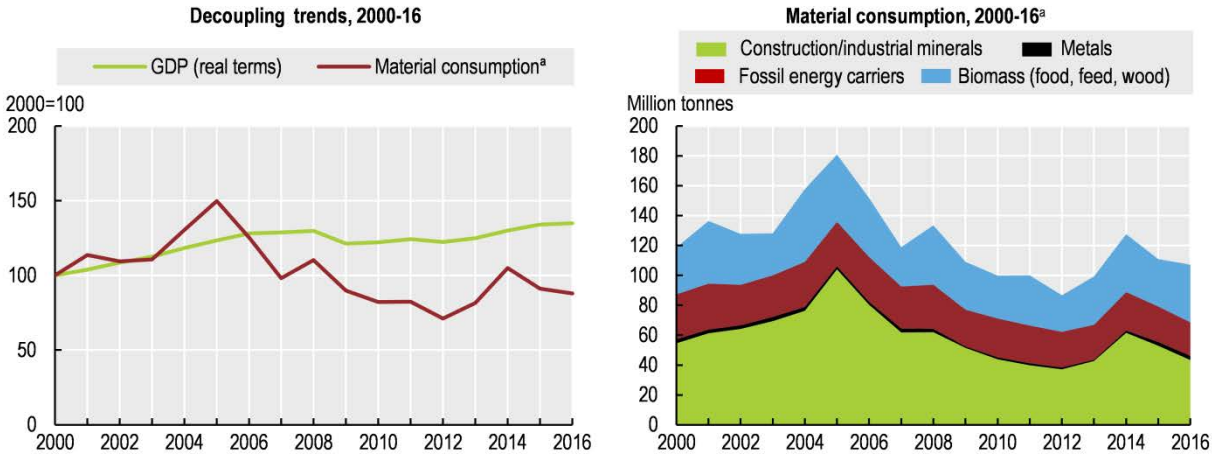
DMC decreased by 12% between 2000 and 2016. It dropped by 35% between 2008 and 2012 due to the economic crisis, but increased again with the economic recovery (Figure 4.2).

Figure 4.2. Material consumption, dominated by construction minerals and biomass, is declining



a) Refers to domestic material consumption, i.e. domestic material extraction plus imports minus exports of materials and derived products.
Source: OECD (2017), "Material resources", *OECD Environment Statistics* (database); OECD (2017), *OECD National Accounts Statistics* (database).

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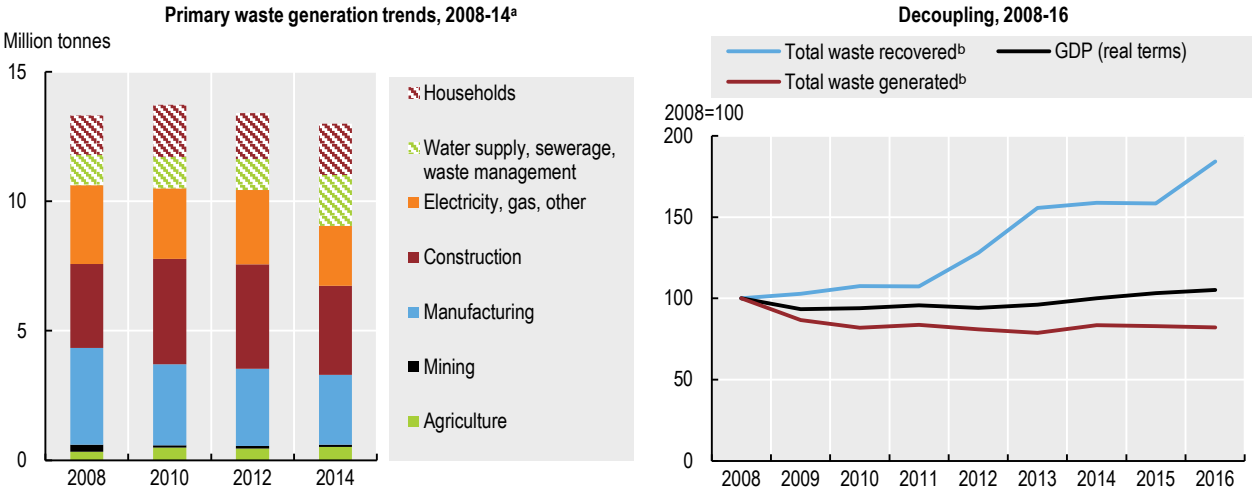
In 2016, about 40% of the materials consumed were construction minerals, a share slightly lower than the OECD average, followed by biomass (36%) and fossil energy carriers (21%). The peak in use of construction minerals observed in 2005 is reported to be the result of motorway construction and the related gravel, sand and clay extraction.

Around 30% of the materials were imported in 2016. The country is particularly dependent on imports of fossil fuels. In terms of material outputs, an estimated 30% of the materials are used for products that are exported; about 70% of materials are consumed in the country. Nearly 15% of Hungary's consumption ends up as waste.

4.2.2. Trends in waste generation and management

Hungary generated about 16 million tonnes of waste in 2014. As in many countries, construction and demolition (C&D) waste constituted the largest share. From 2008 to 2015, total waste generation decreased by 17% while GDP increased by 3%, which is a significant achievement (Figure 4.3).

Figure 4.3. Total waste generation is declining, while recovery is increasing

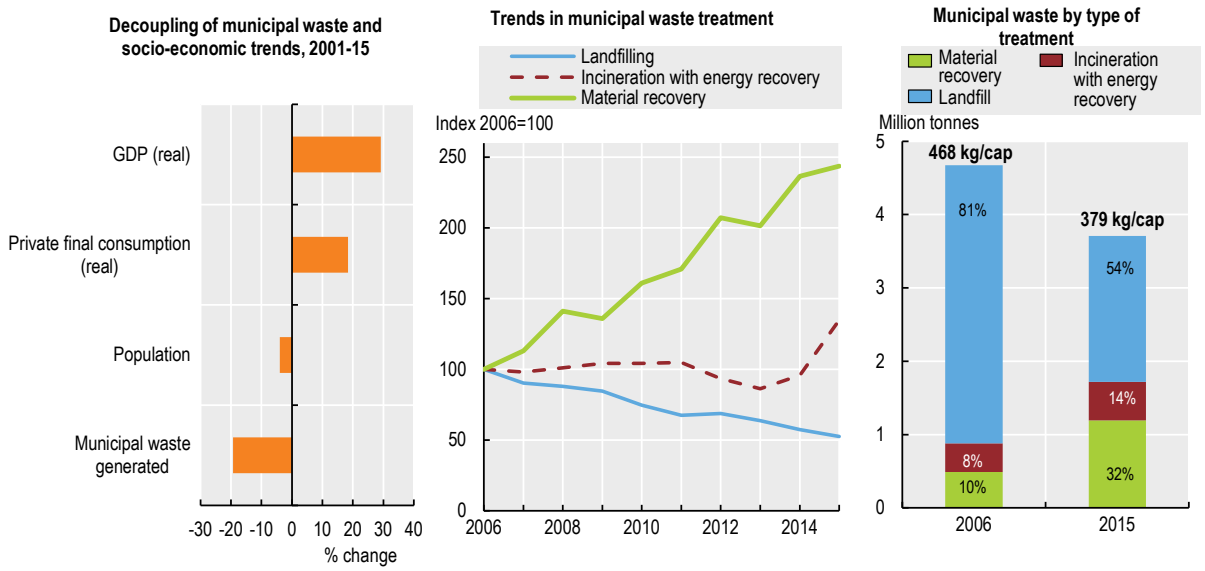


a) Primary waste generated, i.e. excluding residues from treatment operations.
b) Waste generation according to national statistics; data may include time series breaks due to change in methodologies.
Source: Eurostat (2017), *Waste Statistics* (database); OECD (2017), *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933712776

In recent years, Hungary has achieved decoupling between GDP growth and municipal waste generation (Figure 4.4). In 2014, it generated 3.8 million tonnes of municipal solid waste (MSW), 73% of which originated from households (EEA, 2016b). Municipal waste generation decreased by around 19% between 2001 and 2015 despite significant GDP growth (+29%). In 2015, Hungary generated 379 kg/capita of MSW, well below the OECD average of 520 kg/capita. Together, plastics, paper and cardboard, glass and metal represent close to 45% of municipal waste, while organic waste represents about 23%.

Figure 4.4. Landfilling of municipal waste is going down, but remains high



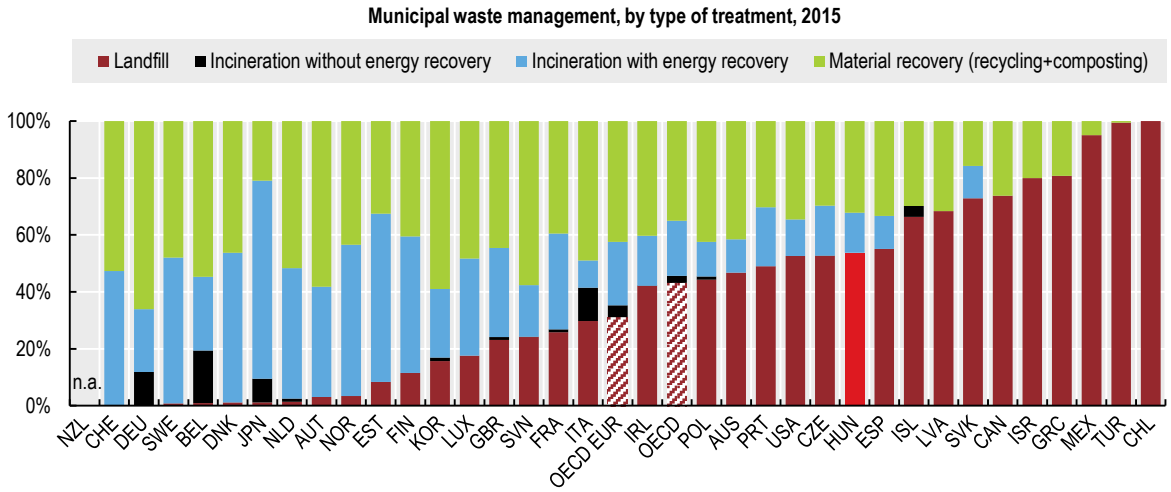
Note: Municipal waste refers to household and similar waste collected by or for municipalities, originating mainly from households and small businesses. Includes bulky waste and separate collection. It includes estimates for population not served by municipal waste services until 2013. As of 2013, 100% of the population is served by municipal waste services.

Source: Country submission; OECD (2017), "Municipal waste generation and treatment", *OECD Environment Statistics* (database); OECD (2017), "Labour Force Statistics: Population projections", *OECD Employment and Labour Market Statistics* (database); OECD (2017), *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933712795

Landfilling remains the most frequent treatment option for municipal waste (54% in 2015). However, material recovery rates (including recycling and composting) steadily increased from 10% to 32% over 2006-15 (Figure 4.4). This rate is still below the OECD average (Figure 4.5). Energy recovery slightly increased from 9% to 14% between 2008 and 2015.

Figure 4.5. Hungary is lagging behind in waste recovery



Notes: Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Household and similar waste collected by or for municipalities, originating mainly from households and small businesses. Includes bulky waste and separate collection. For the specific country notes see the source database.
Source: OECD (2017), "Municipal waste", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933712814

C&D waste represents around 22% of total waste generation with important yearly variations during the review period. In 2008, Hungary produced 3.2 million tonnes of C&D waste. This amount grew to 4 million tonnes in 2010 and 2012, then came down to 3.4 million tonnes in 2014. The share of landfilling has significantly decreased (a 53% decrease since 2009) with the increase of material recycling. In 2016, 23% of all C&D waste was landfilled.

Overall, the generation of hazardous waste decreased substantially from around 1.4 million tonnes (HCSO, 2014) in 2006 to about 550 000 tonnes in 2016 with strong annual variations. Chemical waste, contaminated soils, mineral wastes from waste treatment and waste oils are the most important categories of hazardous waste (BiPRO, 2014c). Industrial hazardous waste from the energy sector, manufacturing, and mining and quarrying has been on the decline since 2010 (EEA, 2016c).

4.2.3. The information basis

Hungary has good quality data on waste and material flows. It has developed a good monitoring system for waste generation and treatment since the establishment of the Waste Management Information System (HIR) in 2004. The HIR, based on the European Waste Catalogue, receives around 25 000 data entries per year (HCSO, 2014). Prior to 2004, the general data availability for waste management was poor. Estimates often complemented sporadically collected data (EEA, 2016b).

In 2015, a web-based Electronic Waste Information System (EHIR) was set up as part of the government's National Environmental Information System (OKIR). EHIR contains data from quarterly or annual mandatory reporting by waste generators, collectors, transporters, dealers, brokers and treatment facilities (OKIR, 2015). Aggregated data have been publicly available since 2004.

Material flows are monitored and analysed in accordance with the 2001 Eurostat methodological guidelines, which are aligned with OECD methodology for material flows and indicators. Since 2007, the Hungarian Central Statistical Office (HCSO) has published annual nationally aggregated material flow accounts. HCSO produces indicators such as DMC, domestic material input and domestic extraction. The indicators are used in a series of government publications such as the Indicators of Sustainable Development and other environmental reports.

While the quality of data on waste and material flows is good, data are not easily accessible to the public and key stakeholders (Rayment et al., 2017). Improving accessibility of information could facilitate better monitoring of industry initiatives on resource efficiency and waste prevention.

4.3. Legal and institutional framework for waste and circular economy

4.3.1. Institutional arrangements

At the national level, the Ministry of Agriculture is the main authority for waste management policies. It is also the lead ministry for the transition to a circular economy, albeit this transition is perceived as an extension of waste management policies. The Ministry of National Development has oversight of key public services, including MSW management. The Prime Minister's Office and other ministries, such as the Ministry of National Economy which oversees innovation policies, could play a more active role in promoting resource efficiency. There is no dedicated institutional co-ordination mechanism between the different ministries for the promotion of a circular economy.

During the review period, waste management authorities were subject to several administrative reshuffles. The National Waste Management Agency (2011-15) was the single national co-ordinator for waste management policies. It organised the collection and recovery of waste, including the separate collection systems to be financed with environmental product fees. It also assisted regional authorities with regional waste management plans. The Agency was replaced by the National Waste Management Directorate (NWMD) of the National Inspectorate for Environment and Nature, which operated in 2015-17. The NWMD managed the waste information system, waste data and indicators, and its duties covered municipal, industrial and commercial waste subject to a product fee. It also raised awareness about waste prevention and recycling (including for separate collection). In 2017, the NWMD was incorporated into the Ministry of Agriculture.

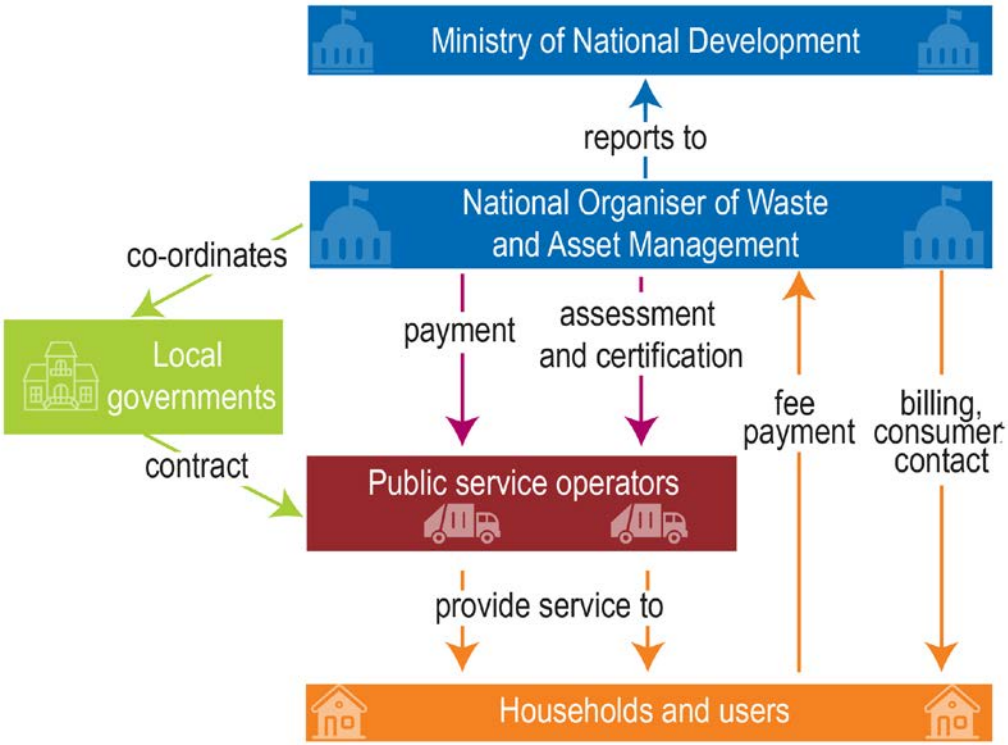
At the county and local levels, institutional settings for waste management were also deeply transformed in 2012, following the municipal and territorial public sector reform and adoption of the new Act on Waste. The territorial reform led to recentralisation of counties' responsibilities and the creation of government offices as deconcentrated administration bodies at the county and district levels (Chapter 2.).

Counties and municipalities have lost important waste management planning responsibilities. Until 2013, county authorities developed regional waste management plans with support of the National Waste Management Agency. Municipalities then developed their own local waste management plans based on the regional plan. At present, counties and municipalities no longer develop separate local waste management plans.

Municipalities are still responsible for public waste management service contracts, including collection, transport, treatment of waste, and operation and maintenance of waste management facilities. However, they have limited flexibility. The Act on Waste created a new obligation to attribute such contracts only to certified public service operators. These operators are non-profit business associations in which the state of local governments control the decision-making process (for instance, through a majority of shares or voting rights arrangements). In 2016, there were around 130 public service operators. In addition, some local authorities have also created about 40 associations to carry out this responsibility jointly.

The system created in 2012 allowed for better oversight of private sector activities by the government. At the same time, it limited incentives for public service operators to collect waste for recovery. In addition, the various service operators and local governments lacked co-ordination, and local authorities charged different prices. To overcome these issues, Hungary further recentralised some of the tasks of local governments. It set up a co-ordinating body called the National Organiser of Waste and Asset Management (NHKV) in April 2016. This central body oversees payment for public waste management services, taking over this role from local authorities (Figure 4.6). The new governance structure for municipal waste management poses several risks. It could limit the capacity of local authorities to tailor waste management services to local needs, restrain them from setting more ambitious objectives than the minimum national requirements, and limit their ability to promote the circular economy.

Figure 4.6. Municipal waste management responsibilities have been centralised



Source: Country submission.

4.3.2. Legal framework

Hungary has a comprehensive framework in place for waste management policies, in line with EU legislation. The 2000 Act on Waste was the main legal instrument in this domain. After significant modifications by the 2012 Act on Waste, it was updated again in 2014 to address requirements of the EU Waste Framework Directive (2008/98/EC).

The 2011 Act on Environmental Product Fee is also particularly relevant for waste management as it implements the extended producer responsibility (EPR) principle. The fee covers a wide range of products, including packaging (metal, paper, wood, glass), paper, tyres, batteries, electrical and electronic products, oils, plastic bags and plastic products, cosmetics, soaps and detergents, and lubricating oils.

These laws are complemented by a series of decrees on specific waste streams: packaging, C&D waste, batteries and accumulators, end-of-life vehicles, hazardous waste, and waste electrical and electronic equipment (WEEE). There are also decrees related to waste treatment operations, transport and transboundary shipments of waste, public waste management services, registering and licensing, and data reporting.

4.4. Policy framework and objectives

4.4.1. Waste management policies

Hungary's comprehensive waste management policy framework is driven by EU waste legislation. For example, in accordance with the EU Landfill Directive, Hungary sought to reduce the amount of biodegradable municipal waste landfilled to a maximum of 75% by 2004, 50% by 2009 and 35% by 2016 compared to 1995 levels.

The first National Waste Management Plan (NWMP) for 2003-08 focused on diverting biodegradable municipal waste from landfills in line with EU objectives. A second NWMP for 2009-14 was drafted, but never officially adopted. The lack of a waste management plan was partly compensated by two other documents: the Strategy for the Management of Biodegradable Waste in Municipal Solid Waste Management 2004-16 and the Development Strategy for Municipal Solid Waste Management 2007-16. The National Environment Programme (2009-13) also included overall waste management objectives.

The current NWMP 2014-20 (Box 4.1) was adopted in December 2013. It focuses on enhancing recovery rates, setting up and improving separate collection, reducing waste generation, providing training and information, and fostering the reuse of products. It sets out key principles highlighted in EU waste policies such as the waste hierarchy, which calls for priority first on prevention, then reuse, recycling, other recovery and disposal.

In addition to the NWMP, Hungary has been developing detailed yearly National Plans for Collection and Recovery (NPCR) since 2012 and the National Waste Management Public Services Plan (NWMPSP) since 2016. The NPCR includes financial planning for EPR-managed waste and the environment product fees (with expected costs for the collection, pre-treatment and recycling of materials). The NWMPSP addresses mainly municipal waste management and lays down national targets and minimum levels of public services for individual waste management areas.

Box 4.1. Waste management objectives are driven by EU targets

The NWMP 2014-20 identifies needs related to recycling and recovery in nine focal areas: municipal waste; non-hazardous production waste; non-hazardous agricultural and food industry waste; sewage sludge; C&D waste; hazardous waste, particularly high-priority hazardous waste streams; packaging waste; biodegradable waste; and waste tyres. The NWMP also includes monitoring requirements.

The plan incorporates the National Waste Prevention Programme. Its main objectives are to promote the decoupling of resource use from economic growth, reduce material use and waste generation, manage resources more efficiently, promote solutions with the lowest impact on the environment during the life-cycle of products and economic activities, and promote job creation. The programme identifies five main areas of action: prevention of the generation of C&D waste, reuse, green public procurement, environmentally friendly production and management, and awareness raising.

It also includes figures and analysis for the previous period (2009-14), as well as quantitative targets for specific waste streams that are set mainly in EU directives as follows:

- The preparation for reuse and recycling rate of municipal paper, plastic, metal and glass waste should be increased to 50% by 2020 in line with Directive 2008/98/EC.
- Batteries and accumulators must be recycled (recycling processes must achieve a minimum efficiency of 65% for lead-acid batteries, 75% for nickel-cadmium batteries and 50% for other batteries) in line with Directive 2006/66/EC.
- From 1 January 2016, the total amount of the separately collected WEEE should be at least equivalent to 45% of the average amount of WEEE that had been put on the market in the three preceding years in line with Directive 2012/19/EU.
- By 2020, the preparing for re-use, recycling and other material recovery of non-hazardous C&D waste should be enhanced up to 70% (measured by weight) in line with Directive 2008/98/EC.

Source: Country submission.

Hungary is anticipating difficulties with the new EU circular economy package, which includes legislative proposals on waste with long-term targets to reduce landfilling, as well as to increase recycling and reuse. There are particular concerns about its ability to meet future recovery and recycling targets.

4.4.2. Circular economy and material management policies

Hungary does not have a dedicated policy framework for a circular economy. Instead, several national strategies and action plans address the issue of material and resource management. The 4th National Environment Programme (NEP) (2015-20), which is the overarching strategy for environmental policy, identifies resource efficiency as a priority. Other sectoral strategies and plans, such as the National Environmental Technology Innovation Strategy (NETIS), the National Framework Strategy on Sustainable Development, the National Forest Programme, the National Energy Efficiency Action

Plan and the Renewable Energy Action Plan 2010-20, emphasise resource efficiency as well.

Hungary uses material flows information and indicators for target setting. As part of NETIS, it has adopted 17 targets for sustainable resource management to be achieved by 2020 (Table 4.1). Hungary has set an objective to reduce its material intensity (the ratio between DMC and GDP) to 80% of the 2007 level by 2020. It has also set objectives to increase recycling of packaging waste and decrease generation of MSW. Nevertheless, such targets remain indicative and are not related to any specific policy measures or action plan. Their level of ambition is not adapted following the monitoring of performance.

Table 4.1. Sustainable resource management targets remain indicative and often lack ambition

Indicator (compared to 2007 level =100)	2007	2012	2013	2014	2015	2016	Target 2020
1. Material intensity	100	74.6	83.9	104.1	97.3	..	80
2. Energy intensity	100	91.6	90.7	86.8	89.9	..	80
3. Water intensity	100	90.4	85.4	80.8	79.5	..	80
4. Import dependence on fossil fuels	100	92.5	95.9	106.4	94.2	..	75
5. Share of renewables in electricity production	100	134.0	140.4	155.3	155.3	..	275
6. Energy efficiency of road transport	100	88.1	77.8	83.1	87.7	..	80
7. Energy efficiency of rail transport	100	91.2	81.1	86.9	95.2	..	85
8. Consumption of packaging material in trade	100	104.6	105.6	104.5	119,7	..	75
9. Generation of municipal solid waste	100	88.0	82.7	84.2	82.5	82.9	70
10. Recycling of packaging waste	100	110.1	110.4	109.3	106.4	..	150
11. Wastewater generation	100	81.6	93.0	92.4	92.7	105.2	70
12. Population connected to wastewater treatment plants	100	106.0	107.4	109.7	112.6	115.5	125
13. Environment-related public and private R&D expenditure	100	108.1	118.2	99.9	..	..	200
14. Trade of energy-saving equipment	100	..	..	..	..	..	250
15. Share of employment in environmental industry	100	89.2	93.0	87.6	..	..	200
16. Environment-related patents and certifications registered	100	34.6	35.7	..	..	..	300
17. Export income from environmental industrial activities	100	135.2	112.7	110.0	..	..	150

Source: Country submission.

4.5. Strengthening waste management performance and accelerating circular economy transition

While it is on track to meet most of its waste management objectives, Hungary remains an average performer in promoting recovery and recycling of waste. There is growing interest in the transition to a circular economy, but public authorities do little to support local and business initiatives in this field. As the country has used EU funds primarily to invest in treatment infrastructure for unsorted municipal waste, it is now focusing on separate collection systems to enhance municipal waste recycling. Waste prevention measures, especially for C&D waste, are also a priority.

Economic instruments are in place to contribute to waste management objectives. However, the price of landfilling remains low despite the introduction of a landfill tax. Changes to municipal waste tariffs could be undermining cost recovery and further investments in waste management services. Product fees and the new governance system

for EPR do not seem to be conducive to improved environmental performance and engagement of the private sector.

4.5.1. From landfilling to waste reduction and recycling

Remediation of former landfills

By 2009, Hungary had successfully closed old former landfill sites that did not comply with EU standards. Seventy landfill sites are now operating with a permit, of which 60 are owned by local governments. Remediation programmes for former landfills are being rolled out. Between 2007 and 2013, 23 former landfill sites were remediated for a total of HUF 39.3 billion (around EUR 127 million) through the Environment and Energy Operational Programme. At the same time, 889 abandoned landfill sites were re-cultivated. The Environment and Energy Efficiency Programme for 2014-20 also earmarks funds for environmental remediation, including that of landfills. Despite efforts to control landfill sites, illegal dumping remains high in Hungary. The Ministry of Agriculture supports awareness-raising campaigns to address this problem, for instance through participation in the "TeSzedd!" ("Pick up!") campaign. Since 2011, the "Pick up!" campaign has taken place annually to raise awareness about sound waste management practices. Each year, more than 100 000 volunteers clean up litter and illegal dumpsites throughout Hungary.

Municipal waste

Landfills are still the most frequent destination of waste: 54% of municipal waste ends up in landfills. Material recovery of municipal waste has increased steadily since 2008 and reached 32% in 2015, but remains below the OECD average. Composting is at a particularly low level.

Hungary has one municipal waste incinerator with energy recovery connected to district heating in Budapest. It has an annual capacity of 420 000 tonnes per year (around 11% of the total generated municipal waste in 2015). However, Hungary considers that additional incineration capacity, including regional incinerators, may be needed to reduce the landfill disposal rate by 2030 in line with future EU targets. An incineration project for sewage sludge and municipal waste is at an early stage of development. The country has invested massively in municipal waste pre-treatment and sorting facilities. In 2014, its 23 mechanical biological treatment plants operated with a capacity of nearly 1.2 million tonnes per year (EC, 2016). The high capacity of such plants and additional incineration capacity for unsorted municipal waste may be detrimental to separate collection efforts to promote high quality recycling.

Hungary had introduced a ban on landfilling of untreated waste and hazardous waste prior to EU accession in 2004. Subsequently, it progressed rapidly towards the diversion of biodegradable municipal waste from landfill. Hungary met the requirements of the EU Landfill Directive (1999/31/EC) to progressively reduce the amount of biodegradable waste going to landfill until 2016. In that year, the Hungarian government reported achieving the objective to reduce the amount of biodegradable waste going to landfills by 65% compared to 1995 levels. Furthermore, Hungary is on track to meet the Waste Framework Directive targets to increase the recovery rate of municipal paper, plastic, metal and glass waste to 50% by 2020. This rate was 41% in 2014.

Regarding packaging waste, Hungary overachieved most of the recovery and recycling objectives for specific waste flows set in the EU Packaging and Packaging Waste

Directive (94/62/EC). However, it failed to meet the overall recycling objective of 55% for packaging waste during 2012-14 mainly due to the low recycling rate for glass (Table 4.2). To remedy this situation, Hungary introduced as of January 2018 take-back obligations for glass for large supermarkets retailers. Most EU countries have achieved high glass recycling rates: Sweden and Belgium have exceeded 90%. Some high performing countries combine a "bring system" for glass (whereby the consumer brings waste to a collection point) with a deposit-refund system (often for refillable containers). For example, a deposit-refund scheme for both single-use and refillable beverage containers in Lithuania proved instrumental in raising the collection rate for glass beverage containers from 32% to 73% within a few months in 2016 (USAD, 2017). Door-to-door separate collection of glass or pay-as-you throw schemes charging users for waste (measured by weight or volume) could also help enhance glass recycling.

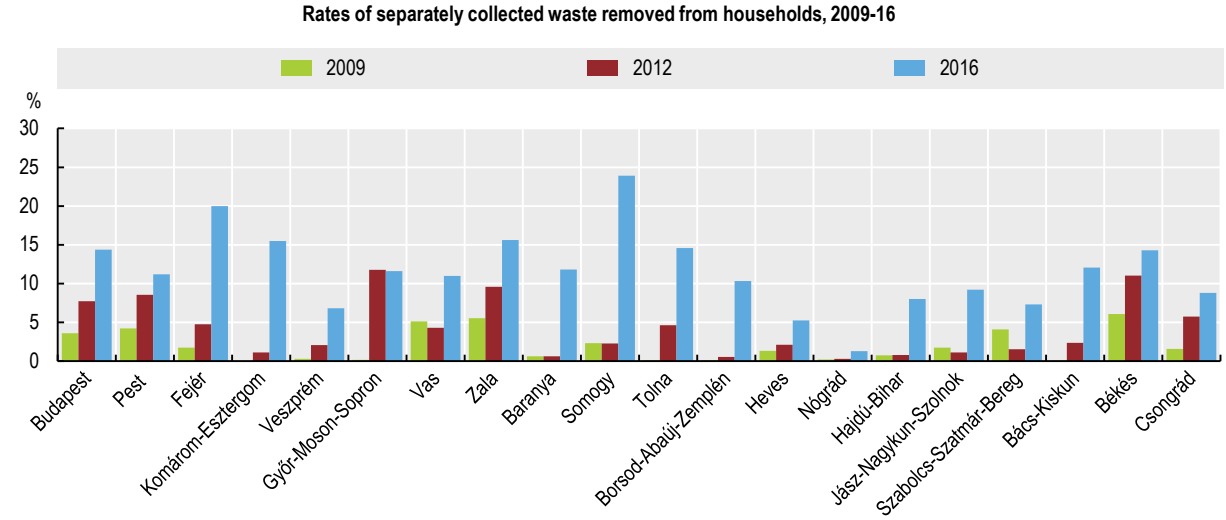
Table 4.2. The recycling of glass packaging remains particularly low

	Recycling targets of Directive 94/62/EC	Achieved in 2014
Paper	60%	74.5%
Plastics	22.5%	49.9%
Glass	60%	36.3%
Metals	50%	**83.5%**
Wood	15%	33.7%

Source: Country submission.

Separate collection of household waste, which promotes quality recycling, increased during the review period, but remains low. There are important variations between counties. Budapest, Békés and Zala, for example, reached separate collection levels of around 15%, while separate collection was virtually inexistent in Nógrád in 2016 (Figure 4.7). A possible explanation for low separate collection rates could be the burning of solid waste for heating. This remains a widespread practice in Hungary despite awareness-raising campaigns to inform the public about its health and environmental consequences. Together, plastics, paper and cardboard, glass, metal and organic waste represent close to 68% of municipal waste. This indicates there is room to improve separate collection of household waste, leading to higher recycling rates. The introduction of door-to-door separate waste collection obligations in 2015 and the earmarking of EUR 300 million of EU funds for 2014-20 to improve public waste management services should also help increase recycling rates.

Figure 4.7. Separate waste collection increased, but remains low and varied across counties



Source: HCSO (2017), "Waste statistics", *STADAT* (database).

StatLink http://dx.doi.org/10.1787/888933712833

Regarding prevention of municipal waste, Hungary has been active in the European Waste Reduction Week, a European-wide awareness-raising campaign for waste reduction. It has also joined initiatives such as the "Green list campaign" to encourage shopping practices that reduce waste. However, the National Waste Prevention Programme does not set quantitative objectives for waste prevention, making it difficult to monitor progress.

Construction and demolition waste

C&D waste is a priority in the Hungarian Waste Prevention programme. To boost prevention and management of C&D waste, a new government decree is planned for adoption in 2018. It aims to introduce mandatory waste prevention plans for construction activities, promote selective demolition to help remove recyclable and reusable parts of C&D waste, and foster sales centres for C&D reusable materials.

A large share of treated C&D waste is now recovered. It is mainly used for backfilling, where waste replaces non-waste materials in excavation or landscaping. In 2013, re-use, recycling and other material recovery of non-hazardous C&D waste reached 63%. This means that the country is on track to meet the objective of 70% by 2020.

Nevertheless, it is not always clear whether these landscaping operations would take place regardless of the availability of waste. Some suggest that backfilling is a way for operators to avoid paying the landfill tax for C&D waste (Deloitte et al., 2015).

Hungary has a mining royalty fee that applies to extraction of virgin construction materials. However, the fee is not conceived as an economic instrument for environmental purposes. Its level is not set to promote use of secondary raw materials.

Industrial waste and hazardous waste

Industrial waste and hazardous waste are not targeted by a specific policy or strategy, but are covered by general objectives of the NWMP. Since 2017, industrial waste is covered by the landfill tax, which could help further divert waste from landfills.

During the review period, Hungary experienced several accidents, putting in question the effectiveness of its hazardous waste management. In 2010, a dam break led to a red mud toxic spill near Kolontár (killing ten people and polluting land over several kilometres). Environmentalists pointed to several weaknesses ranging from the lack of inspections and controls to inappropriate waste management licensing. The waste storage licence for the red mud failed to recognise its hazardous qualities. In another case, environmental non-governmental organisations alerted Hungarian authorities in 2015 to about nearly 3 000 tonnes of hazardous waste. It was stored in corroded and leaking barrels on the yard of the defunct plant of the Budapest Chemical Works site in the city of Budapest. Although the waste has been removed, the soil has yet to be remediated. The case shows the limits of the environmental liability regime for contaminated sites (Chapter 2.).

Waste shipments

Regarding transboundary movements of waste, Hungary has intensive waste trade with its neighbouring countries. It has been party to the Basel Convention since 1992 and implements the 2006 EU waste shipment regulation. Hungary also prohibits the import of hazardous and municipal waste, as well as municipal waste incineration residues, for disposal.

The country reports to the European Commission and the Basel Convention secretariat all hazardous waste shipments and some additional categories of waste (including some non-hazardous waste) in line with the EU waste shipment regulation. In 2011, Hungary exported more than 1.1 million tonnes of mainly non-hazardous (green-listed) waste destined for recovery operations in other EU member states.

Hungary is a net exporter of hazardous waste. However, exports remain low compared to other European countries on a per capita basis. According to Eurostat data, it exported 3 kg per capita in 2014 compared to an average of 12 kg in the European Union. In 2015, Hungary exported close to 30 000 tonnes of hazardous waste compared to its imports of 2 000 tonnes of waste. Exports mainly consisted of acid lead accumulators (24 000 tonnes). The main export destinations are neighbouring EU countries. Such exports are expected to decrease substantially after a recovery facility for such products opened in Jászberény in 2015. Imports come mostly from Romania and consist of end-of-life appliances containing hydrofluorocarbons.

In 2015, Hungary established a specific department to control and authorise transboundary waste shipments. The new authority is preparing annual control plans and reports on waste shipments and controls. During the review period, Hungary increased the number of on-site inspections related to waste shipments (60 cases in 2016). It also set up a 24-hour service called Green Commando to detect international illegal waste shipments.

4.5.2. Improving waste management performance through economic instruments

Hungary has increased the use of economic instruments with the introduction of a new landfill tax and the extended use of product fees. The country has also changed the system for waste tariffs, which are now set at the national level. The latter reform, along

with limiting the private sector's role in EPR schemes, may help the central government in its co-ordination role, avoiding wide regional waste-tariff discrepancies and facilitating access to waste data. However, these actions may have detrimental long-term effects on waste management performance.

Waste tariffs

Since 2008, there has been a major change in tariffs for waste management services to households. They were capped in 2013 (at around 90% of the 2012 level) by the new Act on Waste. This move was part of government efforts to reduce the financial burden on households. Furthermore, since 2013 waste tariffs have been determined at the national level and no longer by municipalities. Since April 2016, the NHKV has been billing and collecting public waste management service fees from the population and paying for the service of public service operators.

The new system was introduced to eliminate wide discrepancies in tariffs and waste performance between municipalities. The standard fee can be corrected depending on the quality of the waste management services and fulfilment of waste management targets. However, there are concerns that the fee levels do not guarantee recovery of actual waste management costs (EC, 2017). It is doubtful whether the new system will encourage further initiatives by municipalities to significantly improve waste management services. The new system could be subsidising waste management services to the detriment of the polluter pays principle. There is also a risk that tariff setting becomes overly politicised, leading to below-cost fees and deteriorating services. Hungary should undertake robust monitoring and evaluation of the new system to validate the choice of institutional arrangements and ensure overall cost recovery.

Landfill tax

A landfill tax was introduced in 2013 and rose from EUR 10 (HUF 3 000) per tonne to EUR 20 (HUF 6 000) per tonne in 2014, with revenues earmarked for waste management. At the same time, its scope was extended to cover industrial waste. The tax was expected to grow up to EUR 40 (HUF 12 000) per tonne in 2016. However, the rates were frozen at 2014 levels and later increases have not been implemented. The government reported that such an increase could be counterproductive and lead to more illegal dumping. As a result, the cost of landfilling remains low, which could represent a set-back for the promotion of recycling.

In the new state-controlled system for municipal waste management, public service operators are obliged to fulfil recycling targets and other minimum requirements defined in the NWMPSP, while tariffs are set the national level. The main driver for public sector operators is no longer the price of waste treatment operations (i.e. the landfill tax), but rather the minimum standards set by the NWMPSP. To maintain the landfill tax as an incentive, the tax should be increased to a level that would encourage municipalities and operators to go beyond the minimum requirements set in the NWMPSP.

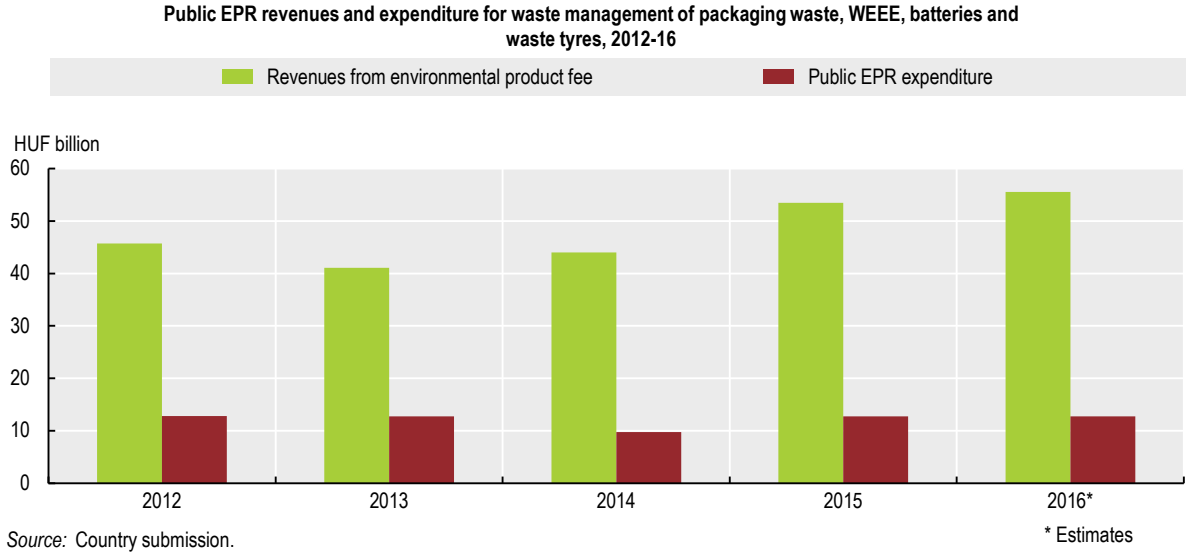
Product fees

Fees were introduced in 2012 for a wide range of products, including batteries, packaging materials, electrical and electronics equipment, tyres, plastic bags, plastics and office paper. The single-use carrier bag tax (at HUF 1 900 per kg), which is one of the environmental product fees, has been an effective way of stimulating the shift to reusable

bags and contributing to waste prevention. The consumption of single-use plastic bags fell from 3.3 thousand tonnes in 2011 to 1.7 thousand tonnes in 2012.

Product fees were extended to additional categories, including photovoltaic panels, in 2015. However, this instrument does not always seek to achieve environmental objectives and promote environmental performance. Rather, product fees are primarily a fundraising tool for the central state budget. It is estimated that only 22% to 31% of the product fee revenue is used for financing the collection and treatment of waste products (Figure 4.8). Without a clear link between the cost of end-of-life management and the fee amount, the fee does not provide a sufficient incentive to improve eco-design and product performance.

Figure 4.8. Product fee revenues largely exceed expenditure for end-of-life product management



Source: Country submission.

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Extended producer responsibility schemes

Product fees are combined with a wider EPR system with take-back obligations for several products. These include packaging, industrial and automotive batteries, and some WEEE. End-of-life vehicles and medicines benefit from take-back obligations, while tyres and lubricants are only subject to product fees (Table 4.3). National targets correspond to EU targets for collection and recycling of all these products apart from medicines. Collection objectives for WEEE and batteries have been fulfilled. Hungary took steps to improve the performance of EPR schemes. In 2015, for example, it introduced a system of coupons to help increase collection of WEEE. When consumers take back their e-waste to a selling point, they get a coupon for purchasing the next piece of electrical or electronic equipment. Nevertheless, Hungary had difficulties meeting the EU packaging targets in 2012-14 (EC, 2017) mainly due to failure to achieve glass packaging recycling targets.

Table 4.3. Extended producer responsibility schemes and product fees

Products covered by the environmental product fee (without regulatory EPR scheme)	Products covered by a regulatory EPR scheme (without environmental product fee)	Products covered by a regulatory EPR scheme and subject to the environmental product fee
Tyres; lubricants	Portable batteries; WEEE categories 5, 5a, 8; end-of life vehicles; medicines	Packaging; industrial and automotive batteries; WEEE categories 1-4, 6-7, 9-10

Source: Country submission.

Hungary modified the governance of EPR schemes in 2012. Until then, producers could either join a producer-funded producer responsibility organisation (PRO) or choose self-compliance. Since 2012, some EPR schemes (packaging, industrial and automotive batteries, some WEEE) have been modified. They now give producers a choice between a central co-ordination system managed by the national government together with a product fee, or self-compliance with a reduced fee. For such products, PROs are no longer allowed to operate. There are other examples of government-run EPR systems such as the system for WEEE in some US states (Washington, Connecticut) and the People's Republic of China. However, most OECD member countries have opted for EPR approaches that give producers managerial or decision-making responsibilities within either a single PRO or competing PRO systems.

According to government officials, the system has helped make waste management data more reliable and enhanced recycling in the short term. However, it has raised concerns that taxes on producers under the auspices of the government-run EPR system will be directed to non-EPR purposes. This could lead to higher long-term costs for the system, while incentives to improve products via eco-design remain limited. Hungary should monitor and evaluate the new institutional arrangements for EPR schemes to analyse and address potential longer-term negative impacts.

4.5.3. Steering the shift towards a circular economy

Hungary lacks a steering mechanism for the transition to a circular economy. There are ongoing efforts to include resource efficiency and circular economy in cross-cutting and sectoral policies such as NETIS. However, the targets set in NETIS remain indicative and are not translated into other policy measures and mechanisms. The Irinyi Plan on Innovative Industry Development Directions could provide an opportunity to encourage the move to a circular economy in the production value chain.

Several non-governmental initiatives address circular economy issues. The Hungarian Cleaner Production Centre of the Corvinus University of Budapest is involved in international and European projects to promote best practices on resource efficiency and cleaner production. The National Industrial Symbiosis project co-funded by the EU LIFE+ Environment programme helped Hungarian industries develop industrial symbiosis approaches where wastes or by-products of one industry become raw materials for another (Box 4.2). The Circular Economy Foundation, founded in 2013, gathers business partners to promote a circular economy and provides a forum to share experiences and best practices. The Ablakon Bedeott Pénz programme encourages dissemination of good practices in companies through an award for environmental performance, including on waste management and resource efficiency. This initiative is led by KöVET, an association of environment-focused consulting companies. However, there is no co-operation platform supported by public authorities to encourage companies to share best resource efficiency and circular economy practices.

Box 4.2. National Industrial Symbiosis encouraged innovation for the circular economy

Over 2009-12, the Industrial Development Coordination Agency (IFKA) collaborated with a UK-based platform to encourage industrial symbiosis in the central region of Hungary. The three-year National Industrial Symbiosis project built capacity among Hungarian businesses and set up an industry network through a series of workshops and site visits. Thanks to the project, around 1 200 tonnes of industrial waste were diverted from landfill and used in different industrial processes.

After the end of the project, IFKA joined the European Climate Knowledge and Innovation Community (Climate KIC) as a partner. Knowledge and Innovation Communities (KICs) are partnerships that bring together businesses, research centres and universities. They receive support from the Budapest-based European Institute of Innovation and Technology. As a Climate KIC partner, IFKA has been able to continue the promotion of industrial symbiosis in Hungary and take part in other EU funded-projects.

The ongoing three-year Transition Regions towards Industrial Symbiosis project (2016-19) aims at integrating industrial symbiosis practices into regional policy instruments by disseminating good industry practices. For example, the Hungarian company Clean Way has developed an application for construction and demolition firms gathering information about emerging waste in construction and demolition sites to facilitate reuse and recycling.

Source: IFKA (2018), National Industrial Symbiosis Project (2012).

Recommendations on waste, material management and circular economy

- Introduce a whole-of-government approach through collaboration between relevant ministries to steer the transition to a circular economy; develop a national circular economy action plan with measurable targets and timelines; improve the prominence and visibility of resource efficiency targets and circular economy measures in the Waste Management Plan and the Irinyi Plan on Innovative Industry Development Directions; establish a platform for broader co-operation between businesses, financial institutions and other stakeholders to promote development of a circular economy.
- Design and implement additional incentives for municipalities to strengthen waste management performance and allow for greater flexibility for municipalities in waste management planning; encourage best practice exchanges between municipalities by supporting associations of local authorities or environmental NGOs in developing guidelines, training and best practice recognition initiatives.
- Continue improving door-to-door separate waste collection; introduce deposit-refund or pay-as-you-throw schemes for glass.
- Evaluate the impact of new fixed waste tariffs for households on waste management performance and on the viability of waste management companies and infrastructure projects; consider raising waste tariffs, while compensating vulnerable households for the costs of waste management services; continue increasing the landfill tax to levels initially foreseen to encourage more separate collection and recycling efforts by municipalities.
- Monitor the impact and evaluate the performance of state-operated extended producer responsibility schemes on long-term waste management performance, overall costs and promotion of eco-design of products; ensure that product fees reflect end-of-life management costs, are predictable and encourage private sector investment.

References

BIO Intelligence service et al. (2009), "Web platform to facilitate the reuse of construction materials, waste prevention best practices" (factsheet), prepared for the European Commission, Brussels, June 2009, http://ec.europa.eu/environment/waste/prevention/pdf/Nemsitt_hu_Factsheet.pdf.

BiPRO (2016), "Detailed assessment of waste management plans – first batch", final report prepared for the European Commission, January 2016, http://ec.europa.eu/environment/waste/studies/pdf/Assessment_of_WMP_final_report.pdf.

BiPRO (2015), "Detailed evaluation report for assessing the waste management plan of Hungary – National", prepared for the European Commission, Brussels, January 2015.

BiPRO (2014a), "Assessment of separate collection schemes in the 28 capitals of the EU, national factsheet on separate collection: Hungary", prepared for the European Commission, Brussels, http://ec.europa.eu/environment/waste/studies/pdf/Separate%20collection_Final%20Report.pdf.

BiPRO (2014b), "Assessment of separate collection schemes in the 28 capitals of the EU, capital factsheet on separate collection: Budapest", prepared for the European Commission, Brussels, http://ec.europa.eu/environment/waste/studies/pdf/Separate%20collection_Final%20Report.pdf.

BiPRO (2014c), "Screening information on hazardous waste management – Hungary", prepared for the European Commission, Brussels.

BiPRO (2012), "Screening of waste management performance of EU member states", July 2012, prepared for the European Commission, Brussels, http://ec.europa.eu/environment/waste/studies/pdf/Screening_report.pdf.

Daily News Hungary (2015), "Let's do it Hungary, the Environment Clean-up campaign", Daily News Hungary, 14 May 2015, http://dailynewshungary.com/lets-do-it-hungary-the-environmental-clean-up-campaign/.

Deloitte et al. (2015), "Construction and demolition waste management in Hungary", in *Resource Efficient Use of Mixed Waste*, prepared for the European Commission, Brussels, September 2015, http://ec.europa.eu/environment/waste/studies/deliverables/CDW_Hungary_Factsheet_Final.pdf.

EC (2017), The EU Environmental Implementation Review, Country Report – Hungary, *Commission Staff Working Document,* SWD (2017) 46 final, European Commission, Brussels, 3 February 2017, http://ec.europa.eu/environment/eir/pdf/report_hu_en.pdf.

EC (2016), *Municipal Waste Compliance Promotion Exercise 2014-15*, http://ec.europa.eu/environment/waste/framework/pdf/municipal_waste_compliance_report_2014_2015.pdf.

EEA (2016a) "More from less — material resource efficiency in Europe 2015 overview of policies, instruments and targets in 32 countries" (country profile: Hungary), European Environment Agency, Copenhagen, www.eea.europa.eu/publications/more-from-less.

EEA (2016b), "Municipal waste management" (country factsheet: Hungary), European Environment Agency, Copenhagen.

EEA (2016c), "Industrial pollution" (country profile: Hungary), European Environment Agency, Copenhagen, www.eea.europa.eu/themes/industry/industrial-pollution/industrial-pollution-country-profiles-2016/hu.pdf.

EEA (2013), *Municipal Waste Management in Hungary*, European Environment Agency, Copenhagen, www.eea.europa.eu/publications/managing-municipal-solid-waste/hungary-municipal-waste-management.

GoH (2013), *Országos Hulladékgazdálkodási Terv 2014-2020 (National Waste Management Plan 2014-2020, Budapest*), http://videkstrategia.kormany.hu/download/c/96/90000/Orszagos%20Hulladekgazdalkodasi%20Terv%202014-2020.pdf.

HCSO (2015), *Indicators of Sustainable Development for Hungary, 2014,* Hungarian Central Statistical Office, Budapest, www.ksh.hu/docs/eng/xftp/idoszaki/fenntartfejl/efenntartfejl14.pdf.

HCSO (2014), *Environmental Report 2013*, Hungarian Central Statistical Office, Budapest, www.ksh.hu/docs/eng/xftp/idoszaki/ekornyhelyzetkep13.pdf.

IFKA (2018), IFKA Public Benefit Non-Profit Ltd. for the Development of Industry website, https://ifka.hu/en (accessed 5 February 2018).

Javór et al. (2011), The Kolontár Report: Causes and Lessons from the Red Mud Disaster, 2011, Greenpeace Hungary, Budapest.

KOVET (2017), Ablakon Bedobott Pénz Program website, www.ablakonbedobottpenz.hu/ (accessed 25 April 2017).

National Council for Sustainable Development (2013), *National Framework Strategy on Sustainable Development of Hungary*, www.nfft.hu/documents/127649/1361679/NFFT-ENG-web.pdf/f692c792-424d-4f5a-9f9d-9e6200303148.

National Environmental Information System (2015), *OKIR EHIR Waste Management* (database), http://web.okir.hu/en/ehir (accessed 16 February 2017).

National Industrial Symbiosis Programme (2012), "ISIM-TCC-industrial symbiosis: An innovative method in tackling climate change", final report prepared for LIFE, http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=LIFE08_ENV_H_000291_FTR.pdf (accessed 25 April 2017).

OECD (2016a), "Hungary", in *OECD Regional Outlook 2016: Productive Regions for Inclusive Societies*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264260245-27-en.

OECD (2016b), *OECD Economic Surveys: Hungary 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-hun-2016-en.

OECD (2010), *OECD Economic Surveys: Hungary 2010,* OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-hun-2010-en.

Parliament of Hungary (2014), *National Development 2030 – National Development and Territorial Development Concept, Resolution No. 1/2014*, Budapest, http://regionalispolitika.kormany.hu/download/b/c9/e0000/OFTK_vegleges_EN.pdf.

Rayment, M. et al. (2017), "Support to the fitness check of monitoring and reporting obligations arising from EU environmental legislation," final report 10.2779/903905, March 2017, prepared for the European Union, http://ec.europa.eu/environment/legal/reporting/pdf/Reporting%20and%20monitoring/support_fitness_check_report_annexes.pdf.

SCP (2014), Hungary-Waste Prevention Programme, European Topic Centre on Sustainable Consumption and Production website, http://scp.eionet.europa.eu/facts/WPP/hungary (accessed 15 February 2017).

USAD (2017), Užstato Sistemos Administratorius, Lithuania website, http://grazintiverta.lt/en/ (accessed 18 August 2017).

Chapter 5. Biodiversity

Hungary has one of the largest continuous grasslands, an extensive system of underground caves and among the most important wetlands for birds in Europe. It was one of the first EU member states to have its Natura 2000 network of protected areas declared complete. However, 62% of species remain in an unfavourable state. This chapter reviews pressures influencing the status and trends of biodiversity; the institutions, policy instruments and financing established to promote conservation and sustainable use; and the degree to which biodiversity considerations have been mainstreamed into sectoral policies.

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.

5.1. Introduction

Hungary has made several important improvements in policies related to biodiversity conservation and sustainable use since 2008, supported by European Union (EU) directives and the Convention on Biological Diversity. It was one of the first EU member states to have its Natura 2000 network of protected areas declared complete in 2011. The conservation status of most habitats and species improved between 2007 and 2012. Hungary's second National Biodiversity Strategy is also an improvement over its first, with measurable targets and identified actions.

However, over 80% of habitats of community importance, and 62% of species, remain in an unfavourable state. Further effort is needed to reduce pressures on biodiversity from land-use change, habitat fragmentation, pollution, invasive species and climate change. Agriculture and forestry sectors remain key sources of pressures, despite their inclusion in the Biodiversity Strategy. Attention is also needed in other sectors, such as energy, transportation, tourism and industry. Greater use of economic instruments, enhanced public financing and a renewed focus on implementation will be important to significantly reduce the rate of biodiversity loss.

5.2. Pressures, state and trends

5.2.1. Status and trends

Hungary has one large biogeographic region – the Pannonian – that consists of a large flat alluvial basin and two major rivers, the Danube and Tisza. The area was once an inland sea, surrounded by hills and mountains. The Pannonian extends into Slovakia, the Czech Republic, Romania, Serbia, Croatia and Ukraine (EC, 2009). Hungary, for the most part, is at a low elevation with 84% of the country below 200 m above sea level. Only 2% of the country is above 400 m (ICPDR, 2006).

Hungary is one of the least forested countries in Europe, with around one-sixth of the Pannonian region remaining forested. Around 40% of the forest is plantations and semi-plantations of alien species. The transition zone between the forest and the plains is an important habitat for several species, including rare plants, grasshoppers and sand lizards.

Hungary has one of the largest continuous grasslands in Europe. The plains, home to endemic plants and animals, are also important for birds and rodents. Hungary has an extensive system of underground caves that are home to bats, as well as other unique species. The caves and thermal spas are attractive tourist destinations.

The largest rivers are the Danube, Tisza and Dráva, which have many tributaries. The rivers that flow out of the surrounding mountains and upstream countries are ideal habitats for rare freshwater fish and other water-dependent species. They have been considerably altered over centuries, but still harbour large areas of natural floodplain, forests and meadows. Hungary has several lakes, with Lake Balaton being one of the largest shallow lakes in Central Europe.

There are a range of wetland types, from permanent to ephemeral (characterised by annual flooding and drying). Hungary's wetlands are among the most important in Europe to birds, particularly waterfowl and migratory species. Hundreds of thousands come to the salt marshes and shallow alkaline lakes to rest and feed during their annual migration.

The main threats to biodiversity are over-exploitation of natural resources, habitat loss, habitat fragmentation and ecosystem degradation from pollution and development, similar to other European countries. Invasive species spread easily in disturbed and degraded habitats, and climate change further deteriorates already stressed environmental systems (GoH, 2014b).

Natural environments

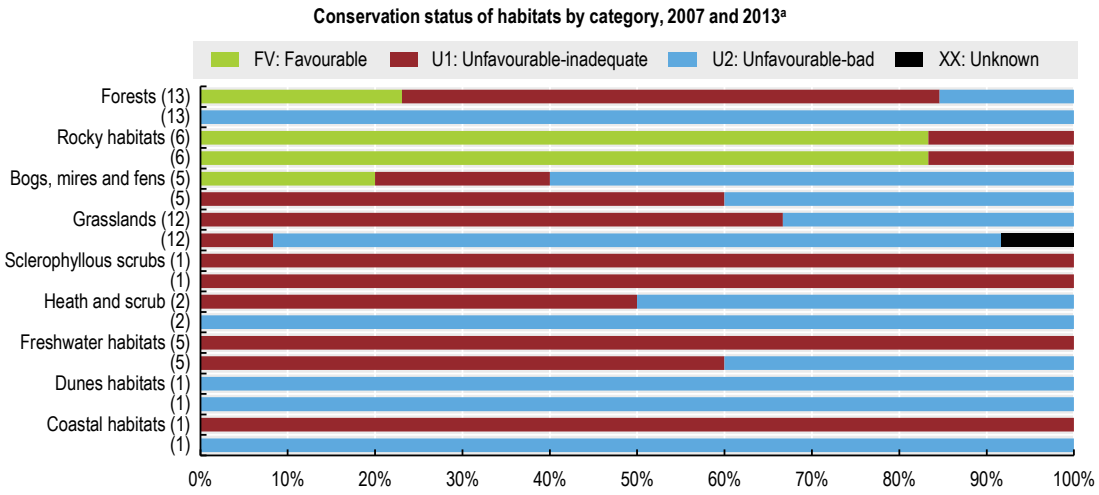
The condition of natural environments in Hungary, as with most countries in Europe, continues to raise concerns. Some 80% of Sites of Community Importance (SCIs) under the EU Habitats Directive (92/43/EEC) have bad or unfavourable conservation status. Despite some improvement between 2007 and 2013, action taken to date has not been significant enough to shift priority habitats to favourable status.

Sites of community importance and special protection areas

Within Hungary's Pannonian region are 479 SCIs and 56 Special Protection Areas under the EU Birds Directive (2009/147/EC). Together they cover about 21.4% of the total land area of the country (EC, 2018). Habitats with a favourable status increased from 11% to 19% over 2007-15, and the conservation status of more than half improved (GoH, 2014b).

The reported conservation status of forests improved slightly over the 2001-06 and the 2007-12 reporting periods, with 3 of the 13 forest habitats now in favourable condition. However, this is mainly due to a change in survey methodology and additional data rather than actual improvement (GoH, 2014b). The change in the status of wetlands was mixed: one habitat moved to favourable status, while another moved to unfavourable-bad status. The situation for grasslands improved somewhat, with the number of habitats in unfavourable-bad status decreasing from ten to four. There are no longer any freshwater habitats with unfavourable-bad status (Figure 5.1).

Figure 5.1. The conservation status of most habitats improved between 2001-06 and 2007-12



a) The first bar for each habitat refers to 2013 and the second one to 2007.
Source: EU (2013), Hungary Habitats Directive Article 17 Report 2007-2012.

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Water-dependent and wetland ecosystems

Around 56% of the 1 026 natural and artificial water bodies have been classified at risk due to pollution from households not connected to the sewage system, sewage treatment plants and agriculture. None of the 108 groundwater bodies is considered at risk, but 46 sites are identified as "possibly at risk" due to nitrate pollution (GoH, 2014b). While 8% of rivers, 18% of lakes and 68% of groundwater bodies are in excellent condition, 60% to 70% of surface waters are eutrophic with excess nutrients from agriculture and municipal wastewater (GoH, 2014b).

As 95% of Hungary's surface waters originate from other countries, external factors can significantly influence their ecological status (GoH, 2015). International co-operation is therefore particularly important to improving the status of rivers. River regulation and flood management within Hungary have also significantly impacted water flow, water levels and alluvium conditions of water systems, with dams closing off river branches and backwaters (GoH, 2015).

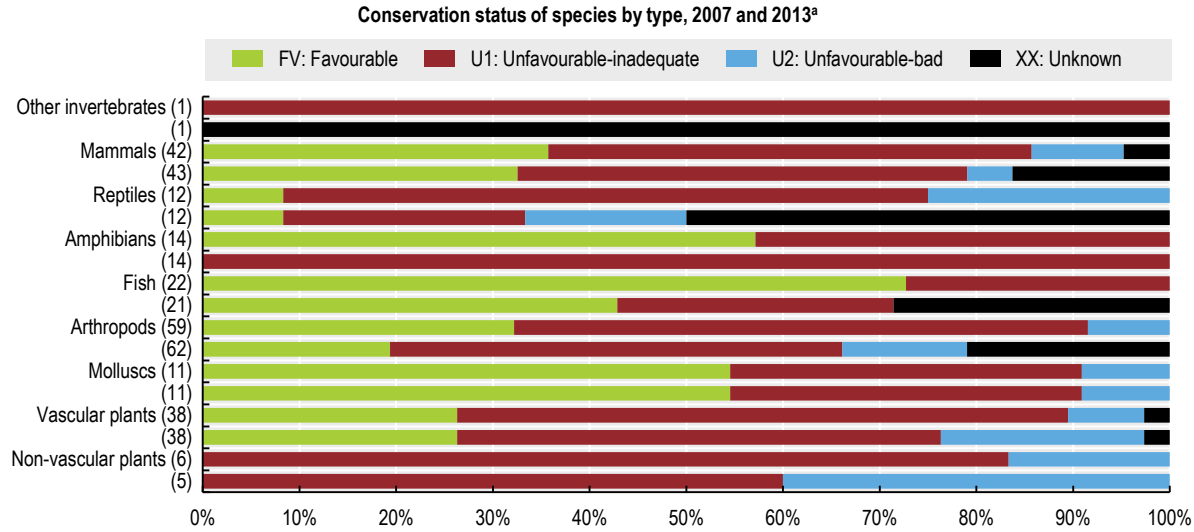
Hungary has 29 designated wetlands of international importance under the Ramsar Convention on wetlands, covering 243 000 ha. Reduced water levels are a key issue for wetlands, with pressures from both human activities and climate change (GoH, 2015).

Flora and fauna

More than 53 000 species are present in Hungary, of which 82% are animals (CBD, 2017). Hungary's Pannonian region covers only 3% of EU territory, but the region harbours 17% of the species listed in the Habitats Directive and 36% of species listed in the Birds Directive (GoH, 2014b). The high number reflects the level of biodiversity, endemism and fragility of species in the region (EC, 2009).

Around 62% of species under the Habitats Directive are in an unfavourable- inadequate or unfavourable-bad conservation status. The conservation status of 5% of species has improved since 2007, while the status of 4% has worsened (Figure 5.2).

Figure 5.2. The conservation status of species improved slightly between 2007 and 2013



a) The first bar for each species refers to 2013 and the second one to 2007.
Source: EU (2013), Hungary Habitats Directive Article 17 Report 2007-2012.

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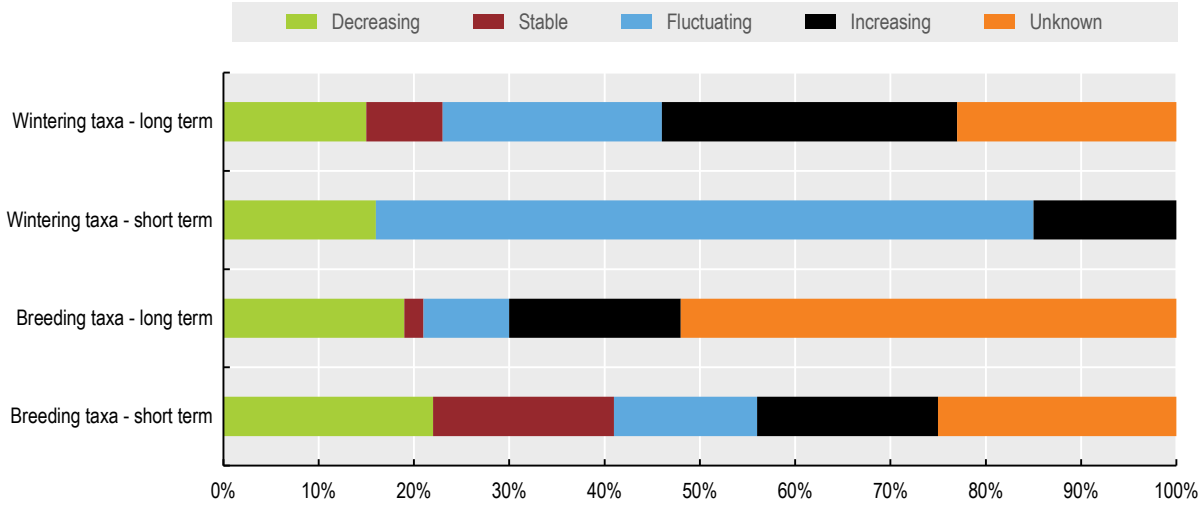
Birds

Many species that are endangered in the rest of Europe still breed in large numbers in the Pannonian region. Every spring and autumn, hundreds of thousands of birds come to rest and feed in the region during their annual migration.

Populations of farmland bird and wild duck species have declined since 2005, but forest birds have been relatively more stable (GoH, 2015). Reporting for 2008-12 under Article 12 of the EU Birds Directive analysed the population trends of birds. It found that 19% of breeding birds and 15% of wintering birds declined in population over 24 years (Figure 5.3). The long-term status of 52% of breeding birds is unknown. The focus to date has largely been on common birds and threatened species, leaving those in-between with limited monitoring. A new government initiative aims to map breeding birds and estimate the populations of medium-rare species.

Figure 5.3. Population trends in bird species highlight potential risks



Note: Article 12 only covers a subset of wintering taxa occurring in Hungary.
Source: EU (2013), Reporting under Article 12 of the Birds Directive (2008-2012).

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5.2.2. Pressures on biodiversity

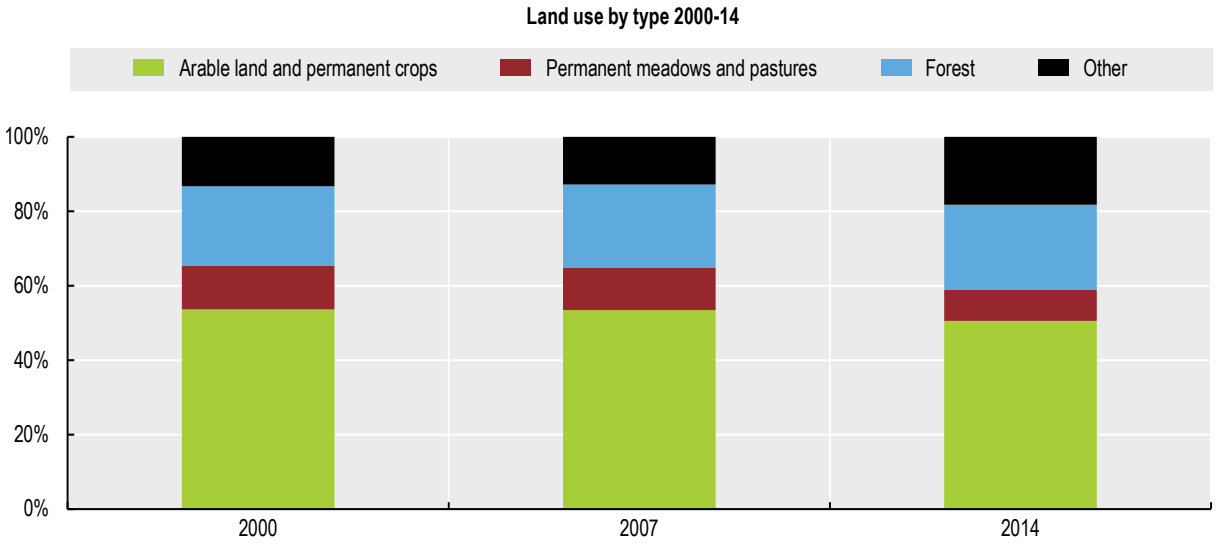
Land-use change and fragmentation

Over time, land use has changed considerably in Hungary. At the end of the 19th century, large-scale canalisation and land reclamation drained floodplains to make way for crop production. During the period, the Tisza River was shortened by 134 km. A network of dykes and drainage channels was constructed across the plains, transforming the vegetation of the region. Over the last 150 years, around 93% of Hungary's floodplain was lost and over 60% of land in the Pannonian biogeographical region was converted to arable land (EC, 2009). Natural system modifications, such as water abstractions, dredging and fire suppression, continue to be key pressures on biodiversity.

Net habitat loss has increased since 2004 (Mihok et al., 2017). Though many arable lands and other agricultural areas are being abandoned, agricultural production has increased and intensified. Agriculture remains one of the most significant pressures on biodiversity (Section 5.6.1). Forest area[1] has increased from 21% to 23% as a share of the total terrestrial area over 2000-14, but this is due primarily to plantations of non-native tree species (Section 5.6.3). Indigenous trees represent around 57% of the forested area (CBD, 2017).

Landscape fragmentation is a leading cause of the decrease in wildlife populations in Europe. Fragmentation prevents access to resources, facilitates the spread of invasive species, reduces habitat area and quality, and isolates species into smaller and more vulnerable fractions (EEA, 2011). In Hungary, fragmentation from roads, railways and urban expansion is greatest in and around the Budapest Metropolitan Area (which comprises roughly one-third of Hungary's population). However, fragmentation is also increasing across the country. For example, between 1990 and 2011, the country's road network grew by over 2 600 km. By 2027, it is expected to grow by an additional 2 600 km (Bata and Mezosi, 2013).

Figure 5.4. Agricultural land and meadows are shrinking, while forest and built areas are increasing



Note: Other includes built-up and related land, wet open land and dry open land.
Source: OECD (2017), *OECD Environment Statistics* (database).

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Invasive species

Currently, 13% of natural and near-natural habitats are heavily infested with invasive species (GoH, 2014b). There are 41 plant and 35 animal species that are considered a threat to indigenous flora and fauna. Of these, 17 plant species and 3 animal species represent a high ecological risk (GoH, 2015).

Invasive species can impact the reproduction and germination of indigenous species, carry diseases and push out local fauna (GoH, 2015). Forest plantations of species such as black locust (false acacia) can spread and become a problematic invasive species in protected areas despite limitations on planting (Section 5.6.3).

Pollution

Pollution, which can have a significant impact on biodiversity, is a major cause of habitat degradation for aquatic species. As noted in Section 5.2.1, 60% to 70% of surface waters in Hungary are eutrophic. The main contributors to eutrophication are nitrogen, phosphorus and ammonia pollution. These can come from air emissions, run-off from agricultural activities or municipal wastewater. Nitrogen oxide emissions dropped 27% between 2005 and 2015. However, emissions from agriculture increased by more than 30% over the period. Ammonia emissions, also mainly from agriculture, dropped during the economic slowdown, but almost returned to 2005 levels by 2015. This will make it difficult for Hungary to meet its EU target for ammonia (-34% compared to 2005 levels over 2020-29).

Climate change

Climate change will increase the vulnerability of species in Hungary. Increased evaporation, for example, is expected to reduce the surface area of smaller lakes. In addition, certain wetland habitats and shallow oxbow rivers may become dry. This will decrease the habitat of waterfowl and nesting sites for birds and may cause other species to migrate from dry areas. The risk of higher saline content and eutrophication will also increase (Climate Change Post, 2017). If water consumption, particularly from agriculture, remains unchanged, certain regions could face water shortages that will further impact biodiversity.

5.3. Strategic and institutional framework

Hungary has a strong legislative framework to support biodiversity, with legislation covering nature conservation, forests, fisheries and other areas. The country's biodiversity policy is largely determined by EU legislation, particularly the Birds and Habitats Directives. As noted in Chapter 2. , Hungary has significantly transformed its governance system relating to the environment and biodiversity over the past decade. A full assessment of the implications for biodiversity has not been completed. However, anecdotal evidence suggests negative impacts have accompanied the integration benefits. Greater effort is needed to clarify policy direction, co-ordinate across relevant organisations, monitor and evaluate results, and increase financial and human resource capacity in district offices.

5.3.1. Strategic framework

In 2015, the Hungarian government adopted its second National Biodiversity Strategy (2015-20). The strategy is linked to the Aichi targets under the Convention on Biological Diversity. It has 6 strategic areas, 20 objectives, 69 measurable targets and 168 related actions, as well as a variety of indicators to measure progress (Table 5.1). Implementation will rely on the European Union as well as on Hungarian funding, although many actions do not have cost estimates. The strategy requires an interim evaluation in 2017 and a retroactive evaluation in 2021 (GoH, 2015).

The strategy, relatively comprehensive and ambitious, improves upon the previous version, which did not have measurable targets. However, the strategy could have stronger linkages to sectors beyond agriculture, forestry and fisheries. The strategy has no influence on other ministries beyond the Ministry of Agriculture (which is now responsible for biodiversity, agriculture, forestry and fisheries). The interim evaluation of the National Biodiversity Strategy in 2018 is expected to indicate progress in implementation.

Table 5.1. Hungary's National Biodiversity Strategy objectives and key indicators

Objectives (paraphrased)	Selected key indicators
Improve the condition of Natura 2000 sites, as well as **protected natural areas** and those subject to international environmental protection	Size of Natura 2000 sites, protected areas Share of habitat types with favourable status Share of sites with management plans
Improve environmental **conditions of most problematic species** of community importance, most endangered species	Number of species protection plans Share of species with favourable status
Develop a **knowledge base** for the preservation of species/habitat types in need of protection	Share species/habitats with monitoring protocols Share of species status listed as unknown
Improve **public awareness**/judgement of biodiversity via knowledge dissemination, attitude shaping and interpretation	Number of visitors to nature interpretation sites Number of schools with title "eco-school"
Preserve **landscape diversity** and ecological landscape potential	Number of studies related to landscape diversity Number of rehabilitation/reconstruction projects
Co-ordinate development of **green infrastructure** to maintain/ improve function of natural systems, adapt to climate change	Change in size of restored/regenerating areas Number of corridors reducing fragmentation
Define the **value of ecosystems**, and integrate them into comprehensive and thematic strategies	Natural capital index Ratio of strategies reflecting ecosystem services
Integrate biological and landscape diversity into comprehensive and relevant **sectoral policies**	Area of arable land re-classified for other use Area used for long-term forestry
Preserve, develop and use sustainably **genetic resources** in agriculture	Plant and forestry gene bank collections Number of agricultural animal breeds lost
Promote a varied, mosaic-patterned **agriculture** with a view to preserving biological diversity and landscape protection	Size of certified areas of ecological use Number of grazing animal species
By 2020, maximise the total area of land under **sustainable farming**	Size of high-nature value farmland areas Size of grassland
Further increase the total size of **forests** managed via nature-friendly forestry methods; enforce biodiversity considerations	Total area covered by indigenous tree species Deadwood quantity
Manage big game to not endanger renewal of biodiversity, ensure small game can naturally reproduce	Number of foxes per land unit Size of reconstructed/new waterfowl habitat
Promote the natural reproduction of **fish**, preserve endangered fish species in the wild; rehabilitate endangered habitats	Size/share of habitats with satisfactory water quality Length of shorelines rehabilitated for fish breeding
Identify the role of **water** in ecosystems, frugal water consumption; decrease water pollution	Ratio of water bodies in good ecological condition Number of completed river rehabilitation projects
Curb the communities of **invasive and non-indigenous species** that harm ecosystems	Number of action plans for invasive species Number of new invasive species posing threat
Apply principle of due care when emitting **genetically modified organisms** (GMOs) into the environment	Total area of GMO-free farming Number of independent GMO impact studies
Protect animal and plant species threatened by **trade** (CITES)	Ratio of domestic and border checks performed Identified illegal acts
Ensure access to **genetic resources** and just and fair equitable sharing of the benefits from their use (Nagoya Protocol)	Number of accesses to Hungary's genetic resources Number of procedures re. unauthorised access
Increase emphasis on preserving biodiversity in Hungary's international activities, including **development co-operation**	Number of financed projects related to biodiversity Funding complying with biodiversity preservation

Source: GoH (2015).

Biodiversity commitments are made in several other strategies and plans, though with insufficient cross-references or connections to the Biodiversity Strategy. The National Nature Conservation Master Plan 2015-20, part of the National Environmental Programme approved by Parliament, sets the main policy objectives and priorities for the relationship between the economy and the environment (GoH, 2014b). Biodiversity has also been integrated into the National Sustainable Development Framework Strategy 2012-24, the National Rural Development Strategy 2012-20, the National Action Plan for the Development of Ecological Farming and the Fourth National Environmental Programme 2014-20. The National Environmental Programme 2015-20 includes the protection of natural values and resources and their sustainable use as one of three strategic objectives. It also makes linkages to biodiversity in several areas, including agriculture, silviculture, mineral resources management and traffic. There has also been some integration of biodiversity aspects into the National Climate Change Adaptation Strategy, the National Water Strategy and the National Forest Programme 2006-15 (GoH, 2014b). The partnership agreement between the European Commission and Hungary for 2014-20 includes several operational programmes (OPs). Biodiversity considerations are well integrated into some, such as the Environmental and Energy Efficiency OP, but less so into others, such as the Integrated Transport OP that primarily aims to increase road and rail transport (EC, 2014c).

International commitments

Hungary ratified the Convention on Biological Diversity in 1994. Since then, it has produced five national reports and two national strategies and action plans supporting the convention. Hungary ratified the Nagoya Protocol on access to genetic resources and a fair and equitable sharing of benefits from their use in April 2014, with entry into force in October 2014 (GoH, 2014b).

All but one native species listed by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) are strictly protected in Hungary. The country represents the European Union at the CITES Standing Committee. The National Park Directorates have strong co-operative relationships, having 43 projects with cross-border countries and 12 with other countries. Hungary's biodiversity policies are influenced by regional conventions such as the Berne Convention on the Conservation of European Wildlife and Natural Habitats.

5.3.2. Institutional framework

Government

Environmental policy is largely the responsibility of the central government and its territorial institutions. These bodies share operational and enforcement responsibilities with regional and local authorities. Hungary is one of the only EU member states without a dedicated environment ministry (Chapter 2.). In 2010, biodiversity policy, along with other environmental policy responsibilities, was transferred to the Ministry of Rural Development (renamed the Ministry of Agriculture in 2014). In 2012, water management was transferred to the Ministry of Interior.

The Department for Nature Conservation and the Department of National Parks and Landscape Protection share responsibility for biodiversity policy development and programme management. These departments fall under the Ministry of Agriculture, which has a total staff of 56. There are also 10 National Park Directorates, with

1 100 employees. The regional nature conservation authorities have 86 employees spread across 19 counties. An additional 66 employees work on invasive alien species, which reflects the challenge in Hungary. Environment and nature regulatory enforcement was recently transferred from the 10 regional nature conservation authorities to the 19 county government offices and 197 district offices as part of the State Territorial Administration Reform (Chapter 2.). The transfer has been a challenge for biodiversity conservation, since the 83 staff from the authorities, with different specialties, are now dispersed across 19 offices, with only 3 additional staff. Training has begun, but it will take time, additional resources and continued effort to ensure that the transfer improves biodiversity outcomes.

Civil society

There are 50 to 60 non-governmental organisations (NGOs) in Hungary working on nature conservation. The NGOs receive some funding from the Ministry of Agriculture's Green Fund, which has been reduced by more than 30% since 2011. Some NGOs participate in several committees. These include the Hungarian Man and Biosphere Committee (2010), which controls 6 biosphere reserves, and the Hungarian Ramsar National Committee, which oversees 29 Ramsar wetland sites. NGOs have also been recipients of HUF 1.38 billion (EUR 4.4 million) in financing from the EU LIFE Capacity Building in Hungary project that supports nature conservation. In addition to reduced government funding to NGOs, recent legislative changes increased financial reporting requirements for NGOs receiving more than EUR 24 000 from foreign donors (including the European Union). This may make it more difficult for conservation NGOs to remain viable (Thorpe, 2017).

Two NGOs in particular have contributed significantly to nature conservation in Hungary. WWF Hungary has operated for 25 years, working with national parks conservation authorities, other NGOs, educational institutions, business representatives and the local population to promote nature conservation. Birdlife Hungary, founded in 1974, advocates for nature conservation of birds and their habitats, works to raise awareness and undertakes monitoring and research in partnership with the government. The NGOs have expressed strong concerns about the impact of government changes, such as the merger of the Environment Ministry with the Ministry of Agriculture, on nature conservation. They did, however, successfully argue against a bill proposing to transfer land management rights of National Park Directorates to a centralised National Land Fund (Benedetti, 2015; WWF et al., 2016, 2015).

Private biodiversity stakeholders

Most private action has been stimulated by government subsidies. However, in 2008, the electricity sector came together with Birdlife Hungary and state nature conservation bodies to sign the Accessible Sky Agreement, aimed at minimising bird mortality along power lines by 2020. The agreement is supported by 2008 legislation requiring power lines to be constructed in a bird-friendly manner. A study prioritised power lines for retrofit, and a new EU LIFE+ project aims to bury priority power lines in the area of the largest great bustard population in Hungary. However, progress has recently slowed.

Scientific and technical expertise

Hungary does not have one single programme to support research and development (R&D) related to biodiversity. There are instead general calls for research, where biodiversity-related research is eligible to apply. Some major projects related to

biodiversity have been funded, including research for mitigating the negative effect of climate change, land-use change and biological invasion.

Hungary has several initiatives related to conservation of genetic resources, including the Centre for Plant Diversity and the Research Centre for Farm Animal Gene Conservation. The centres maintain and co-ordinate protection of conventional agricultural plant varieties and endangered old Hungarian farm animal species in gene banks.

Environmental impact assessment and strategic environmental assessment

In Hungary, environmental impact assessment (EIA) is required for activities that are likely to have adverse effects on biodiversity. In 2005, the scope of EIA was extended to include not only the impact of individual projects, but also their cumulative and global effects. The EU Habitats Directive also requires the assessment of any plan or investment that may have a significant impact on any Natura 2000 territory. The analysis is required to cover impacts on soil, air, water, wildlife and the built environment (Chapter 2.). A lack of localised data on species and ecosystems, particularly outside of protected areas, can limit the extent to which biodiversity is considered in some assessments (Section 5.4.1).

Strategic environmental assessment (SEA) is required for regional plans, settlement structure plans, the National Development Plan, operative programmes, road network development plans, and other local and sectoral plans or programmes. SEA considers environmental effects of implementing the plan or programme, including on biodiversity and Natura 2000 areas.

5.4. Information systems

The environmental awareness of Hungarians increased from 41% to 55% over 2007-11. However, only 10% of respondents were familiar with the term “biodiversity” in 2011. This highlights the need for further education and information dissemination relating to biodiversity (GoH, 2014b). As part of its response, the government established the Intergovernmental Platform on Biodiversity and Ecosystem Services in 2012. The platform aims to promote adequate use of scientific information and strengthen the relationship between science and political decision making (GoH, 2015). Monitoring systems and ecosystem indicators have also improved. However, detailed and local information needed to inform decisions on projects or policies remains inadequate, particularly outside of protected areas.

Box 5.1. Improving awareness of biodiversity conservation through National Park Products

In 2010, the Ministry of Agriculture created a brand of National Park Products. It identifies products made in protected natural areas based on local traditions consistent with the principles of sustainable development. Currently, 158 producers use the label for more than 618 products, including syrups, fruit juices, wines, salami, sausages, jams, honey, cheese and smoked trout. The programme helps raise environmental awareness and strengthen co-operation between nature conservation, rural development and economic growth.

Source: NPT (2017).

5.4.1. National Biodiversity Monitoring System

A National Biodiversity Monitoring System (NBMS), introduced in 1998, assesses the status of, and long-term changes in, species and habitats. Monitoring takes place at the national and local levels. The number of locations and species populations examined has increased steadily since the system was introduced.

The data generated from the NBMS are entered into the Nature Conservation Information System. This is a geographic information system (GIS) linking biological protection, biodiversity monitoring, geology nature preservation, nature conservation and asset management. Hungary launched a voluntary online nature observation programme in 2009 to collect data on animal and plant species from the general public (GoH, 2015).

The EU Birds and Habitats Directives require expansion of the NBMS to monitor species and habitats of community importance. The nature conservation status of only 2% of the 208 species of community importance remained unknown in 2013, down from 17% in 2007, demonstrating improvement, though work continues to increase the quality of data. None of the 46 habitat types was classified in the unknown category (GoH, 2015).

Ecological data at the local level are limited outside of protected areas. EIA and SEA often require local GIS-based data, as well as habitat and soil maps. Historically, the cost of obtaining the data needed to adequately analyse biodiversity impacts was prohibitive. However, the government is working to improve the availability of, and access to, relevant data through national ecosystem mapping and an open data policy.

5.4.2. Ecosystem service information

Hungary's planned mapping and assessment of ecosystems and their services in 2016-20 will help address data gaps and improve biodiversity knowledge. Specifically, it will include improved data collection, monitoring and research related to biodiversity within and outside protected areas. The project will produce a map of ecosystems and a survey of their status, a map and prioritised list of ecosystem services, and guidance on the protection of natural and close-to-natural ecosystems and their services. This information will be key for policy makers and could form the foundation of future work to determine monetary values for ecosystem services. The use of ecosystem service assessments is an important communication lever to justify public investment in biodiversity, including in protected areas. For example, initial estimates of the value of forest provisioning services alone are close to HUF 1 000 billion (approximately EUR 3.3 billion) (GoH, 2014b).

5.5. Instruments for biodiversity conservation and sustainable use

Hungary has a number of instruments to ensure biodiversity conservation and sustainable use. Over and above regulatory approaches, which are generally preferred for protecting habitats and species of importance, economic instruments can finance programmes in favour of biodiversity. They can also contribute to the integration of biodiversity considerations into economic sectors (Section 5.6).

5.5.1. Protecting ecosystems, habitats and species

Protected areas

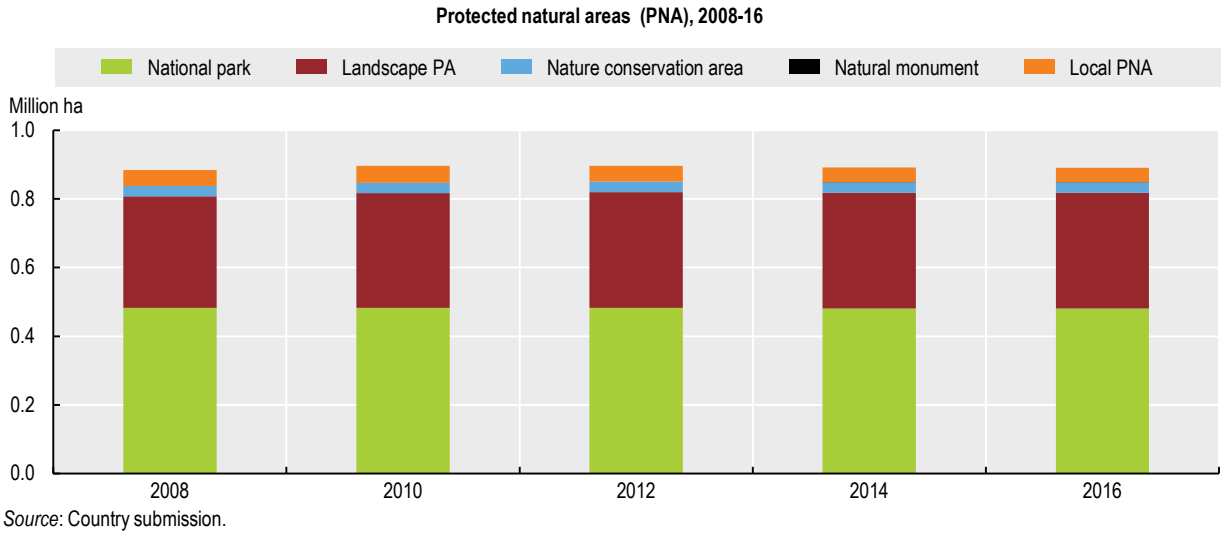
Hungary has already surpassed the Aichi target to protect at least 17% of land and water under its jurisdiction by 2020. It was also one of the first EU member states to have its Natura 2000 network of protected areas declared complete in 2011. However, work remains to complete management plans for all the protected areas, improve coverage of species types and address the shortage of park rangers.

The total size of territory under protection in Hungary increased from 9.4% under national legislation to 22.2% when Hungary was brought into the EU Natura 2000 network in 2004 (CBD, 2017). Nature conservation sites of local importance cover almost 0.5% of the country (GoH, 2014b).

Hungary's protected areas network is considered sufficient for all habitats and species of European importance. It consists primarily of national parks and landscape protected areas (Figure 5.5). The proportion of grasslands under protection is more than double the EU average (GoH, 2014b). Over half of national protected areas are forest, with 22% of forests located in a protected area. Over 70% of inland waters belong to the Natura 2000 network (GoH, 2014b). The area of protection has remained relatively stable since 2008, with minor extensions and adjustments reflecting more accurate delineation (Figure 5.5). Protection is now measured at 22.6% of the territory. In October 2017, the Constitutional Court ruled that measures that result in deterioration of the environment are contrary to the Fundamental Law, specifically referencing the sale of Natura 2000 land to farmers and the use of associated revenue to reduce state debt (CCH, 2017).

Work remains to improve management of protected areas. The number of areas with management plans has increased, growing from 45 of 211 (21%) in 2008 to 180 of 307 (59%) in 2016 (GoH, 2014b). However, only 8% to 10% of protected areas had binding management plans as of 2016. There are also no national data available on the extent of management plans for local protected areas, as this is left to local governments.

Figure 5.5. Surface of protected areas has been stable since 2008



Source: Country submission.

StatLink http://dx.doi.org/10.1787/888933712947

The coverage of the Natura 2000 sites is very good for habitat types. Almost three-quarters of assessed sites have 75% to 100% coverage, and the remaining quarter has 25% to 74% coverage (GoH, 2014a). For species types, the coverage is less complete. Slightly more than half of assessed species have 75% to 100% coverage; around 40% have 25% to 74% coverage; and 5% have 0% to 24% coverage (GoH, 2014a).

There is a shortage of park rangers. One ranger covers an average of 372 km^2, including 80 km^2 of Natura 2000 or nationally protected areas. More than 700 volunteer civil nature guards assist in patrolling and fill some of the capacity gap, but do not have the same training as rangers.

Species action plans

The EU LIFE programme has funded projects that target conservation of individual species, including the great bustard, the Hungarian meadow viper, the Saker falcon and the red-footed falcon. Most species conservation efforts focus on protected areas. However, there have been some initiatives elsewhere, such as projects to make power lines more bird-friendly, subsidies for good environmental practices in agriculture, and restrictions on farming and forestry in habitats of strictly protected species. Habitat reconstruction and habitat development has been carried out on 5% of Natura 2000 areas (GoH, 2014b).

Invasive species management

National legislation prohibits the unauthorised introduction of new invasive organisms and requires that agricultural lands be maintained free of weeds. Activities to eradicate or manage invasive species have taken place in most protected areas to varying degrees, depending on the level of concern and financing available. However, outside of protected areas, there has been limited effort. Hungary is participating in a European-wide awareness-raising initiative – NatureWatch – that allows citizens to identify and report invasive alien species online (GoH, 2014b).

5.5.2. Economic instruments

Economic instruments, such as taxes or subsidies that discourage activities harmful to biodiversity or encourage beneficial activities, can play an important role in biodiversity conservation and sustainable use policy. They can help correct market failures that lead to overexploitation of natural resources, degradation of ecosystems and impacts on species and their habitats. Hungary uses economic instruments in several areas, but has relied mainly on subsidies for the agriculture sectors where key pressures on biodiversity remain. There is scope to expand the use of taxes and charges in areas such as ammonia emissions and the cultivation of flooded land. In addition, Hungary could expand subsidy payments for ecosystem services to areas such as control of invasive species, modernisation of irrigation systems and protection of species or habitat outside of protected areas.

Taxes, fees and charges

Hungary has a number of taxes, fees and charges linked to biodiversity. Investors pay non-refundable application fees for licences that give them the right to use natural resources or protected species. No licences have been issued to commercial fishers since January 2016. However, recreational fishers and anglers must pay for tickets from the fishing rights holder. The charge depends on the water body and frequency of use (daily, weekly, monthly, annually). Revenue from the tickets is used to fund fisheries-related activities of state interest.

Protected areas have several fees associated with them. These include fees at visitor centres and interpretation sites. Protected areas are, however, for the most part free to visit.

Hungary's water resource fee is calculated for each user based on the volume and purpose of water use, as well as the type and quality of the water resource. A new pressure multiplier was introduced to the fee at the beginning of 2017 to reflect the EU Water Framework Directive. The multiplier increases the fee for groundwater bodies that have an "at risk" or "bad" quantitative status.

Hungary also uses a "land protection contribution" charge linked to a permit to use agricultural land for another purpose, such as conversion to urban use. The charge depends on whether the land-use change is temporary or permanent, as well as on the agricultural quality and size of the land. Exemptions to the payment are provided for some public utilities, state and local rental housing, irrigation, soil and conservation facilities, as well as social, health and sports facilities. Over 2013-16, the charge raised around HUF 1.5 to HUF 2.2 billion (EUR 4.9 to EUR 7.1 million) of general budget revenue.

A soil conservation charge is also levied on anyone who removes humic (containing organic matter) topsoil. Revenue from the charge helps finance regulatory tasks related to soil conservation on agricultural land. A forest protection charge also applies to the use of forest, unless the forest is replaced.

Payments for ecosystem services

EU agricultural and rural development subsidies encourage biodiversity-friendly practices (Section 5.6.1). Other subsidy programmes encourage actions beneficial to biodiversity, such as payments for afforestation and forest rehabilitation (Section 5.6.3) and payments for environmentally-friendly aquaculture practices (Section 5.6.2). In some cases, nature

conservation authorities may pay compensation to a proprietor for damage by a protected animal species or by management restriction or prohibition. The majority of these types of payments have been to farmers, and some forest owners. The most relevant species for the payment are birds such as the corncrake, black stork, white-tailed eagle and collared pratincole. Further use of payment for ecosystem service schemes could be considered to alleviate pressures on biodiversity, such as improving control of invasive species, modernising irrigation systems and protection of species or habitat outside of protected areas.

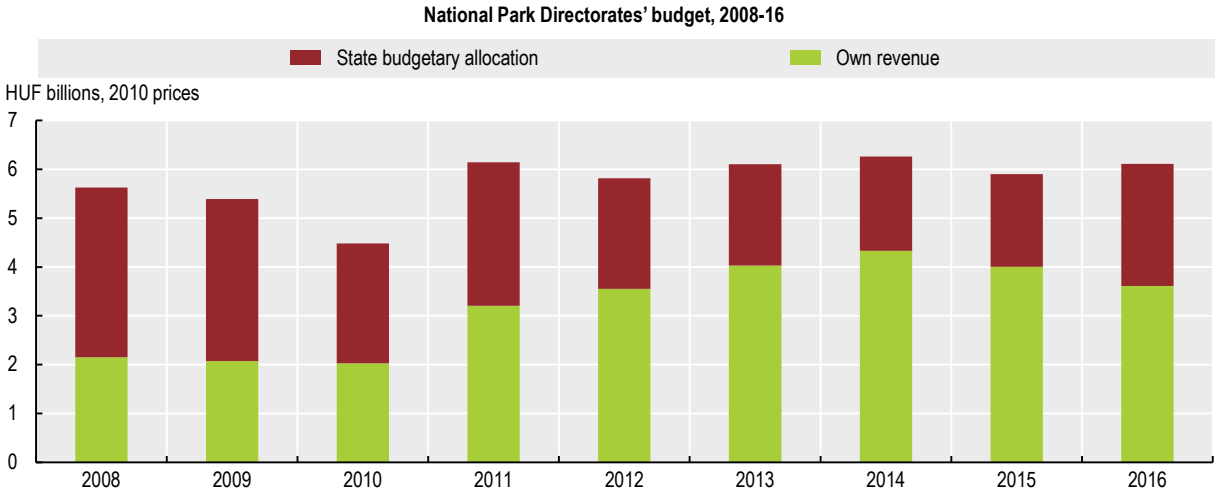
5.5.3. Public financial support

The budget for the National Park Directorates has increased since 2008, largely as a result of substantial revenues raised by the directorates themselves. Nature conservation funding from the European Union has declined, but Hungary could still significantly benefit from the EU LIFE programme that co-finances specific projects.

The Ministry of Agriculture does not allocate an independent budget to the Department for Nature Conservation or the Department of National Parks and Landscape Protection. Their funding is included in the overall ministry budget, which may risk a loss of resources if priorities shift. Capital, county and district government offices also receive a general budget from the Annual Budget Act, with no specified allocation for nature conservation. It is therefore difficult to assess trends in funding for nature conservation over time. National Park Directorates do, however, receive a separate budget.

The budget for National Park Directorates has increased since 2008 (Figure 5.6), with a significant portion (almost 60%) sourced from their own revenues (HUF 4.1 billion in 2016). The directorates generate revenue from the use of protected land for environmentally-friendly farming, including crops and livestock, as well as ecotourism. The lands are also eligible for EU agricultural grants. Revenue declined between 2014 and 2016 due to a change in rules under the EU Common Agricultural Policy (CAP), and public funding was increased to fill the gap. Environmental groups have, however, expressed concern that the directorates' dependence on own-source revenue is distorting decision making, favouring revenue-generating activities over nature conservation (WWF Hungary et al., 2015).

Figure 5.6. National Park Directorates generate revenue for a significant share of their budget



Source: Country submission.

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Between 2007 and 2013, HUF 45.3 billion (EUR 147 million) was provided for direct nature conservation investments under the Environment and Energy Operational Programme and the Central Hungary Operational Programme. The funds supported 214 projects targeting 130 000 ha of land within protected areas, with National Park Directorates receiving 66% of the funding. Most projects related to improving natural habitats or nature management infrastructure. In 2014-20, HUF 37.8 billion ha under the Environment and Energy Efficiency Operational Programme and the Central Hungary Operational Programme is available for direct nature investments. These include ecological restoration projects and investments in nature management infrastructure on at least 100 000 ha of protected areas and/or Natura 2000 sites. Additional funding of HUF 4.5 billion will be provided for ecotourism investments in National Park Directorates (down from HUF 7.3 billion over 2007-13). The drop in EU funding related to nature conservation results from shifting EU priorities, such as the focus on urban green areas and ecotourism in World Heritage Sites. In addition, numerous nature educational facilities were improved in 2007-13, reducing the need for new financing.

The nature and biodiversity component of the EU LIFE programme co-finances best practice and demonstration projects that contribute to implementation of the Birds and Habitats Directives and the Natura 2000 network. This is an important source of financing for Hungary's National Park Directorates. Over 2008-16, the programme financed 19 projects in Hungary, providing more than EUR 1 million towards total costs of EUR 2.1 million. However, changes in budgeting in 2012 may have reduced capacity to apply for EU funding (WWF Hungary et al., 2015).

5.6. Mainstreaming biodiversity into economic sectors

Hungary has done relatively well in mainstreaming biodiversity into the strategic plans for agriculture, forestry and fisheries, which are included in the National Biodiversity Strategy and managed under the same ministry. However, it has been less successful at implementation and in integrating biodiversity considerations into other sectoral strategies,

notably energy, industry, transportation and tourism. Spatial planning and EIA appear to be the main policy tools to address biodiversity impacts in these sectors.

Further work remains to reduce pesticide use, ammonia emissions and cultivation of flooded land, and to modernise irrigation systems and increase organic farming. Forest area has increased, but the plantations of non-native species are relatively large. Hungary is also one of the largest bioethanol producers in the European Union, making it important to monitor the land-use and biodiversity impacts of growing production. Policies that support biofuel production can encourage agricultural expansion, and therefore risk increased pressures on biodiversity over time.

5.6.1. Agriculture

Hungary's fertile plains, climate and water availability support a strong agricultural sector. Agricultural land, which covers 59% of total land area, consists of 48% arable land, 9% grassland and 2% gardens, vineyards and orchards. Rural residents, who represent 46% of the population, depend significantly on agriculture for employment, and the agriculture industry accounts for 15% of Hungary's gross domestic product (GDP). Farm sizes are smaller in Hungary than elsewhere in the European Union, with 87% of farms having less than 5 ha (EC, 2014a).

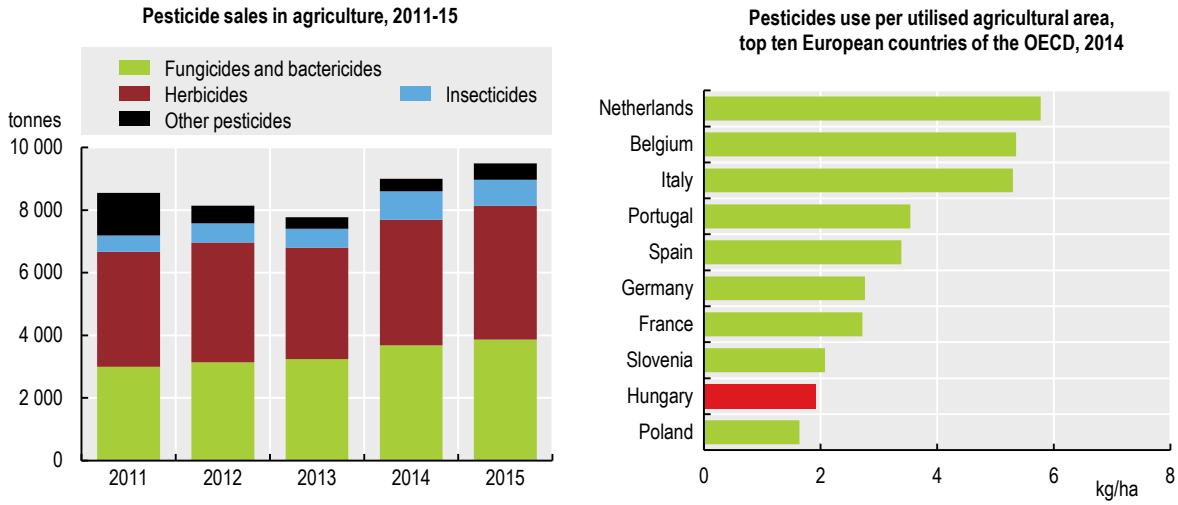
The key pressures on biodiversity in agriculture areas are from excessive use of natural resources, pesticide use, invasive species, a lack of modern technology and modern practices, and climate change (GoH, 2015). Hungary experiences both drought and flooding, yet its outdated irrigation system only covers 2.4% of the agricultural area (EC, 2014a). Legislation and flood management programmes continue to support cultivation of regularly flooded areas, threatening wetlands (CBD, 2017). The abandonment of grazing also presents a threat to grasslands (GoH, 2015).

Pesticide use

Pesticide sales in Hungary increased significantly between 2011 and 2015, and the intensity of their use per hectare is among the ten highest in European countries of the OECD (Figure 5.7). Hungary's 2012 National Plant Protection Plan describes several actions to limit pesticide use. These include limits on pesticide purchases; training and information to reduce exposure; pilot projects to showcase good practice; encouragement of organic farming; protection of vulnerable ecosystems; control of hazardous waste; and inspection of equipment. However, weather extremes, new invasive pests, EU bans of certain substances and a lack of manual labour have increased overall use of pesticides.

Hungary is also one of the few EU member countries that still allows aerial spraying of pesticides, under very strict conditions (EC, 2017). Inadequate use of fertilisers is also a risk due to accumulation of heavy metals in the soil. Heavy metals can be integrated into the food chain, acidify the soil and contaminate groundwater (GoH, 2015). The Hungarian government does not support a tax on pesticides, as is used in France, Denmark, Norway and Sweden. It is concerned that a tax would increase the purchase of black market pesticides from other countries. However, additional measures may be required to address pesticide use that is negatively impacting ecosystems and species if the Plant Protection Plan does not produce measurable improvement.

Figure 5.7. Pesticide use is increasing in Hungary



Source: Eurostat (2017),"Pesticides sales", *Agriculture statistics* (database).

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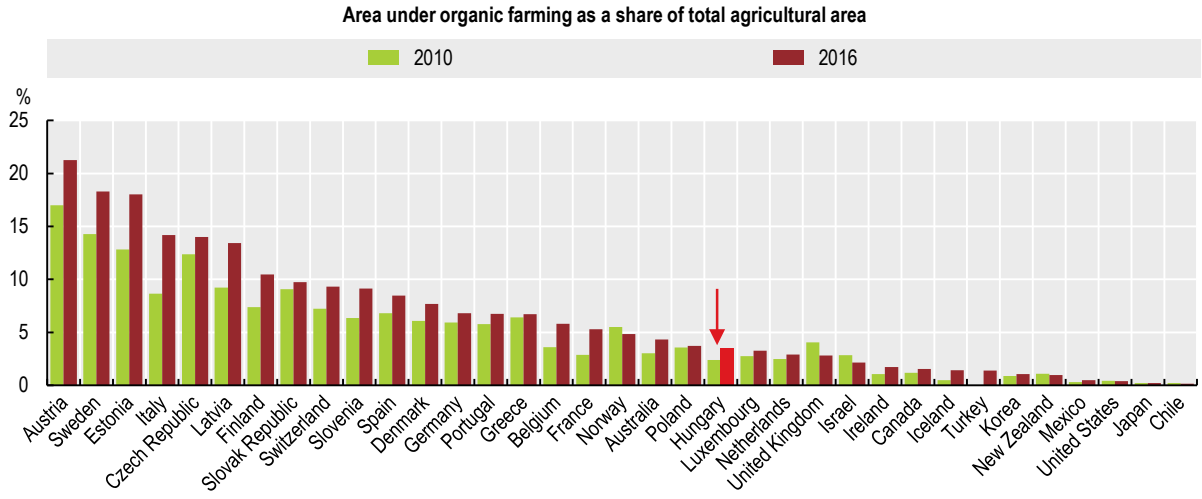
Organic farming

Organic farming could benefit biodiversity as it can reduce use of chemical or synthetic fertilisers or pesticides and limit livestock density (although additional use of manure may sometimes increase ammonia emissions and nitrate leaching). It is also an economic opportunity for Hungary, given market conditions in Europe, existing restrictions on genetically modified organisms (GMOs), and favourable climate and soil conditions for organic farming. The country has a relatively small share of organic farming compared to other OECD member countries, though the total area increased from 2.4% to 3.5% over 2010-16 (Figure 5.8). Roughly 80% to 85% of certified organic products made in Hungary are exported without processing.

In 2014, Hungary developed an Action Plan for Developing Organic Farming that focuses on incremental improvements to regulations, training, research and product promotion. The plan is in accordance with the European Action Plan for Organic Food and Farming. It aims to at least double the organic farming area (reaching 300 000 ha) and controlled livestock by 2020. It also seeks to increase organic bee colonies, local processing of animal products and use of organic products in public catering. The National Biodiversity Strategy also proposes subsidies for experimental ecological farming (GoH, 2015).

Organic farms are eligible for funding designated for sustainable agricultural practices under the EU CAP. They are also eligible for Rural Development Programme funding in 2014-20, which supports both conversion and maintenance. Achieving 350 000 ha of organic farming by 2020 will be challenging, given that the area was only 129 735 ha in 2015 – a level virtually unchanged since 2012 (FiBL and iFOAM, 2017). In 2016, the area of organic farms receiving support was 133 679 ha. At this rate, the total area would need to grow by over 35 000 ha per year to reach the 2020 target. Hungary has, however, achieved GMO-free agriculture through its 2006 strategy (MRD, 2017).

Figure 5.8. Hungary has low levels of organic farming



Note: Data refer to the share of total organic area (fully converted or under conversion) in the total utilised agricultural land (excluding kitchen gardens).
Source: Eurostat (2017), "Organic farming", *Agriculture Statistics* (database); OECD (2017), "Environmental performance of agriculture - indicators", *OECD Agriculture Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933713004

Ammonia emissions

Agriculture accounts for over 90% of ammonia (NH_3) emissions in Hungary (EMEP, 2017). Ammonia contributes to acid deposition and eutrophication, affecting soil and water quality (Section 5.2.1). The EU directive on atmospheric pollutants (2016/2284/EU) sets a target for Hungary to reduce ammonia emissions by 10% below 2005 levels over 2020-29 and by 32% thereafter. In 2015, Hungary's ammonia emissions were 1% below 2005 levels. However, this is higher than 2010 levels, which had reached 10% below 2005 (EMEP, 2017). Further effort, through increased regulation or taxation, is needed to reduce agricultural sources of ammonia emissions, to both meet the EU directive and address eutrophication in Hungary's lakes.

Agriculture subsidies

Hungary has not assessed environmentally harmful subsidies comprehensively. However, it has committed to review support policies detrimental to the preservation of agricultural biodiversity and amend them as necessary in its National Biodiversity Strategy. The National Rural Development Strategy 2012-20 also sets a target to revise harmful subsidies. In 2015, agricultural support was reformed in line with the EU CAP and environment-related support was added. The revised programme aims to maintain permanent grasslands, promote crop diversification and encourage designation of agriculture that is environmentally friendly. There are indications, however, that some subsidies harmful to biodiversity remain, such as those related to flood protection that encourage the drainage of regularly flooded land important to birds and other species.

In 2012, Hungarian farmers received HUF 650 billion (EUR 2.1 billion) in agricultural-rural development support. Of this amount, 14% was related to environmental measures that contribute directly or indirectly to biodiversity. Since the reform of the EU CAP in 1999, agro-environmental measures have been mandatory for

rural development programmes of member states. In Hungary, 20% of the agricultural area is now part of the agri-environmental programme, of which 48% is dedicated to the preservation of agricultural biodiversity (GoH, 2015).

The agri-environmental programme has a focus on high nature value areas (HNVAs). These encourage the preservation and maintenance of nature-friendly farming, habitat protection, the continuation of biodiversity and protection of the landscape and cultural values. The total area of designated HNVAs in Hungary is 1.2 million ha, with 900 000 ha eligible for support. In 2011, farmers requested payments for more than 94 000 ha of arable land and more than 100 000 ha of grassland (GoH, 2015). As noted in Section 5.5.3, National Park Directorates also receive EU subsidies for environmentally friendly farming in protected areas. It will be important to gradually expand the promotion of environmentally friendly farming practices through both information provision and subsidy programmes to all agricultural areas until sustainable practices are widespread.

As mentioned in Section 5.5.2, payments are available for Natura 2000 grasslands to compensate farmers for restrictions put in place. Farmers may apply for an annual payment of EUR 69 per hectare. The amount of compensated area has grown from 75 000 ha to 319 000 ha over the past eight years. Farmers are also eligible for public support for investments that have a positive environmental impact but do not generate a financial return (EUR 6.4 million was received between 2011 and 2015, and EUR 19 million more is available for 2014-20). In addition, the Ministry of Agriculture launched the Productive Village Programme to revitalise former backyard orchards and vineyards to both increase rural incomes and preserve the genes of local fruits. Hungary could consider a broader payment for ecosystem services programme for sustainable farming practices outside of protected areas. This might be financed through taxes on negative inputs to, or outputs from, agriculture such as pesticide use and ammonia emissions.

5.6.2. Fisheries and aquaculture

As noted in Section 3.2, no permits have been issued for commercial fishing since 2016. Aquaculture, which dominates the fisheries sector, is expected to continue growing. Aquaculture can have both positive and negative impacts on biodiversity. In Hungary, 80% of bird species and 60% of otters live on fish farms (PMO, 2015). While this is positive for birds and otters, this can be harmful to aquaculture production. Aquaculture can also reduce pressure on overexploited wild fish stocks and promote species diversity. However, careful management is important for several reasons (Diana, 2009). Non-native species that escape from aquaculture can become invasive and effluents can cause eutrophication. In addition, there is a risk of disease transmission to wild fish. Finally, ecologically sensitive lands should not be used. These risks are more relevant for intensive aquaculture than fish ponds.

Aquaculture production grew by almost 35% over 2000-15, reaching 1.3% of EU-28 aquaculture production in 2015 (FAO, 2017). The majority of production comes from extensive fish ponds (GoH, 2014b). Carp remains the main fish species produced in fish ponds, but geothermal water resources are providing potential for other species such as the African catfish in intensive systems (Varadi, 2011). Hungary ranks seventh within the European Union in freshwater aquaculture production, representing 6.2% of the total volume. However, it is the third largest producer of common carp and the second largest

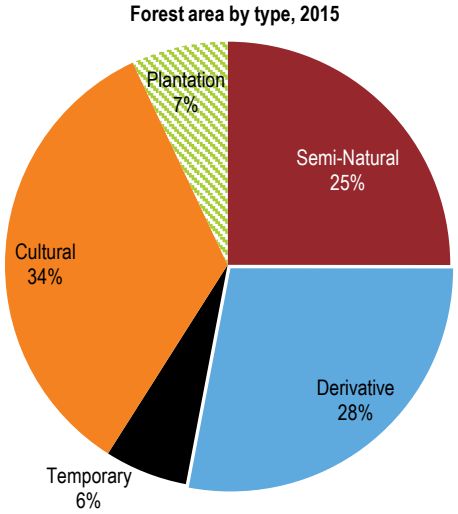
producer of North African catfish. The Multiannual National Strategy Plan on Aquaculture of Hungary targets a 25% increase in production from 2013 levels by 2023.

Despite some advancements, Hungary (along with other Central and Eastern European countries) has generally lagged in aquaculture innovation relative to other OECD member countries (Varadi, 2011). There is no direct reference to aquaculture in the National Biodiversity Strategy. However, Hungary's Fisheries Operational Programme 2014-20 sets an objective to protect and restore aquatic biodiversity and ecosystems and promotes environmentally-friendly aquaculture. Under the EU Common Fisheries Policy, aquaculture producers may be eligible for financing from the European Maritime and Fisheries Fund for conversion to organic aquaculture (which requires biodiversity-friendly approaches) that covers loss of revenue or additional costs for three years (EC, 2014b).

5.6.3. Forestry

Forest cover (as the share of the total terrestrial area) has increased from a low of 11% in the mid-20th century to 23% in 2014. Significantly, 53% of the forested area is considered favourable to biodiversity because it is close to natural (derivative) or semi-natural (the area covered by natural forests is negligible). The remaining 47% is mainly plantations and semi-plantations of non-native species (Figure 5.9). Some non-native species can be harmful to biodiversity in certain circumstances. For example, the false acacia (black locust) that represents 24% of forest area, can be considered invasive in some environments when it is planted near native vegetation, as it can reduce light for plants and invertebrates and change the microclimate and soil quality (SEP, 2017). Other invasive species represent only around 1% of total managed forest area, but can be relatively concentrated in some regions such as river flood basins. Almost 24% of forests have nature conservation as their primary function, but strict forest reserves account for only 0.6% of total forest area (GoH, 2014b).

Figure 5.9. More than half of Hungary's forests are considered favourable to biodiversity



Source: GoH (2015), *National Strategy for the Conservation of Biodiversity in 2015-2020.*

StatLink http://dx.doi.org/10.1787/888933713023

While the overall proportion of forests is low, nearly 60% of forests are located in blocks larger than 1 000 ha. The health condition of Hungary's forests is considered good in comparison to other EU countries and has not changed considerably in the last few years. The government has set a goal of reaching 27% forest coverage by 2050 (GoH, 2017). The area of indigenous trees is increasing, but the overall extent of forest in Hungary only increased by 0.2% between 2010 and 2015 (FAO, 2015; GoH, 2015). Afforestation in protected areas is limited to native tree species. The EU Rural Development Programme provides HUF 50 billion (EUR 160 million) for afforestation over 2014-20, but this will only allow for the plantation of 25 000 ha. The Ministry of Agriculture is, however, planning to launch a national programme to increase forest cover to meet afforestation goals and support biomass energy expansion.

The Forest Act renewed in 2009 categorises forests according to the ratio of native, introduced and invasive tree species. Different management objectives are set for each category, with regulatory decrees specifying tree species for afforestation and forest regeneration, rotation ages by stand categories, the size of buffer zones around bird nesting places and other restrictions. Compensation for forest owners affected by Natura 2000 restrictions began in 2012 and covered 90 000 ha in 2014. Some forestry companies have also implemented management methods voluntarily. Modification of the Forest Act in 2016 has, however, raised concerns among environmental groups about weakening biodiversity safeguards and sustainable forest management. Specifically, they question policies that promote the economic function of forests, that shift the concept of sustainable forest management away from close-to-nature management and that allow the cutting of native tree species with replacement by non-native species (WWF Hungary et al., 2016).

Forest certification has increased, growing from no certification in 2000 to 321 000 ha in 2014 (25% of forest designated for production). All certification is with the Forest

Stewardship Council, which implies that products come from responsibly managed forests that are evaluated to meet both environmental and social standards. Further growth in the percentage-certified forest would be worthwhile, consistent with the National Biodiversity Strategy objective to increase nature-friendly forestry.

5.6.4. Spatial planning

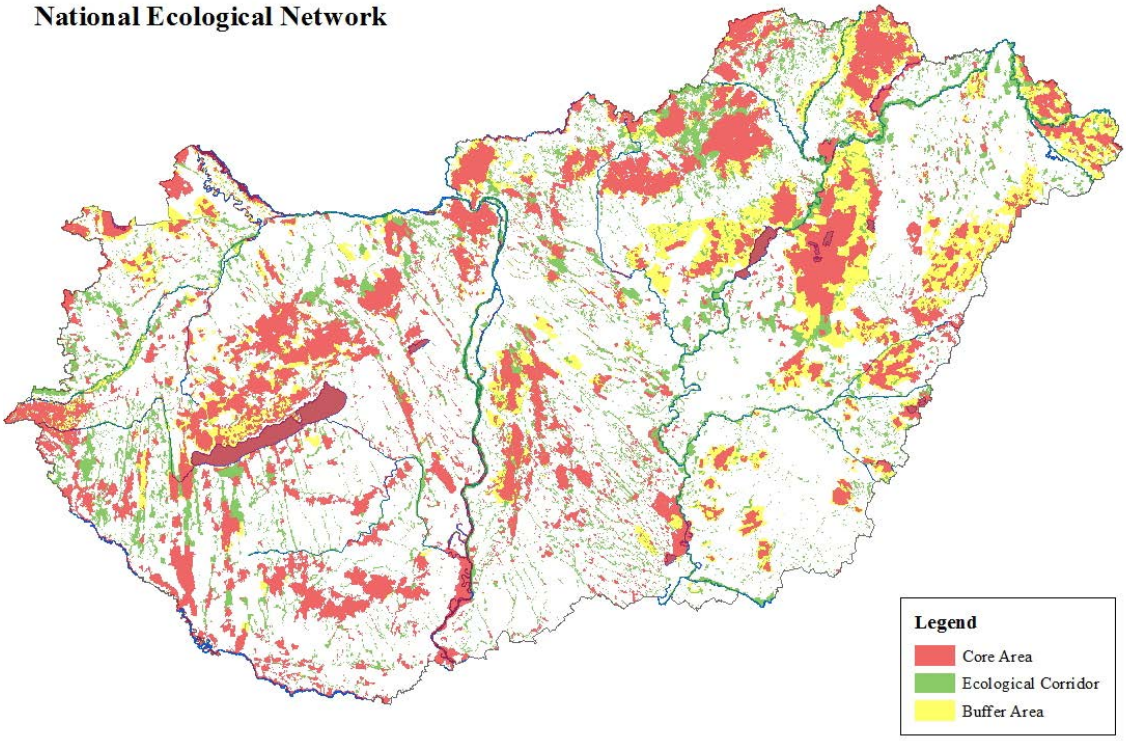
Outside of the agriculture, forestry and fishery/aquaculture sectors, there is little direct reference to biodiversity-related actions in sectoral plans and no reference to other sectors in the National Biodiversity Strategy. In those other sectors, spatial planning is a key tool for mainstreaming. However, it is not clear that decision makers always give equal weight to biodiversity considerations in specific development projects.

Hungary's National Spatial Plan, developed by the Prime Minister's Office, was established through legislation in 2003. It defines specific zones, with detailed regulation of what can take place within the zones. These requirements must guide municipal-, regional- and national-level planning. The plan has also undergone a SEA.

The National Ecological Network (updated in 2014) includes natural and semi-natural habitats of national importance (including Natura 2000 areas) and a system of ecological corridors and buffer zones that links the core areas together. The network covered 36.4% of the country in 2016, up 0.4% from 2008 (Figure 5.10). Of the total area, 54% is defined as core, 25% as ecological corridors and 21% as buffer zones. The National Spatial Plan imposes rules that restrict development, transportation infrastructure or new open pit mines within the zone. For example, transport infrastructure is permitted as long as it integrates wildlife passages below or above highways, which ensure the survival of natural habitat and functioning of ecological corridors. However, technical solutions will not be enough to mitigate the impacts of habitat fragmentation or loss for some species. The zones of the network, in terms of core areas, ecological corridors and buffer zones, were harmonised with the Pan-European ecological network category system in 2009.

There are also other zones with specific requirements, including the Zone of High Water Bed (3% of territory); the Zone of Excellent-quality Forest Areas (12% of territory); the Zone of World Heritage Sites; the Zone of Excellent-quality Arable Land Areas; and the Zone of Areas of High Importance Landscape. Regional and county spatial plans guide settlement structural plans at the local level. As noted in Chapter 2. , SEA of local structural plans has been required since 2005, but very few have actually been conducted.

Figure 5.10. The Zone of National Ecological Network covers a significant portion of Hungary



Source: Country submission.

The National Environmental Programme also includes objectives related to increasing both the quantity and quality of urban green spaces. Most implementation measures are, however, at the county and local level. These include surveying underused urban areas and increasing their green spaces by giving them new functions and setting up a cadastre of brownfield sites at the municipal level. Environmental groups have, however, expressed concern that these measures are not implemented.

Transportation, and road transport in particular, is also rapidly increasing. Approximately 394 km of new highways were built in 2009-16. Some new roads affect protected areas, despite the requirements of the National Spatial Plan. A 2009 study estimated the annual costs of habitat fragmentation and loss associated with the public road network at HUF 34.4 billion (EUR 111 million). The costs of the railway network were estimated at HUF 19.5 billion (EUR 63 million) (Lukács et al., 2009). The National Environmental Programme calls for consideration of nature, environment, water management, and landscape conservation aspects during preparation and implementation of transport infrastructure. This, in turn, would help mainstream conservation of ecological values. However, implementation is weakened by a lack of biodiversity expertise and territorial-level indicators to support decision making. The new Operational Programme for Integrated Transport anticipates the addition of almost 240 km of highway and prioritises international road and railway accessibility (EC, 2014d).

5.6.5. Energy

The Hungarian Energy Strategy 2030 includes a section on environmental protection and nature conservation, and references landscape and nature conservation requirements in environmental assessments (MND, 2012). No specific measures are outlined, however.

Hungary is one of the largest bioethanol producers in the European Union. Biofuels and biomass electricity production can encourage agricultural expansion, and therefore affect biodiversity. The European Union has set a 2020 target of 10% renewable energy content in transport energy consumption. A country can reach this target through biofuels, electro-mobility and biogas-based transport. Conventional biofuels, which are mainly produced from corn, are permitted to contribute no more than 7% to the target.

The EU directive to reduce indirect land-use change for biofuels and bioliquids (2015/1513/EU) restricts the amount of biofuels produced from food sources. The European Commission has also recommended phasing out conventional biofuels after 2020. In Hungary, mandatory blending requirements for biofuels have been the main policy tool since 2011. The compulsory inclusion level is set at 4.9%, and will go up to 6.4% for 2019-20. While Hungary's production of biofuels increased significantly between 2000 and 2014, the amount of land used for it decreased by around 4% and is not expected to increase despite the 2020 target.

Biomass use for heat and power production has also increased (Chapter 1.). Hungary has targets to reach 10.9% renewables in electricity generation, and 18.9% in heating and cooling by 2020. The biomass volume used for this purpose has not yet had a significant impact on land-use change. Future increases in forest plantations intended for energy use could, however, negatively affect biodiversity, depending on the tree species used and forestry practices. In its 2017 review of Hungary, the International Energy Agency posited that the country was close to reaching the limits of biomass production. It recommended pursuit of other renewable technologies such as solar, wind and geothermal (IEA, 2017).

While Hungary has only three major hydroelectric power plants, the facilities must build and operate fish ladders when obstructing the passage of fish on watercourses. Natural or near-natural shoreline of watercourses and lakes are also conserved as a wetland habitat.

5.6.6. Industry

Industry, including construction, represented 32% of value added in Hungary in 2015. Within the industry sector, the main sub-sectors are food products, beverages and tobacco; rubber and plastic products; basic metals and fabricated metal products; and chemicals and chemical products (HCSO, 2017a). Hungary's oil and gas and mining sectors are relatively small, but there is potential for growth in the future. Sectoral strategies do not include specific measures or indicators relating to biodiversity.

Industrial impacts on biodiversity, water and soil are, however, covered by the EU Environmental Liability Directive, which has been transposed into Hungarian law (Chapter 2.). EIA can also address the impact of industrial projects on biodiversity. Indications are that the green economy element of the 2016 Irinyi Plan on Innovative Industry Development Directions in Hungary will promote the use of renewable technologies, renewable energy, the circular economy and improved resource efficiency. It could be expanded, however, to also make linkages to biodiversity and limiting risks from pollution or industrial accidents, such as the major toxic spill from a Hungarian alumina factory in 2010 (Chapter 2.). The 2010 incident clearly shows that industrial

accidents can be devastating for biodiversity. Adequate preventive measures recommended by the OECD in the areas of chemical safety and waste management (as part of the OECD acquis) can ultimately support the protection of biodiversity and the environment.

Although mining represents only 0.2% of GDP, Hungary has a number of exploitable deposits of bauxite, manganese and uranium, as well as reserves of crude oil, natural gas, coal and lignite. The Hungarian government is interested in pursuing economic opportunities in mining and fossil fuels, and reducing dependence on imports.

Expanded mining and fossil fuel extraction could have an impact on biodiversity if not managed carefully. Habitat destruction, fragmentation and pollution would be significant risks. Many mineral deposits are located in mountain areas that are both popular tourist attractions and valuable habitat for biodiversity. The National Environmental Programme includes an objective to reduce the environmental impacts and damages during extraction and use of mineral raw materials. However, the measures related to the objective are not specific to biodiversity.

5.6.7. Tourism

The number of overall visits to Hungary increased by almost 20% between 2009 and 2016 (HCSO, 2017b). Eco-tourism is also becoming more popular. Between 2008 and 2014, the number of guest nights and accommodations on national protected areas in Hungary increased by 30.6%. Increased tourism can help contribute to knowledge and awareness of biodiversity. At the same time, it can have negative impacts from increased waste, ecosystem degradation, habitat fragmentation, pollution, soil erosion and disturbance of endangered species.

Inside protected areas in Hungary, the location of visitor infrastructure and nature trails is carefully chosen to avoid impacts on sensitive habitats and species. Outside of protected areas, however, there are few restrictions relating to the impacts of tourism on biodiversity. A travel website for Hungary developed by the Hungarian Tourism Organisation emphasises opportunities for fishing and hunting as part of eco-tourism, but makes no reference to restrictions (GotoHungary, 2017).

Hungary's National Tourism Development Strategy 2030 is the core document defining the system of targets and methods for tourism management. The document does reference the importance of ecological sustainability and the risks of climate change, intense urbanisation and excessive tourism to popular destinations. It even includes a goal of "co-operative tourism" that works in harmony with the environment. However, no indicator for measuring progress relates to the environment or biodiversity (HTA, 2017). Rather, the focus is on increasing tourism, with a goal of increasing the contribution of tourism to GDP from 10% to 16% by 2030 (BBJ, 2017). The National Environmental Programme includes a section on tourism, but focuses on objectives related to expanding eco-tourism. It does not address pressures to biodiversity from tourism.

As tourism expands in Hungary, it will be increasingly important to make direct linkages with biodiversity priorities at the national, regional and local levels. In this way, Hungary can identify specific policies and indicators for the sector and include them in tourism and biodiversity strategies. The UN World Tourism Organization (UNWTO) developed recommendations relating to tourism and biodiversity in 2010. For its part, the Secretariat of the Ramsar Convention partnered with UNWTO in 2012 to provide guidance on sustainable tourism in wetlands (UNWTO, 2010; SRCW/UNWTO, 2012). Private

operators within the tourism industry could also be encouraged to seek sustainable tourism certification through the Global Sustainable Tourism Council or another body. Chile, for example, created its own sustainable criteria for Chilean Tourist Accommodation and Destinations, drawing on work by the UNWTO (OECD/ ECLAC, 2016).

Recommendations on biodiversity protection

Strategic and institutional framework

- Expand the National Biodiversity Strategy to incorporate specific commitments and indicators related to energy, transport, tourism, industry and mining; improve policy coherence and cross-linkage with sectoral strategies and plans; ensure clear accountability for achieving targets; identify financial and human resources for specific actions to achieve targets.

Information systems

- Continue to improve knowledge of the extent and value of ecosystem services and habitat and soil maps within and outside protected areas, sectoral data sharing, and accessibility and communication of information to the public.

Biodiversity protection and financing

- Ensure measures are in place to enhance the conservation status of threatened species, both in and outside protected areas by improving wildlife corridors and restricting infrastructure expansion to reduce fragmentation of habitats.
- Complete management plans of protected areas with legal force and ensure sufficient financial resources for effective implementation; provide dedicated budgets for nature conservation departments to improve the predictability of financing and reduce the risk of shifting short-term priorities; increase budget funding for National Park Directorates to reduce the need for substantial revenue-raising activity that may be contrary to biodiversity objectives.

Mainstreaming biodiversity across sectors

- Implement additional measures in the agricultural sector to reduce ammonia emissions, curb pesticide use and limit cultivation of flooded land; use subsidies and payments for ecosystem services and information provision to promote the modernisation of irrigation systems, nature conservation and restoration activities outside of protected areas; significantly increase the share of organic farming.
- Expand afforestation of indigenous species beyond protected areas; increase sustainability certification of forest companies; maintain sustainable forest management objectives.
- Improve the effectiveness of the National Ecological Network Zone instrument and other spatial planning policies by developing regional-level biodiversity indicators and using biodiversity experts to support informed decisions; avoid destruction of green space and fragmentation of habitat where possible, including in areas with no formal protection.
- Monitor the impact of biofuel and biomass production on land-use change and other factors influencing biodiversity, producing publicly available indicators to help inform decision making; give preference to added-value organic farming over biofuel and biomass production.

Note

[1] According to the Forest Act of 2009, the national definition of forest area refers to land area spanning at least 0.5 hectares, including specific tree species, higher than 5 metres and with a canopy cover of at least 50%.

References

Bata, T. and G. Mezosi (2013), *Assessing Landscape Sensitivity Based on Fragmentation Caused by the Artificial Barriers in Hungary*, April 2013, University of Szeged, www.researchgate.net/publication/272124261.

BBJ (2017), "Tourism strategy focuses on sports, culture and health", Budapest Business Journal, 17 October 2017, https://bbj.hu/politics/tourism-strategy-focuses-on-sports-culture-and-health-_140324.

Benedetti, L. (2015), "Hungary's nature is in peril", Birdlife Hungary News blog, 11 May 2015, www.birdlife.org/europe-and-central-asia/news/hungary%E2%80%99s-nature-peril.

CBD (2017), Hungary – Country Profile website, www.cbd.int/countries/profile/default.shtml?country=hu (accessed 20 June 2017).

CCH (2017), *The Constitutional Court Adopted Another Decision Protecting Natural Resources*, The Constitutional Court of Hungary, 26 October 2017, http://hunconcourt.hu/announcement/the-constitutional-court-adopted-another-decision-protecting-natural-resources-2/.

Climate Change Post (2017), Biodiversity Hungary website, www.climatechangepost.com/hungary/biodiversity/ (accessed 20 June 2017).

Diana, J.S. (2009), "Aquaculture production and biodiversity conservation", *Bioscience,* Vol. 59/1, Oxford University Press, pp. 27-38, https://doi.org/10.1525/bio.2009.59.1.7.

EC (2018), Commission Implementing Decision (EU) 2018/38 of 12 December 2017 adopting the ninth update of the list of sites of community importance for the Pannonian biogeographical region, Official Journal of the European Union, 19 January 2018, http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018D0038&from=EN.

EC (2017a), "Attitudes of European citizens towards the environment", *Special Eurobarometer*, No. 468, October 2017, European Commission, Brussels, http://mehi.hu/sites/default/files/ebs_468_en_1.pdf.

EC (2017b), Report from the Commission to the European Parliament and the Council on Member State National Action Plans and on progress in the implementation of Directive 2009/128/EC on the Sustainable Use of Pesticides, 10 October 2017, European Commission, Brussels, https://ec.europa.eu/food/sites/food/files/plant/docs/pesticides_sup_report-overview_en.pdf.

EC (2014a), *Factsheet on 2014-2020 Rural Development Programme for Hungary*, European Commission, Brussels, http://ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/country-files/hu/factsheet-hungary_en.pdf.

EC (2014b), *Organic Farming: A Guide on Support Opportunities for Organic Producers in Europe*, European Commission, Brussels, https://ec.europa.eu/agriculture/organic/sites/orgfarming/files/docs/body/support-opportunities-guide_en.pdf.

EC (2014c), *Summary of the Partnership Agreement for Hungary, 2014-2020*, 26 August 2014, European Commission, Brussels, www.palyazat.gov.hu/program_szechenyi_2020.

EC (2014d), *Integrated Transport Operational Programme 2014-2020: Hungary*, European Commission, Brussels, http://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/hungary/2014hu16m1op003.

EC (2013), "Impact Assessment" accompanying the document Proposal for a Council and European Parliament Regulation on the prevention and management of the introduction and spread of invasive alien species, *Staff Working Document,* SWD 2013, 0321 final, European Commission, Brussels, http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52013SC0321&from=EN.

EC (2009), *Natura 2000 in the Pannonian Region*, European Commission, Brussels, http://ec.europa.eu/environment/nature/natura2000/platform/knowledge_base/150_pannonian_region_en.htm.

EEA (2011), "Landscape fragmentation in Europe", *EEA Report,* No. 2/2011, European Environment Agency, Copenhagen, www.eea.europa.eu/publications/landscape-fragmentation-in-europe.

EMEP (2017), *WebDab* (database), www.ceip.at/webdab_emepdatabase/ (accessed 11 October 2017).

FAO (2017), *FAO Statistics, Global Aquaculture Production* (database), www.fao.org/fishery/statistics/global-aquaculture-production/en (accessed 18 June 2017).

FAO (2015), Global Forest Resources Assessment 2015 website, www.fao.org/forest-resources-assessment/en/ (accessed 25 June 2017).

FiBL and iFOAM (2017), *The World of Organic Agriculture 2017*, Willer, H. and J. Lernoud, eds., Research Institute of Organic Agriculture and Organics International, Frick, Switzerland, https://shop.fibl.org/CHen/mwdownloads/download/link/id/785/?ref=1.

GoH (2017), *National Landscape Strategy (2017-2026),* Government of Hungary, Budapest, www.kormany.hu/download/f/8f/11000/Hungarian%20National%20Landscape%20Strategy_2017-2026_webre.pdf.

GoH (2015), *National Strategy for the Conservation of Biodiversity in 2015-2020*, Government of Hungary, Budapest, www.cbd.int/doc/world/hu/hu-nbsap-v2-en.pdf.

GoH (2014a), *National Summary for Article 17*, Government of Hungary, Budapest, https://circabc.europa.eu/sd/a/d5c1f10b-7a2d-444d-9738-c8cdd0295b9f/HU_20140528.pdf.

GoH (2014b), *Fifth National Report to the Convention on Biological Diversity – Hungary*, Government of Hungary, Budapest, April 2014, www.cbd.int/doc/world/hu/hu-nr-05-en.pdf.

GoH (2013), *National Framework Strategy on Sustainable Development of Hungary*, Government of Hungary, Budapest, www.stakeholderforum.org/fileadmin/files/National%20Framework%20Strategy%20on%20Sustainable%20Development.pdf.

GotoHungary (2017), Back to Nature! Ecotourism in Hungary website, http://gotohungary.com/eco-tourism2 (accessed 16 November 2017).

HCSO (2017a), Value of industrial production and sales, in *Time Series of Annual Data – Industry,* Hungarian Central Statistical Office, www.ksh.hu/stadat_annual_4_2 (accessed 12 June 2017).

HCSO (2017b), The number of inbound trips to Hungary and the related expenditures, in *Time Series of Annual Data – Tourism, Catering 2009-2016*, Hungarian Central Statistical Office, www.ksh.hu/docs/eng/xstadat/xstadat_annual/i_ogt002a.html (accessed 4 July 2017).

HDN (2017), "Government accepts tourism development strategy in Hungary", Hungarian Daily News, 16 October 2017, https://dailynewshungary.com/government-accepts-tourism-development-strategy-hungary/.

HTA (2017), *National Tourism Development Strategy 2030: Executive Summary*, Hungarian Tourism Agency, Budapest, http://szakmai.itthon.hu/documents/28123/44398839/mtu_strategia_2030-english.pdf/79fc6922-095c-4e7b-89de-6aeebaa49f91.

ICPDR (2015), The Danube River Basin District Management Plan: Update 2015 website, www.icpdr.org/main/management-plans-danube-river-basin-published (accessed 3 July 2017).

ICPDR (2006), Danube Facts and Figures: Hungary website, www.icpdr.org/main/danube-basin/hungary (accessed 3 July 2017).

IEA (2017*), Energy Policies of IEA Countries: Hungary 2017*, IEA, Paris, http://dx.doi.org/10.1787/9789264278264-en.

IUCN (2013), *Hungary's Biodiversity at Risk: A Call for Action*, International Union for Conservation of Nature, May 2013, https://cmsdata.iucn.org/downloads/hungary_s_biodiversity_at_risk_fact_sheet_may_2013.pdf.

Lukács, A. et al. (2009), *The Social Balance of Road and Rail Transport in Hungary*, www.levego.hu/sites/default/files/social_balance_transport_hungary_20110131.pdf.

Mihók, B. et al. (2017), "Biodiversity on the waves of history: Conservation in a changing social and institutional environment in Hungary, a post-soviet EU member state", *Biological Conservation,* Vol. 211 (2017), Elsevier, Amsterdam, pp. 67-75, http://dx.doi.org/10.1016/j.biocon.2017.05.005.

MND (2012), *National Energy Strategy 2030*, Ministry of National Development of Hungary, Budapest, www.iea.org/media/pams/hungary/HungarianEnergyStrategy2030.pdf.

MRD (2017), Together for a GMO-free Agriculture website, http://gmo.kormany.hu/domestic-regulation (accessed 3 July 2017).

NPT (2017), Nemzeti Parki Termék (National Park Products) website, http://nemzetiparkitermek.hu/ (accessed 15 September 2017).

OECD/ECLAC (2016), *OECD Environmental Performance Reviews: Chile 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264252615-en.

OMSZ (2017), *Informative Inventory Report 2015*, (CLRTAP reporting) Hungarian Meteorological Service, Budapest.

OMSZ (2017), *National Inventory Report for 1985-2015*, (UNFCCC reporting) Hungarian Meteorological Service, Budapest.

PMO (2015), *Fisheries Operational Programme of Hungary 2007-2013*, Prime Minister's Office, http://halaszat.kormany.hu/download/9/6c/01000/HOP2007-2013_4mod_eng20150521.pdf.

Ramsar (2017), Annotated List of Wetlands of International Importance: Hungary website, www.ramsar.org/wetland/hungary (accessed 29 June 2017).

Salamin, G. (2009), "Planning spatial development in Hungary", presentation at the national processes and co-operation of Visegrád four countries workshop, Vienna, 17 June 2009, www.oerok.gv.at/fileadmin/Bilder/2.Reiter-Raum_u._Region/1.OEREK/OEREK_2011/8_SALAMIN_VATI.pdf.

SEP (2017), "Invasive black locust tree can have sustainable future despite biodiversity impacts", *Science for Environmental Policy*, 1 June 2017, Issue 489, European Commission DG Environment

News Alert Service, edited by the SCU, the University of the West of England, Bristol, http://ec.europa.eu/environment/integration/research/newsalert/pdf/invasive_black_locust_tree_can_have_sustainable_future_despite_biodiversity_impacts_489na4_en.pdf.

SRCW/UNWTO (2012), *Destination Wetlands: Supporting Sustainable Tourism*, Secretariat of the Ramsar Convention on Wetlands, Gland and World Tourism Organization, Madrid, http://cf.cdn.unwto.org/sites/all/files/pdf/ramsar_unwto_tourism_en.pdf.

Thorpe, N. (2017), "Hungary approves strict regulations on foreign-funded NGOs", BBC News, 13 June 2017, www.bbc.com/news/world-europe-40258922.

UNWTO (2010), *Tourism and Biodiversity – Achieving Common Goals Towards Sustainability*, Madrid, www.e-unwto.org/doi/pdf/10.18111/9789284413713.

Varadi, L. (2011), *Aquaculture Innovation in Hungary*, Research Institute for Fisheries, Aquaculture and Irrigation, Szvaras, http://halaszat.kormany.hu/download/e/51/20000/Aquaculture%20Innovation%20in%20Hungary.pdf.

Vitková, M. et al. (2017), "Black locust (Robinia pseudoacacia) beloved and despised: A story of an invasive tree in Central Europe", *Forest Ecology and Management*, Vol. 384, 15 January 2017, Elsevier, Amsterdam, pp. 287-302, https://doi.org/10.1016/j.foreco.2016.10.057.

WWF Hungary, Hungarian Birds and Nature Conservation Association, and Hungarian Association of Nature Conservationists (2016), *Letter to Minister of Agriculture March 11, 2016*, Budapest, http://wwf.hu/media/file/1457710173_FazekasS_erdotorveny_level-final.pdf.

WWF Hungary, Hungarian Birds and Nature Conservation Association, and Hungarian Association of Nature Conservationists (2015), *List of Harmful Government Decisions on Nature Management*, http://wwf.hu/media/file/1491205791_WWF_honlapra_GL_0303.docx.

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