OECD Environmental Performance Reviews

TURKEY

2019

OECD

OECD Environmental Performance Reviews: Turkey 2019

OECD

BETTER POLICIES FOR BETTER LIVES

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document, as well as any data 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.

Please cite this publication as:
OECD (2019), *OECD Environmental Performance Reviews: Turkey 2019*, OECD Environmental Performance Reviews, OECD Publishing, Paris.
https://doi.org/10.1787/9789264309753-en

ISBN 978-92-64-30974-6 (print)
ISBN 978-92-64-30975-3 (pdf)
ISBN 978-92-64-30976-0 (HTML)
ISBN 978-92-64-30977-7 (epub)

Series: OECD Environmental Performance Reviews
ISSN 1990-0104 (print)
ISSN 1990-0090 (online)

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.

Photo credits: Cover © Özkan Uluçam/Shutterstock.com, Elena Shchipkova/Shutterstock.com

Corrigenda to OECD publications may be found on line at: *www.oecd.org/about/publishing/corrigenda.htm*.

© OECD 2019

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgement of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to *rights@oecd.org*. Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at *info@copyright.com* or the Centre français d'exploitation du droit de copie (CFC) at *contact@cfcopies.com*.

Preface

This third Environmental Performance Review of Turkey shows that the country's strong economic growth has been relatively decoupled from air emissions, energy use, waste generation and water consumption. However, it still faces many environmental challenges. Turkey's fast-growing energy demand continues to depend heavily on fossil fuels, particularly coal. Turkey's greenhouse gas emissions increased the most of all OECD member countries over the past decade. Power sector and transport emissions of fine particulate matter create a serious health concern. Currently, over 90% of municipal waste is landfilled.

To address the increasing environmental pressures, Turkey needs to step up its transition towards greener growth. The country has strengthened its institutional framework to address environmental challenges. It has also substantially upgraded its environmental regulations, bringing them closer to European Union requirements. However, several key instruments such as strategic environmental assessment and integrated permitting have to be fully implemented, and compliance monitoring needs to be strengthened. More progress is called for in improving access to environmental information.

Environmentally related taxes are high, but could be streamlined to remove distortive incentives for used vehicles. Gradual removal of fossil fuel subsidies would also be instrumental in promoting cleaner energy and transport options. Stronger eco-innovation policies would allow Turkey to capture greater economic benefits from a transition to green growth.

The review looks in detail at climate change and urban wastewater management. Turkey's greenhouse gas emissions are not yet projected to peak despite significant investments in renewable energy and energy efficiency improvements. Climate change mitigation needs to be enhanced. Turkey should ratify the Paris Agreement and identify sector-specific emission reduction targets. Climate change vulnerability and impacts are expected to be significant, especially in the water sector. Concrete adaptation efforts are necessary at the local level.

In urban wastewater management, Turkey has made substantial progress in terms of access to wastewater collection networks and treatment facilities, and is planning further investments in sanitation services. The country would benefit from co-ordinating water and wastewater infrastructure development with river basin planning to avoid excessive capital and operational costs for utilities and to keep consumer tariffs affordable.

This review is the result of extensive policy dialogue between Turkey and the other members and observers of the OECD Working Party on Environmental Performance. It presents 36 recommendations to help Turkey 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 Turkey as it continues to design, develop and deliver 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 Turkey'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 Turkey'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 Turkey for its co-operation in providing information, for the organisation of the review mission to Ankara (3-6 April 2018) and for facilitating contacts both inside and outside government institutions.

Thanks are also due to the representatives of the two examining countries, Jiyoung Shin (Korea) and Margarida Monte (Portugal).

The authors of this report were Tatiana Efimova, Eugene Mazur, Mauro Migotto and Mikaela Rambali from the OECD Environment Directorate and Rachel Samson of Carist Consulting. Nathalie Girouard provided oversight and guidance. Mauro Migotto also provided statistical support; Jennifer Humbert and Mika Hosokawa provided editorial and administrative support; and Mark Foss copy-edited the report. Natasha Cline-Thomas provided communications support. Preparation of this report also benefited from comments from several members of the OECD Secretariat, including Jane Ellis, Michael Mullan, Kathleen Dominique, Xavier Leflaive and Matthew Griffiths of the Environment Directorate, Rauf Gonenc of the Economics Department, Kurt van Dender and Luisa Dressler of the Centre for Tax Policy, and Sylvia Beyer of the International Energy Agency.

The OECD Working Party on Environmental Performance discussed the draft Environmental Performance Review of Turkey at its meeting on 7 November 2018 in Paris, and approved the Assessment and recommendations.

Table of contents

Preface **3**

Foreword **5**

Reader's guide **13**

Abbreviations and acronyms **14**

Basic statistics of Turkey **17**

Executive summary **19**

Assessment and recommendations **23**

1. Environmental performance: Trends and recent developments 24
2. Environmental governance and management 28
3. Towards green growth 31
4. Climate change 38
5. Urban wastewater management 45
References 49
Annex 1.A. Actions taken to implement selected recommendations of the 2008 OECD Environmental Performance Review of Turkey 51

Part I. Progress towards sustainable development **55**

Chapter 1. Environmental performance: Trends and recent developments **57**

1.1. Introduction 58
1.2. Key economic and social developments 58
1.3. Transition to an energy-efficient and low-carbon economy 61
1.4. Transition to a resource-efficient economy 72
1.5. Managing the natural asset base 78
References 85

Chapter 2. Environmental governance and management **89**

2.1. Introduction 90
2.2. Institutional framework for environmental governance 90
2.3. Setting of regulatory requirements 92
2.4. Compliance assurance 95
2.5. Promoting environmental democracy 99
Notes 102
References 103

Chapter 3. Towards green growth **105**

3.1. Introduction 106
3.2. Framework for sustainable development and green growth 106
3.3. Greening the system of taxes and charges 107

3.4. Eliminating environmentally harmful subsidies ... 115
3.5. Investing in the environment to promote green growth ... 117
3.6. Promoting eco-innovation ... 125
3.7. Contributing to the global environmental agenda ... 128
References ... 134

Part II. Progress towards selected environmental objectives ... 141

Chapter 4. Climate change ... 143

4.1. Introduction ... 144
4.2. State and trends ... 144
4.3. Institutional and policy framework for climate change mitigation ... 146
4.4. Key mitigation measures ... 148
4.5. Climate change impacts and vulnerability ... 155
4.6. Climate change adaptation policy and institutional frameworks ... 158
4.7. Mainstreaming adaptation into sectoral policies ... 164
Notes ... 171
References ... 171

Chapter 5. Urban wastewater management ... 177

5.1. State of play and trends ... 178
5.2. Governance framework ... 182
5.3. Policies and instruments ... 186
5.4. Investment and financing ... 190
References ... 197

Figures

Figure 1. Selected environmental performance indicators ... 25
Figure 2. Motor vehicle taxes favour older, cheaper cars with smaller engines ... 33
Figure 3. Greenhouse gas emissions are expected to continue growing rapidly ... 39
Figure 4. Household water and wastewater tariffs exceed affordability limits in many provinces ... 46
Figure 1.1. GDP growth is the highest in the OECD area ... 59
Figure 1.2. Well-being indicators are below OECD averages ... 61
Figure 1.3. Energy supply is heavily dependent on fossil fuels ... 63
Figure 1.4. Energy intensity is decreasing, but not at a steady pace ... 64
Figure 1.5. Renewables' share in TPES has remained relatively stable ... 65
Figure 1.6. Industry and transport are the largest energy consumers ... 66
Figure 1.7. GHG emissions have started to relatively decouple in recent years ... 68
Figure 1.8. Energy industries and transport are the largest GHG contributors ... 69
Figure 1.9. Rising mortality and welfare costs of air pollution ... 70
Figure 1.10. Relative decoupling of air emissions from economic growth in recent years ... 71
Figure 1.11. Material consumption has not decoupled from economic growth ... 73
Figure 1.12. Municipal waste generation has decoupled from GDP growth, but most waste is landfilled ... 76
Figure 1.13. Turkey has a relatively low share of threatened species ... 79
Figure 1.14. Turkey is among the OECD countries with the lowest forest use intensity ... 80
Figure 1.15. Turkey is a water-stressed country ... 82
Figure 1.16. Wastewater treatment has improved, but advanced treatment remains low ... 83
Figure 2.1. Inspection numbers are rising faster than non-compliance detection ... 96

Figure 2.2. Administrative fines are increasingly used in enforcement 97
Figure 2.3. Turkey lags behind in EMS certifications..... 99
Figure 3.1. Share of environmentally related tax revenues is among the highest in the OECD..... 108
Figure 3.2. High effective tax rates on energy use in the road sector, but low in other sectors 109
Figure 3.3. Turkey has relatively fewer emissions priced at high levels..... 110
Figure 3.4. Motor vehicle taxes favour older cars with smaller engines..... 112
Figure 3.5. Turkey provides significant support for fossil fuel use and production..... 116
Figure 3.6. Turkey provides relatively high levels of distortionary agricultural support..... 117
Figure 3.7. Public investment on environmental protection has declined..... 118
Figure 3.8. European Union provides significant environment-related financial assistance..... 119
Figure 3.9. Environmental business expenditure focused on wastewater management..... 120
Figure 3.10. Roads and power generation will dominate infrastructure spending to 2023 122
Figure 3.11. Environmental R&D is relatively low, but green patents are growing 127
Figure 3.12. Renewable energy ODA has grown significantly recently 129
Figure 3.13. FDI inflows have declined since 2012, but remain important for several sectors 131
Figure 4.1. Emissions are expected to continue growing rapidly..... 145
Figure 4.2. Climate-related development finance to Turkey has increased 148
Figure 4.3. Electricity generation from carbon-intensive coal is increasing 149
Figure 4.4. Renewable energy sources are growing..... 150
Figure 4.5. Road transportation emissions are rapidly increasing..... 153
Figure 4.6. Temperature is generally increasing, but unevenly..... 156
Figure 4.7. Extreme meteorological events are more frequent..... 156
Figure 5.1. Irrigation dominates water use in Turkey 178
Figure 5.2. GDP per tonne of water used in Turkey trails behind the best performers..... 180
Figure 5.3. Access to wastewater treatment has increased, but remains among the lowest in the OECD 181
Figure 5.4. Water supply and wastewater treatment expenditures are growing fast 191
Figure 5.5. Household water and wastewater tariffs exceed affordability limits in many provinces.. 193

Boxes

Box 1. Recommendations on energy, air pollution and natural resource management..... 28
Box 2. Recommendations on environmental governance and management 31
Box 3. Recommendations on green growth..... 37
Box 4. Recommendations on climate change..... 44
Box 5. Recommendations on urban wastewater management 48
Box 1.1. Zero-waste project in public buildings 75
Box 7. Recommendations on energy, air pollution and natural resource management..... 85
Box 8. Recommendations on environmental governance and management 102
Box 3.1. Lessons learned from congestion pricing experience 114
Box 3.2. Enhancing incentives for industrial energy efficiency..... 121
Box 3.3. Private sustainability initiatives illustrate potential for progress 132
Box 12. Recommendations on green growth..... 133
Box 4.1. AFAD is helping Turkey better manage risks related to natural hazards 161
Box 4.2. Overcoming barriers to climate action at the local level 162
Box 4.3. Supporting adaptation through knowledge development and sharing 164
Box 4.4. The Agricultural Insurance System covers a growing share of farmers 168
Box 17. Recommendations on climate change..... 170
Box 5.1. National policy dialogues in Eastern Europe, Caucasus and Central Asia 184
Box 5.2. The role of the regulator in Portugal..... 186

Box 5.3. French water policies rely on a combination of economic instruments 188
Box 5.4. Measuring performance of water service providers in Portugal 190
Box 5.5. Ecosystems provide cost-effective wastewater treatment 195
Box 23. Recommendations on urban wastewater management 197

Follow OECD Publications on:

http://twitter.com/OECD_Pubs

http://www.facebook.com/OECDPublications

http://www.linkedin.com/groups/OECD-Publications-4645871

http://www.youtube.com/oecdilibrary

http://www.oecd.org/oecddirect/

This book has...

StatLinks

A service that delivers Excel® files from the printed page!

Look for the *StatLinks* at the bottom of the tables or graphs in this book. To download the matching Excel® spreadsheet, just type the link into your Internet browser, starting with the *http://dx.doi.org* prefix, or click on the link from the e-book edition.

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, Lithuania, 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: Turkish lira (TRY)

In 2017, USD 1.00 = TRY 3.65

In 2016, USD 1.00 = TRY 3.02

All figures converted from TRY to USD are in 2010 prices and use current year exchange rates. Time series comparisons in USD are expressed in constant 2010 prices.

Cut-off date

This report is based on information and data available up to September 2018.

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

AFAD	Disaster and Emergency Management Authority
BAQAM	Regulation on Air Quality Assessment and Management
BAT	Best available techniques
BAU	Business as usual
CAAP	Clean Air Action Plan
CBA	Cost-benefit analysis
CBCCAM	Co-ordination Board on Climate Change and Air Management
COD	Chemical oxygen demand
DMC	Domestic material consumption
EBRD	European Bank for Reconstruction and Development
EECCA	Eastern Europe, Caucasus and Central Asia
EGS	Environmental goods and services
EIA	Environmental impact assessment
EIB	European Investment Bank
EMS	Environmental Management Systems
EPR	Environmental Performance Review
ERSAR	Regulatory Body for Water and Waste Services
ETS	Emissions trading system
EU	European Union
EUWI	European Union Water Initiative
FDI	Foreign direct investment
FTA	Free trade agreement
GDP	Gross domestic product
GDSHW	General Directorate of State Hydraulic Works
GDWM	General Directorate for Water Management
GERD	Gross expenditure on research and development
GHG	Greenhouse gas
GW	Gigawatt
ICZP	Integrated coastal zone plan
IDBT	Industrial Development Bank of Turkey
INDC	Intended Nationally Determined Contribution
IPA	Instrument for Pre-Accession
IPPC	Integrated pollution prevention and control
IUCN	International Union for Conservation of Nature
LULUCF	Land use, land-use change and forestry
MAF	Ministry of Agriculture and Forestry
MDB	Multilateral development bank
MENR	Ministry of Energy and Natural Resources
MEU	Ministry of Environment and Urbanization
MFWA	Ministry of Forestry and Water Affairs
MidSEFF	Mid-size Sustainable Energy Financing Facility
MRV	Monitoring, reporting and verification
$MtCO_2e$	Million tonnes of carbon dioxide equivalent
Mtoe	Million tonnes of oil equivalent
MW	Megawatt
NASAP	National Adaptation Strategy and Action Plan
NBDSAP	National Biological Diversity Strategy and Action Plan
NCCAP	National Climate Change Action Plan
NCCS	National Climate Change Strategy
NDP	National Development Plan
NEEAP	National Energy Efficiency Action Plan

NGO	Non-governmental organisation
NMVOC	Non-methane volatile organic compound
NREAP	National Renewable Energy Action Plan
NSDC	National Sustainable Development Commission
O&M	Operation and maintenance
ODA	Official development assistance
PM	Particulate matter
PPP	Purchasing power parity
PRTR	Pollutant release and transfer register
R&D	Research and development
RBMP	River basin management plan
SDG	Sustainable Development Goal
SEA	Strategic environmental assessment
SKI	Water and Sewerage Administration
TARSIM	Agricultural Insurance System
TDP	Territorial development plans
TFC	Total final energy consumption
TOC	Temporary operation certificate
toe	Tonnes of oil equivalent
TPES	Total primary energy supply
TRY	Turkish lira
TSMS	Turkish State Meteorological Service
TSS	Total suspended solids
TWh	Terawatt-hour
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
UWWTD	Urban Wastewater Treatment Directive
WMCB	Water Management Co-ordination Board
WSS	Water supply and sanitation

Basic statistics of Turkey

BASIC STATISTICS OF TURKEY (2017 or latest available year)*
(OECD values in parentheses)

PEOPLE AND SOCIETY					
Population (million)	80.7	(1 293)	Population density per km^2	102.8	(35.1)
Share of population by type of region (a):			Population compound annual growth rate, latest 5 years	1.6	(0.6)
Predominantly urban (%)	33.6	(48.1)	Income inequality (Gini coefficient)	0.40	(0.32)
Intermediate (%)	36.5		Poverty rate (% of population with less than 50% median income)	17.8	(11.3)
Rural (%)	29.9	(51.9)	Life expectancy	78.0	(80.8)
ECONOMY AND EXTERNAL ACCOUNTS					
Total GDP (National currency, billion)	3 105		Imports of goods and services (% of GDP)	24.9	(27.6)
Total GDP (USD, billion, current prices and PPPs)	2 140	(56 458)	Main exports (% of total merchandise exports)		
GDP compound annual real growth rate, latest 5 years	6.1	(2.1)	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	15.2	
GDP per capita (1 000 USD current PPPs)	26.5	(43.7)	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	8.8	
Value added shares (%)			Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin	6.9	
Agriculture	7.0	(1.7)	Main imports (% of total merchandise imports)		
Industry including construction	32.0	(24.9)	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	15.9	
Services	61.0	(73.4)	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	11.6	
Exports of goods and services (% of GDP)	22.0	(28.2)	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	9.0	
GENERAL GOVERNMENT					
Percentage of GDP (b)					
Expenditure	33.1	(40.9)	Education expenditure		(5.2)
Revenue	34.4	(38.1)	Health expenditure		(7.6)
Gross financial debt	27.4	(112.0)	Environment protection expenditure		(0.5)
Fiscal balance	1.3	-(2.8)	Environmental taxes: (% of GDP)	3.8	(1.6)
			(% of total tax revenue)	13.3	(5.2)
LABOUR MARKET, SKILLS AND INNOVATION					
Unemployment rate (% of civilian labour force)	10.8	(5.8)	Patent applications in environment-related technologies (% of all technologies, average of latest 3 years) (c)	6.0	(10.9)
Tertiary educational attainment of 25-to-64 year-olds (%)	20.0	(36.9)	Environmental management	2.9	(4.3)
Gross expenditure on R&D, % of GDP	0.9	(2.3)	Water-related adaptation technologies	0.3	(0.5)
			Climate change mitigation technologies	4.0	(8.6)
ENVIRONMENT					
Energy intensity: TPES per capita (toe/cap.)	1.8	(4.1)	Road vehicle stock (veh./100 inhabitants)	23.7	
TPES per GDP (toe/1 000 USD, 2010 PPPs)	0.1	(0.1)	Water stress (abstraction as % of available resources)	22.2	(9.7)
Renewables (% of TPES)	12.2	(9.7)	Water abstraction per capita (m^3/cap./year)	675	(804)
Carbon intensity (energy-related CO_2):			Municipal waste per capita, (kg/capita)	425	(523)
per capita (t/cap.)	4.1	(9.2)	Material productivity (USD, 2010 PPPs/DMC, kg)	1.8	(2.4)
per GDP (t/1 000 USD, 2010 PPP)	0.18	(0.24)	Land area (1 000 km^2)	770	(34 403)
GHG intensity (d):			% of arable land and permanent crops	31.1	(12.1)
per capita (t/cap.)	6.2	(12.0)	% of permanent meadows and pastures	19.0	(23.4)
per GDP (t/1 000 USD, 2010 PPP)	0.27	(0.32)	% of forest area	15.2	(31.3)
Mean population exposure to air pollution ($PM_{2.5}$), µg/m^3	45.5	(14.4)	% of other land (built-up and other land)	34.7	(33.2)

* Values earlier than 2011 are not taken into consideration.
a) OECD value is a simple average of available countries;
b) OECD value: where the OECD aggregate is not provided in the source database, a simple OECD average of the latest available data is calculated;
c) Higher-value inventions that have sought patent protection in at least two jurisdictions. Average of latest 3 years;
d) 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. National sources for vehicle stock.

Executive summary

Turkey needs to pursue its transition to a low-carbon economy

Turkey has made progress in relatively decoupling its strong economic growth from air emissions, energy use, waste generation and water consumption. However, these pressures are increasing as economic and population growth continue. Turkey's energy demand growth is among the highest in the OECD.

Fossil fuels represent 88% of the energy mix, with most of these being imported. Turkey plans to reduce import dependency and ensure energy security by diversifying imports; increasing domestic production of coal, renewables and nuclear energy; and promoting energy efficiency. The country is among the top world performers in installed capacity of renewable energy sources. Still, the share of renewables in the energy mix has not increased since 2005, with continued development of coal-fired power plants. Energy efficiency policies have yet to be translated into measurable targets and implementation measures.

Climate change mitigation and adaptation efforts need to be strengthened to reduce risks and costs to the environment and society

Turkey's increase in greenhouse gas (GHG) emissions over the past decade was the largest in the OECD. Although there has been a relative decoupling in emissions in recent years, they are expected to more than double between 2015 and 2030. The decline in emissions intensity due to accelerated renewable energy development and improvements in energy efficiency is lower than in other member countries. GHG emissions per capita are rapidly increasing.

Turkey has signed, but not yet ratified, the Paris Agreement. The country needs a long-term low-emission and resilient development strategy that would integrate climate and energy objectives. Its National Climate Change Strategy and Action Plan would benefit from an updated sector-by-sector plan with GHG emissions reduction goals, and regular monitoring and evaluation.

Turkey is experiencing an increase in annual mean temperature and changes in precipitation patterns resulting in serious floods and droughts. Projected climate change impacts are likely to put further pressure on the water sector. Adaptation efforts to date have concentrated on modelling these future changes. There is considerable scope for better mainstreaming climate change adaptation into public sector operations such as policy or project appraisal. Efforts to improve scientific knowledge on climate change vulnerability and impacts need to continue to make the economic case for action. This will also be important for supporting local authorities in preparing their climate change adaptation plans.

Urban wastewater services need better planning and management tools

Turkey is moving towards regulating and monitoring water pollutants based on conditions of receiving water bodies at the river basin level, in line with European Union (EU)

requirements. It has made significant progress in urban wastewater management as a result of continuous investments of national and international funds. Access to wastewater collection network and treatment facilities has increased, but remains among the lowest in the OECD. There is, however, a risk of overinvestment to reach stringent national effluent standards that in some aspects go beyond EU requirements. This may lead to excessive capital costs, technology lock-in, a knock-on increase of operation and maintenance costs and, ultimately, rising consumer tariffs. River basin planning could be used as a tool to determine the level of ambition, priorities and financing needs for water infrastructure development and management. National guidelines would be helpful in improving water supply and sanitation services, promoting better utility performance and keeping tariffs affordable.

More action is required to address air pollution from fine particulate matter

Air quality is a major concern, especially in large cities and industrialised regions. Limit values for most air pollutants are expected to align with EU standards by 2024, but not for fine particulate matter. Population exposure to dangerous levels of particulate matter, emitted mostly by power generation and transport, is higher than the World Health Organization's guidelines. To reduce these health impacts, Turkey needs to retrofit old coal power plants with efficient and clean technology or close them down, and gradually substitute coal with natural gas in residential heating, as envisaged. In the transport sector, reducing air pollution calls for a modal shift from private vehicles to public transportation, renewal of the truck fleet and promotion of clean vehicles.

Resource efficiency and recycling need to grow as part of a transition to a circular economy

Turkey has made progress by aligning with waste-related EU directives and by reducing the generation of municipal and hazardous waste. However, most municipal waste is still sent to landfills, and only a small quantity is composted or recovered. Domestic material consumption has not decoupled from economic growth. The government needs to adopt a comprehensive and dedicated material resource policy going beyond waste management while promoting separate collection and recycling of different types of municipal solid waste.

Regulatory tools need to be strengthened

Turkey has made remarkable progress in bringing its environmental regulatory framework closer to the European Union's environmental acquis. As a result, regulatory standards in many environmental domains have been strengthened. However, there is significant room for improving the implementation of several key regulatory instruments. Strategic environmental assessment does not cover local spatial plans, leaving an important evaluation gap in land-use planning. Consolidated environmental permits have yet to be based on best available techniques. Turkey is implementing risk-based inspection planning, scoring regulated facilities based on their environmental impact and compliance record. However, with less than 20% of inspections that are planned, much remains to be done to make compliance monitoring more efficient.

Environmental information should become more accessible

Environmental information held by public institutions is accessible upon request, with only a small amount available on the environment ministry's website. The government needs to remove restrictions and fees for access to environmental information and give the public access to environmental permits and compliance records using recently created electronic

information systems. It should also follow through on its plans to establish a pollutant release and transfer register that would open data on environmental impacts by individual companies to the public.

Better tax incentives and reduced harmful subsidies will stimulate cleaner energy production and use

Turkey has among the highest rates of environmentally related taxes as a percentage of gross domestic product in the OECD, largely as a result of high taxes on gasoline and diesel fuel. Energy taxes in other sectors of the economy, including industry, remain low. Turkey's vehicle taxation system provides some environmental incentives, but generally pushes consumers towards older, used vehicles that are likely to have higher emissions. Integrating emissions criteria into motor vehicle tax rates would help to encourage the purchase of cleaner vehicles.

Turkey continues to provide substantial environmentally harmful subsidies. A subsidy for water use in agriculture has been eliminated, but fuel tax exemptions for petroleum products and a new fuel price stabilisation mechanism are counterproductive. Subsidies for poor families to use coal for heating remain significant despite the ongoing transition to natural gas heating. Gradually phasing out fossil fuel subsidies would help to promote investment in cleaner alternatives.

Stronger support for innovation will enhance the market for environmental goods and services

To capture greater economic benefits from a transition to green growth, Turkey needs to scale up its eco-innovation policies. Feed-in-tariffs have encouraged investment in renewable electricity. The government is supporting an industrial consortium developing a Turkish electric car. There is also potential to expand a burgeoning solar thermal sector. Increasing spending on environmental research and development and supporting technology demonstration and commercialisation with targeted clean technology incubators would help expand the domestic market for environmental goods and services and support Turkish innovators and entrepreneurs developing environmental solutions.

Assessment and recommendations

The Assessment and recommendations present the main findings of the OECD Environmental Performance Review of Turkey and identify 36 recommendations to help Turkey 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 7 November 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. Environmental performance: Trends and recent developments

Turkey is the eighth largest OECD economy and the fastest growing. Real gross domestic product (GDP) increased by 83% over 2005-17, and the GDP per capita gap narrowed from 46% of the OECD average to 63% during the same period.

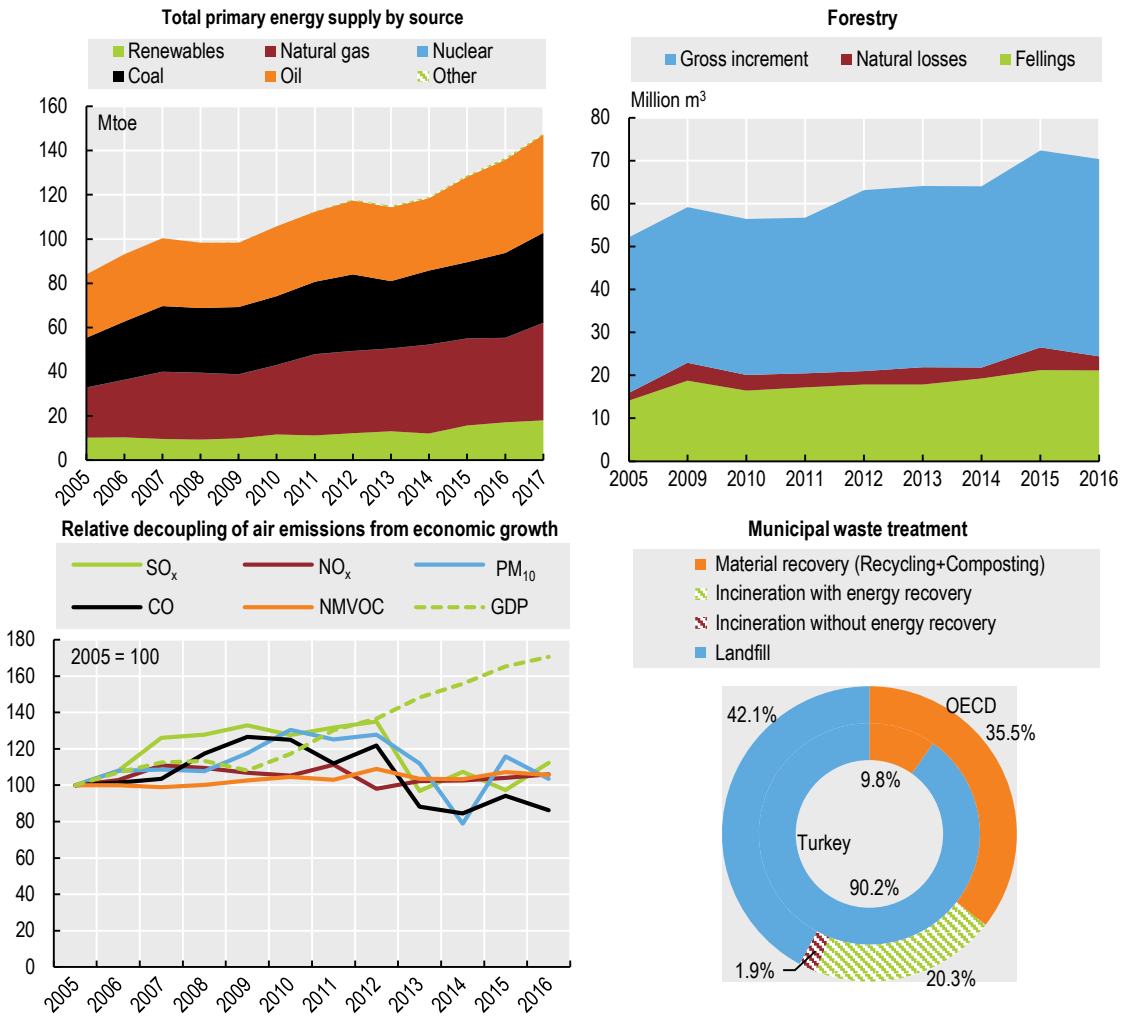
Since the last Environmental Performance Review (EPR) in 2008, Turkey has made progress in relatively decoupling its strong economic growth from a range of environmental pressures (air emissions, energy use, waste generation and water consumption). However, rapid economic, population and urbanisation growth is likely to aggravate these pressures. Integration of environmental protection into economic plans and implementation of key environmental policies with necessary financial and human resources need to be accelerated.

Transition to an energy-efficient and low-carbon economy

Turkey's energy mix remains carbon-intensive, with fossil fuels representing 88% of total primary energy supply (TPES) (Figure 1), above the OECD average of 80%. The country is highly dependent on imported energy, notably oil and natural gas. Energy self-sufficiency is only 25%. Turkey's energy demand growth is among the highest in the OECD: TPES has increased by 76% since 2005. This trend is expected to continue for the medium and long term (MEU, 2016a). Reducing energy dependency and improving energy security is a top policy priority. Turkey plans to reduce import dependency and ensure energy security by diversifying imports, integrating regional markets, increasing domestic production (especially lignite and renewables, but also nuclear energy), fostering energy efficiency, preventing wastage and reducing consumption. There could be tension between the objectives of reducing import dependency (by relying on domestic coal) and curbing air emissions (by replacing coal with imported natural gas in heating systems). Turkey has one of the largest coal plant developments in the world (IEA, 2016), which would make the energy mix more carbon- and emission-intensive.

The country has important renewable energy sources, which need to be better utilised. Turkey figures among the top world performers in installed capacity in recent years, especially in solar, wind, geothermal and hydropower (REN21, 2018). Recent competitive auctions for large-scale solar and wind projects have been successful in driving investment. Other off-shore wind and on-shore wind and solar projects have been planned as envisaged by the National Renewable Energy Action Plan. The share of renewables in TPES is higher than the OECD average. However, it has remained stable since 2005, as conventional energy sources have met most of the increase in energy demand. Energy intensity has decreased since 2005, but not at a steady pace, and remains dependent on economic conditions. The need to improve energy efficiency is highlighted in the 2017-23 National Energy Efficiency Action Plan (NEEAP) and several other policy documents. However, the overall target to save 23.9 Mtoe of primary energy consumption (24% of total consumption in 2016) by 2023 is not broken down by sector (Section 4). For instance, despite building and heating being a priority, there are no quantitative targets and timeframes for reducing energy consumption in private buildings. Existing measures, such as energy performance certificates and tax breaks on real estate income for energy-saving expenses, may fall short of the stated objectives. It is important to translate the energy efficiency objectives of the NEEAP into adequately funded plans with measurable targets.

Figure 1. Selected environmental performance indicators



Note: In panel 1 breakdown excludes electricity trade. GHG exclude emissions/removals from land use, land-use change and forestry. GDP at 2010 prices and purchasing power parities.
Source: IEA (2018), *World Energy Statistics and Balances* (database); OECD (2018), "Air and Climate: Air Emissions by Source", *OECD Environment Statistics* (database).; OECD (2018), "Municipal waste, generation and treatment", *OECD Environment Statistics* (database); OECD (2018), "Forest resources", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892174

Strong economic growth and high levels of energy consumption, together with a road-dominated transport system, have caused large increases in greenhouse gas (GHG) and air pollutant emissions. Turkey's economy has the highest GHG emission growth among OECD member countries. GHG emissions have followed closely GDP growth and have been relatively decoupled only in recent years. The government expects part of GHG emission mitigation to come from significant development of renewable energy, especially in the power sector, by increasing solar and wind generation capacity and better utilising the hydroelectric and geothermal potential.

Air pollution and quality are major concerns, especially in large cities and industrialised regions. Population exposure to fine particulate matter is higher than the EU standards and

the World Health Organization's guidelines. Coal-based heating systems and industrial and vehicle emissions are the main drivers of GHG and air pollutant emissions growth. Air pollution has relatively decoupled from economic growth in recent years. However, emissions have increased since 2005, except for carbon monoxide.

Limit values for most air pollutants are expected to align with EU standards by 2019. The 2008 Regulation on Ambient Air Quality Assessment and Management is mainly implemented through local Clean Air Action Plans (CAAPs). CAAPs have been enacted in 64 of 81 provinces. The main measures relate to industry, residential heating and road transport. Implementation is, however, slow due to high municipal staff turnover, frequent amendments to the legislation regulating roles and responsibilities, and limited technical and human resource capacity at the provincial and municipal levels, especially in less developed regions.

Given their weight in air emissions, road transport and power generation are areas for intervention. In the transport sector, the government needs to stimulate a modal shift from private road to public transportation, use integrated urban planning, promote alternative fuels and renewal of the truck fleet (Section 3). In the power sector, the use of coal should rely on efficient and clean coal technology. This would mean refurbishing or closing down old plants. The envisaged gradual substitution of coal with natural gas in residential heating would reduce local air pollution. These measures would also help reduce emissions of black carbon, a contributor to climate change.

Transition to a resource-efficient economy

Turkey is a resource-intensive economy. Domestic material consumption has not decoupled from economic growth. As a consequence, material productivity has been decreasing since 2005, to only pick up in recent years thanks to high economic growth. The government has the double objective of reducing import dependency and making consumption sustainable. To that end, it aims at using domestic natural resource potential more effectively, reducing waste and moving away from a disposal-centred approach, and promoting a circular economy. However, the government does not have a dedicated material resource policy.

Waste management is key to reducing import dependency by promoting a more circular economy. Turkey has been making progress by aligning almost completely with waste-related EU directives and by reducing the generation of municipal and hazardous waste (EC, 2016). Although waste generation has decoupled from economic growth and progress has been made in recycling, most municipal waste is still sent to landfills, and only a small quantity is composted or recovered (Figure 1). Turkish authorities are seeking solutions to reduce the amount of municipal solid waste going to landfills and to increase recycling of materials. However, low investments at the local level remain a challenge. Furthermore, although the number of waste recovery facilities has increased, Turkey has been slow in improving hazardous waste treatment, and relevant legislation has not yet been fully implemented.

Legislative progress has been made in chemicals management. A regulation on chemicals registration, evaluation, authorisation and restriction was adopted in 2017. Legislation was harmonised with the EU Seveso II and III Directives. On the other hand, Turkey does not yet have a pollutant release and transfer register (PRTR) and does not provide open access to information related to chemical accidents. A draft PRTR regulation has been prepared, but its adoption is uncertain. The Rotterdam Convention on international trade of hazardous chemicals was ratified in 2017, and draft regulations have been prepared to align legislation

with EU regulations on export and import of hazardous chemicals and on persistent organic pollutants.

Managing the natural asset base

Turkey is a hotspot of biodiversity and has made progress on conservation, increasing the coverage of protected areas. According to national data, combined terrestrial and marine protected areas accounted for 9% of the national territory in 2017. This is significantly lower than the Aichi target of 17% for terrestrial and inland water, and 10% for coastal and marine areas. The National Biodiversity Strategy and Action Plan has been revised in line with Aichi targets, but Turkey has not yet submitted national targets under the Convention on Biological Diversity. A number of conservation and monitoring activities are being carried out: there are plans to build bio-corridors along major roads and a nationwide 2013-19 project on biodiversity monitoring and inventory. Research on site detection, protection of biodiversity and restoration of endangered species habitat is being done. Agro-biodiversity research and genetic characterisation studies have also been carried out since 2001. However, habitat loss and fragmentation continue as a result of urban, transport and industrial expansion. Furthermore, responsibilities across ministries – namely the Ministry of Agriculture and Forestry and the Ministry of Environment and Urbanization – need to be better co-ordinated.

The country has made progress in expanding the forest cover thanks to afforestation, erosion control, rehabilitation of degraded forests and pasture, and artificial regeneration. Unlike in many other OECD member countries, natural and semi-natural areas, as well as forest cover, have increased. Turkey is among the OECD member countries with the lowest forestry use intensity. On the other hand, rapid urbanisation has led to urban sprawl encroaching on natural areas.

Turkey is not a water-rich country, and water resources are not distributed evenly. Renewable freshwater resources per capita are well below the OECD average, and projected population and water-use growth will increase water stress. Competition for water access across sectors is growing. This competition is expected to become more challenging with increased urbanisation, expansion of irrigation areas and climate change (OECD, 2016). Management plans are expected to be prepared for all river basins by 2023.

Water stress is aggravated by losses/leakages throughout the supply network, and water quality is becoming a serious concern. Overuse of natural resources, discharges of untreated industrial and domestic effluents into freshwater bodies and the sea due to unplanned and rapid urbanisation, insufficiency of wastewater treatment facilities (Section 5), and diffuse nitrogen and ammonia pollution from agricultural activities, all contribute to decreased water quality (MEU, 2016a). A marine pollution monitoring programme is being carried out, but eutrophication is a problem in several coastal areas.

Recommendations on energy, air pollution and natural resource management

Energy

- Reduce the share of fossil fuels, especially coal, in the energy mix and increase the share of renewables, especially geothermal (in residential heating), solar and wind; set a revised energy transition roadmap with quantifiable targets by energy source to provide clear signals to investors.
- Set measurable objectives in the NEEAP in the power, residential and transport sectors; provide more economic and fiscal incentives for energy efficiency investments in public and private buildings.

Air pollution

- Formulate a comprehensive nationwide air pollution reduction strategy, integrated with energy and transport policies and plans; strengthen the implementation of local clean air programmes and ensure their alignment with nationwide objectives.

Material resources, waste and chemicals

- Adopt a comprehensive and dedicated material resource policy going beyond waste management, with quantitative targets and an appropriate monitoring system.
- Promote separate collection of different types of municipal solid waste; reduce the volume of biodegradable waste going into landfills and increase biogas generation; prepare local waste management plans while promoting inter-municipal collaboration.
- Strengthen the institutional and administrative capacity to implement national programmes for prevention, preparedness and response to accidents involving hazardous substances; adopt a legal framework for collecting, and providing public access to, information on pollution releases by industry sector and by pollutant.

Biodiversity

- Clarify roles and responsibilities for biodiversity protection across ministries; improve routine biodiversity monitoring and inventory activities; continue the work to establish bio-corridors connecting protected areas.

2. Environmental governance and management

Turkey's environmental regulatory framework has been substantially strengthened since 2008, primarily as a result of continued efforts to harmonise its environmental legislation with directives of the European Union (EU). This demonstrates the country's ambition to upgrade and modernise its environmental regulation. However, progress in implementing EU standards and best practices has been uneven across policy areas.

Institutional framework

Turkey has a centralised system of environmental governance, where most powers are exercised by the national government and its territorial institutions. Environment-related responsibilities are fragmented across several ministries. The Ministry of Environment and

Urbanization (MEU) has key regulatory responsibilities, but other ministries develop and implement energy, water resource management and biodiversity protection policies.

Horizontal co-ordination is facilitated by environmental boards at the national and provincial levels under the aegis of the MEU and water management committees at the central, river basin and provincial levels chaired by the Ministry of Agriculture and Forestry (MAF). However, not all of them meet frequently and systematically engage all stakeholders in decision making. Responsibilities for municipal environmental services are divided differently depending on the administrative status of the province, adding management complexity.

Regulatory requirements

In line with recommendations of the 2008 EPR, Turkey has made remarkable progress in bringing its environmental regulatory framework closer to the European Union's environmental acquis. As a result, regulatory standards in many environmental domains have been strengthened. Despite the uncertainty of Turkey's EU accession process, there is a need to continue aligning the country's legislation with best international practices.

Progress in environmental evaluation of regulations and policies has been partial. Regulatory impact analysis that includes environmental considerations is carried out only for laws of major economic significance. A regulation on strategic environmental assessment (SEA) of plans and programmes was adopted in 2017. Its implementation (for new plans and programmes) will be phased in through 2023, but will not cover local spatial plans. So far there have been only pilot SEA projects. There is no *ex post* evaluation of policies or legislation.

The evaluation gap is particularly important in land-use planning, as emphasised in the 2008 EPR. Spatial plans at all administrative levels are aligned with development plans and, in the absence of SEA, address environmental concerns only to a limited extent. The development of integrated coastal zone plans has not been completed.

Environmental impact assessment (EIA) and permitting processes have been simplified by using electronic systems. However, there is room for improving the implementation of these instruments: the mechanism to ensure compliance with impact mitigation measures described in the EIA report needs to be strengthened. EIA is not used in the transboundary context. Turkey has introduced a consolidated environmental permit, but its conditions are not yet based on best available techniques (BAT) and favour end-of-pipe pollution control – it has only partly implemented the respective 2008 EPR recommendation. Temporary operation certificates allow installations to operate before they obtain an environmental permit. Turkey plans to introduce BAT-based permitting in 2024.

Compliance assurance

The MEU has made considerable efforts to build capacity of its inspectors through training and use of a software to plan, report and evaluate inspections. It is implementing risk-based inspection planning, scoring regulated facilities based on their environmental impact and compliance record. However, much remains to be done to make the compliance monitoring regime more efficient: less than 20% of inspections are planned, and inspection numbers had until 2017 been rising faster than non-compliance detection.

Environmental enforcement relies largely on administrative fines, whose total annual amount has nearly doubled in constant prices since 2008. Criminal sanctions may be used in addition to administrative ones. Turkish law establishes strict liability for damage to

human health and property, but similar provisions regarding damage to soil, water bodies and ecosystems need to be strengthened. Turkey created a register of contaminated sites in 2015, but there is no planning or regular budget allocation for remediation of abandoned sites.

Environmental authorities are not proactive in promoting green business practices. Turkey lags behind similar-size OECD economies in environmental management system certifications, which have declined since 2008. Green certification initiatives have been launched for hotels and the construction sector, but their uptake by businesses has been limited. The integration of environmental aspects into the country's public procurement policies has been slow.

Environmental democracy

Turkey's progress in ensuring public participation and access to information and justice on environmental matters has been uneven. The development of environmental legislation, policies and programmes is open to stakeholders through special consultative committees. The public has opportunities to participate in EIA, spatial planning and, potentially, SEA, but not in environmental permitting. However, any party has to prove that it is directly affected by an environment-related administrative decision to challenge it in court.

Some environmental information is available to the public, mainly through the MEU website. Environmental information held by public institutions is accessible upon request. However, this access is hampered by broadly interpreted "economic interest" restrictions and processing fees. Turkey does not have a PRTR (Section 1), and data on environmental impacts by individual companies are not publicly available.

The country has made progress in implementing environmental awareness programmes, mostly through distribution of printed materials on environmental impacts and good practices. The school curriculum integrates environmental matters into several science and social studies courses.

Recommendations on environmental governance and management

Institutional and regulatory framework

- Strengthen the role of environmental boards in horizontal co-ordination of environmental aspects of energy, transport and other sectoral policies; reinforce the National Sustainable Development Commission and expand its institutional membership.
- Implement the regulation on SEA for public plans and programmes, including all local spatial plans, and build related institutional capacity; expand regulatory impact analysis to secondary legislation and ensure consideration of potential environmental impacts of all regulatory proposals; introduce ex post evaluation of policies and legislation.
- Strengthen the EIA system by systematically reflecting identified impact mitigation measures in environmental permits and implementing EIA in a transboundary context.
- Make best available techniques the basis for setting conditions in environmental permits for high-risk installations; phase out temporary operation certificates.

Compliance assurance

- Implement risk-based planning for environmental inspections in all provinces and define minimum inspection frequencies for different categories of installations.
- Adopt legislation to impose strict liability for damage to soil, water bodies and ecosystems and establish appropriate remediation standards; create a fund for remediation of abandoned contaminated sites.
- Use different information channels to deliver advice and guidance on green practices to the business community; expand sector-specific green certification programmes; establish binding environmental criteria for public procurement.

Environmental democracy

- Enhance mechanisms for public participation in drafting environmental legislation, policies and programmes, as well as in the permitting process.
- Remove restrictions and fees for access to environmental information held by public institutions; give the public access to environmental permits and compliance records using recently created electronic information systems; establish a PRTR open to the public.

3. Towards green growth

Turkey has made progress in several areas related to green growth since the 2008 EPR. Environmental and sustainable development considerations have been increasingly integrated into National Development Plans (NDPs), the main tool used to provide overall strategic direction. There are signs of emerging eco-innovation, particularly in the automotive and renewable energy sectors, and new industry-led initiatives in improving environmental sustainability. To fully shift towards green growth, Turkey would need to

increase the scale and scope of this effort. The pace of growth and urbanisation is too rapid for incremental action to have a significant impact. Policies, such as fossil fuel subsidies and investment in new coal facilities, are slowing progress.

Framework for sustainable development and green growth

Turkey has made progress on some Sustainable Development Goals (SDGs), but further effort is needed on environmental goals to transition towards a green growth path of development. Without accelerated action, air pollution, water scarcity and quality, and impacts of climate change will increasingly act as constraints on growth. Turkey is also at risk of missing out on market opportunities in environment-related products without scaling up policy measures supporting domestic eco-innovation across all sectors. Turkey could benefit from the Paris Collaborative on Green Budgeting launched by the OECD, France and Mexico in December 2017. This initiative helps governments to green fiscal policy and embed environmental objectives into their national budgeting and policy frameworks.

Additional effort is needed to drive co-ordinated implementation of policy commitments across institutions and sectors, breaking down silos and improving programme evaluation to ensure efficient and effective progress. Turkey is ready to publish an initial set of about 80 SDG indicators based on available data. However, financing for data collection and generation, as well as effective communication of indicators, remains a challenge. Improved evaluation of programmes is needed to ensure continued progress.

Greening the system of taxes and charges

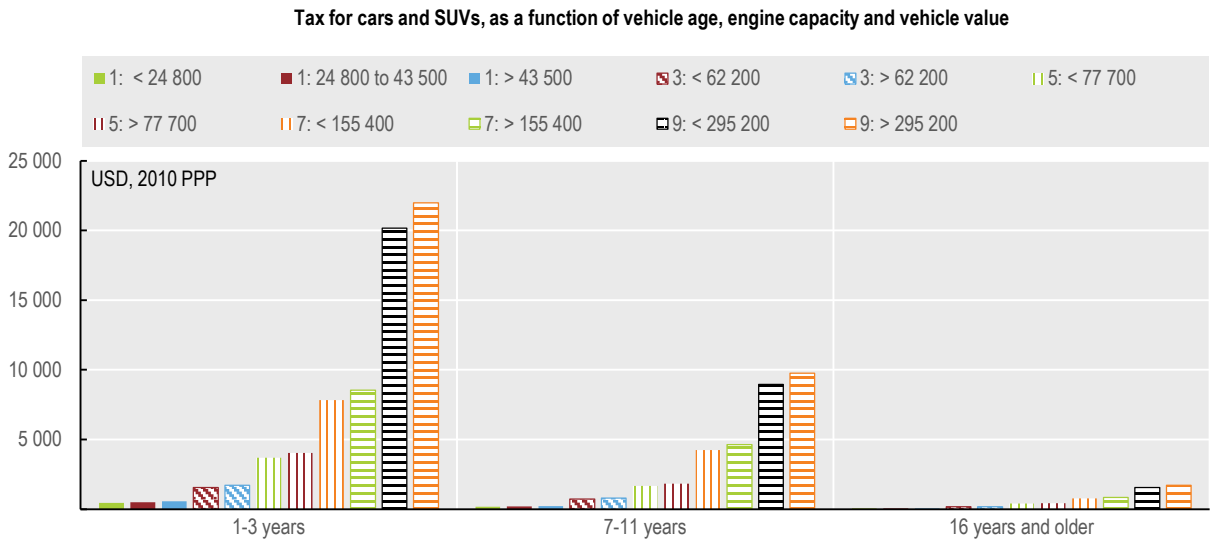
Turkey has among the highest rates of environmentally related taxes as a percentage of GDP in the OECD, largely as a result of high taxes on gasoline and diesel fuel. However, gaps remain: low taxes on coal and natural gas, higher taxes on gasoline than diesel, and substantial fuel tax exemptions. Vehicle taxes do not fully reflect the environmental costs of their use.

Energy taxes do not reflect the full environmental costs of fuel production and use. In 2015, 51% of carbon emissions from energy use were unpriced and only 21% of emissions were priced above EUR 30 per tonne of CO_2 (OECD, 2018a). Broader and higher levels of carbon pricing would drive the investment and innovation needed to realise environmental objectives and capture economic opportunities in growing markets. Concerns related to the economic impact of reform can be addressed through careful design, gradual implementation, revenue recycling and complementary measures that support continued economic growth. Although Turkey has not committed to implement carbon pricing, a 2016 study for the MEU laid out a possible path towards cap and trade, recommending starting with a pilot emission trading system (ETS) for a period of two to three years before moving to a full cap and trade system (Ecofys, 2016). Turkish companies are already actively involved in the global voluntary carbon market.

The transport sector is the second highest energy consumer and fastest growing source of GHG emissions. Turkey's vehicle taxation system provides some environmental incentives, but generally pushes consumers towards older, used vehicles that are likely to have higher emissions. There are two types of vehicle taxes: a special consumption tax (SCT) paid at purchase and a motor vehicle tax (MVT) paid annually. The taxes are relatively high, meaning they have a tangible impact on consumer decision making. Since the SCT does not apply to purchases of used vehicles or leases, as is standard practice, consumers have a strong incentive to purchase older, used vehicles or enter into leases. To discourage the use of very old vehicles, the government introduced a new measure in 2018

that reduces the SCT if a vehicle 16 years and older is exported or scrapped. Both the SCT and MVT are higher for vehicles with larger engines, which generally aligns well with environmental objectives. Electric and hybrid cars are also encouraged by lower SCT rates. The MVT, which was increased at the beginning of 2018, provides an incentive for electric vehicles, but also has lower rates for older and cheaper vehicles (Figure 2). The taxes are not differentiated based on fuel or emissions, which contributes to increased demand for diesel vehicles (whose share rose from 34% of vehicles in 2005 to 50% in 2017) (TurkStat, 2018a).

Figure 2. Motor vehicle taxes favour older, cheaper cars with smaller engines



Note: The numbers in the legend refer to engine capacity (cylinder volume), with: 1= 1 300 cm^3 and lower; 3=1 601-1 800 cm^3; ; 5=2 001-2 500 cm^3; 7=3 001-3 500 cm^3; 9=4 001 cm^3 and higher. Intermediate engine capacities are not presented. The second element is the value of the vehicle in USD 2010 PPP. The conversion to USD is done using the 2017 consumer price index (at constant 2010 prices, PPP).
Source: Country Submission; OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892193

Motorways in Turkey charge tolls based on distance travelled, and a number of bridges are also tolled. In cities, however, driving is not taxed by municipal governments. Turkey's cities have some of the worst air pollution in Europe: 4 are in the top 100 most congested cities in the world (TomTom, 2018). Istanbul is the sixth most congested city. Experience in London, Stockholm, Milan and Singapore has shown that congestion pricing can reduce traffic volume, limit pollution and raise revenue that can be invested in valuable transportation infrastructure and public transit. Istanbul – the largest and most congested city in Turkey – would be the logical place to introduce more comprehensive congestion pricing, starting with district pilot projects and an active educational campaign for residents.

Turkey's introduction of a feed-in tariff for renewable energy in 2010 provided a strong incentive for investment. Those that successfully bid for government renewable tenders are able to receive the feed-in-tariff, generating significant interest. However, there are some concerns that high contribution fees are delaying or stalling installation for some of the

licensed solar projects. Progress will need to be closely monitored to ensure that incentives are sufficient to move forward with projects.

Eliminating environmentally harmful subsidies

Turkey continues to provide substantial environmentally harmful subsidies. Revised OECD estimates that incorporate new data and additional tax exemptions show that fossil fuel support is over nine times higher than estimated in 2008 (OECD, 2018b). Fuel tax exemptions for petroleum products represent most of this increase. The new fuel price stabilisation mechanism is expected to reduce tax receipts further. The highest tax expenditures are for high-emission bitumen and petroleum coke fuels. Coal production and fossil fuel exploration also continue to be subsidised.

Subsidising the use of coal by poor families is the most significant direct budgetary expenditure. Aimed at supporting vulnerable households, this policy contributes to continued use of coal as a heating fuel, which is a source of air pollution and has a direct negative impact on health. However, the government has been implementing a transition to natural gas heating as community pipeline access improves (Section 1). By the end of 2018, all provinces are expected to be supplied with natural gas, leading to a gradual removal of coal aid. Alternative renewable options may also be encouraged. There are already 120 000 households and greenhouses heated by geothermal or solar energy.

Turkey has made improvements regarding agricultural subsidies, with the elimination of a subsidy for water use and new payments for soil conservation and organic farming. However, most agricultural water pricing is not yet tied to the volume of water used, and subsidies for organic farming and good practices represent a small share of total support.

Investing in the environment to promote green growth

Public environmental spending, which is the main source of environment-related financing, has fluctuated since 2008. Most of it focused on waste, water and wastewater services, with very little spent on biodiversity protection. In addition to public resources, funds for environmental investments are provided by multilateral development banks, bilateral development agencies, the European Union and other external sources. Business environmental expenditures have grown since 2008, with a similar focus on wastewater management. Business spending in other environmental areas, such as air and climate, is very low.

Energy efficiency is an opportunity to reduce energy costs, as well as air pollution and GHGs. The government could consider enhancing current incentives to better capture this opportunity. Industrial establishments consuming more than 1 000 toe are already required to be certified to the ISO 50001 energy management system standard, but only 8% of large energy-intensive installations had been certified as of 2016 (Janssen, 2016). Voluntary agreements can also be reached to benefit from energy efficiency subsidies, but only 15 have been or are being completed. Carbon pricing and phasing out fossil fuel subsidies would also help drive greater investment in energy efficiency.

Infrastructure investment has been significant over the past decade. Over USD 100 billion of public and private funds has been invested in capital projects and infrastructure since 2012. Investment is expected to triple by 2023 to meet government objectives (Garanti and PwC, 2017). However, the ability to borrow in foreign markets and attract foreign investment may be affected by the significant drop in value of the Turkish lira in 2018 (OECD, 2018c). According to plans for 2023, the majority of investment will go to the

energy and transportation sectors, making investment decisions critical for Turkey's future environmental performance. Roads are expected to account for 25% of future infrastructure investment, compared to railways at 9% (Garanti and PwC, 2017). Modal shifts from road to rail and public transit will be increasingly important in addressing congestion and air pollution. Renewables (12%) and nuclear energy (11%) will dominate energy-related infrastructure investment, relative to coal power (5%) (Garanti and PwC, 2017). Ideally, all new major investments should go through cost-benefit analysis to consider environmental externalities such as air pollution and GHG emissions.

Investment needs are also substantial in environmental services: about USD 10 billion for water and wastewater, and about USD 7 billion for waste management by 2023 (MEU, 2016c). Irrigation infrastructure modernisation should be a priority within the context of looming water constraints, given that agriculture is the primary consumer of water. Modernisation has started: new projects are designed with drip and sprinkler irrigation, and open canals are turned into closed canal systems.

Turkey's use of public private partnership (PPP) financial models for infrastructure financing has increased significantly, in line with OECD recommendations. However, it has mainly been used for airports, highways, energy and health infrastructure. A few water and rail projects have also used a PPP model. Turkey's domestic financial sector plays an important role in infrastructure financing. However, in recent years foreign banks have been increasingly involved in PPP transactions. Nevertheless, more could be done to reduce real and perceived risks of environment-related investments for traditional investors. Green banks have been a successful tool internationally to reduce real or perceived risk associated with environmental projects. The USD 300 million Green Sustainable Bond issued by the Industrial Development Bank of Turkey in 2016 attracted significant international demand, highlighting the potential for expanded use of such instruments.

Promoting eco-innovation

To capture greater economic benefits from a transition to green growth, Turkey needs to scale up policies that expand the domestic market for environmental goods and services (EGS) and support Turkish innovators and entrepreneurs developing environmental solutions. In 2018, Turkey introduced ecolabel legislation that is in line with the EU Ecolabel Regulation. Broadening the coverage of environmental policies to a greater number of sectors and environmental issues, increasing stringency over time and phasing out subsidies and other policies that give existing products a competitive advantage will help to further expand the domestic market.

According to OECD Statistics, Turkey has historically not made significant investments in environment-related research and development (R&D) through to commercialisation in comparison to other OECD member countries. However, the government has recently developed policies that encourage R&D related to renewable electricity and electric vehicles. There are also several general R&D programmes that support clean technology, waste reuse and energy efficiency projects. Patent applications in environment-related technologies represent a relatively small percentage of total patent applications in Turkey (6% compared to the OECD average of 10.9% for 2012-14), but there are some recent signs of growth in the areas of environmental management, energy and buildings.

Turkey's plan to develop a national electric car holds significant promise, given the country has the fifth largest automotive sector in Europe. The government also plans to stimulate domestic demand through investments in charging infrastructure and incentives for

widespread clean vehicle use. Carbon pricing, vehicle emission standards and phasing out gasoline and diesel tax exemptions would also improve uptake.

The solar thermal industry also has potential. Turkey is already among the top five countries in the world using solar energy for hot water heating, but space heating has received less attention. Turkey has two solar companies that rank in the top 12 of global flat plate collector manufacturers. Phasing out subsidies for coal heating and increasing incentives for renewable and district heating would help expand the domestic market for Turkish companies. New heat supply legislation aimed at establishing a well-functioning domestic heat market is expected to be completed by the end of 2018.

Contributing to the global environmental agenda

Turkey is one of the largest recipients of official development assistance (ODA) commitments in the world, though its ranking has fluctuated significantly over the past decade. The proportion of aid that is environment-related has also fluctuated over time. Renewable energy has increased in importance since 2010. Turkey has also increased its disbursements since 2008, reaching 0.95% of gross national income in 2017 (OECD, 2018d). Turkey undertakes development co-operation activities with African, Central Asian and neighbouring countries, with some environmentally-related aid for water and sanitation, and energy efficiency improvements.

Turkey's largest trading partner is the European Union. A recent analysis concluded that the customs union and other trade agreements have had a negligible impact on the environment. While increased economic activity has had a negative environmental effect, this has been offset by improved performance in energy and steel sectors. Turkey's free trade agreements (FTAs) have included limited reference to environmental issues. Exceptionally, the Korean FTA included a full chapter on trade and sustainable development.

Although foreign direct investment has declined since 2008, it is expected to play a growing role in Turkey, particularly in the transportation and energy sectors. Chinese companies and state-owned enterprises, for example, are major investors in several Turkish coal power projects. Turkey is building its first nuclear power plant with Russian investment. Japan is also a growing source of investment, given the pending FTA, mainly in automotive consumer electronics, energy and food. Investors can influence environmental performance through their selection of projects, as well as through design and implementation.

Corporate social responsibility initiatives are growing in the Turkish private sector, with particular interest from large, export-oriented companies that are conscious of the trend towards increased demand for sustainable products and suppliers. The Borsa Istanbul (Turkey's stock exchange) established a Sustainability Index in 2014 to help institutional investors find companies that have high environmental, social and governance performance. The Turkish government could encourage expansion of these initiatives through information provision, guidelines and financial incentives.

Recommendations on green growth

Framework for sustainable development and green growth

- Continue prioritising sustainability and green growth in public policies, better align fiscal policies and budget allocations with environmental commitments, leveraging all available domestic and international sources of financing.
- Continue to integrate SDGs into NDPs and action plans across institutions and sectors; enhance implementation efforts; finance data collection needed to monitor progress and programme effectiveness.

Greening the system of taxes and charges

- Reform the system of vehicle and fuel taxation to remove exemptions and integrate emissions criteria; introduce congestion pricing in Istanbul to limit traffic and air pollution.
- Closely monitor the uptake of incentives for renewable energy to ensure that fees, project size requirements and approval processes do not deter investment.

Eliminating environmentally harmful subsidies

- Phase out tax exemptions for fossil fuel consumption; gradually replace coal aid to poor families with support for transition to cleaner alternatives.
- Tie water pricing in agriculture to the volume of water used and increase financial incentives for organic and other environmentally friendly practices.

Investing in the environment to promote green growth

- Improve consideration of environmental externalities in evaluation of major investments by using tools such as comprehensive cost-benefit analysis.
- Expand the use of instruments that leverage private sector investment in environmental projects, including public-private partnerships for rail and public transit, green banks to reduce risk for traditional investors, and green bonds.

Promoting eco-innovation

- Evaluate strategic opportunities identified in domestic and global EGS markets; develop an integrated approach to support clean technology entrepreneurs from early stage R&D through to commercialisation and export.
- Strengthen the policy framework for eco-innovation by increasing spending on environmental R&D, supporting technology demonstration and commercialisation with an expanded number of clean technology incubators, and integrating greater awareness of EGS market opportunities into education and skills programming.

Contributing to the global environmental agenda

- Promote corporate social responsibility initiatives such as sustainability reporting, certification, internal environmental performance targets and investment in environmental projects.

4. Climate change

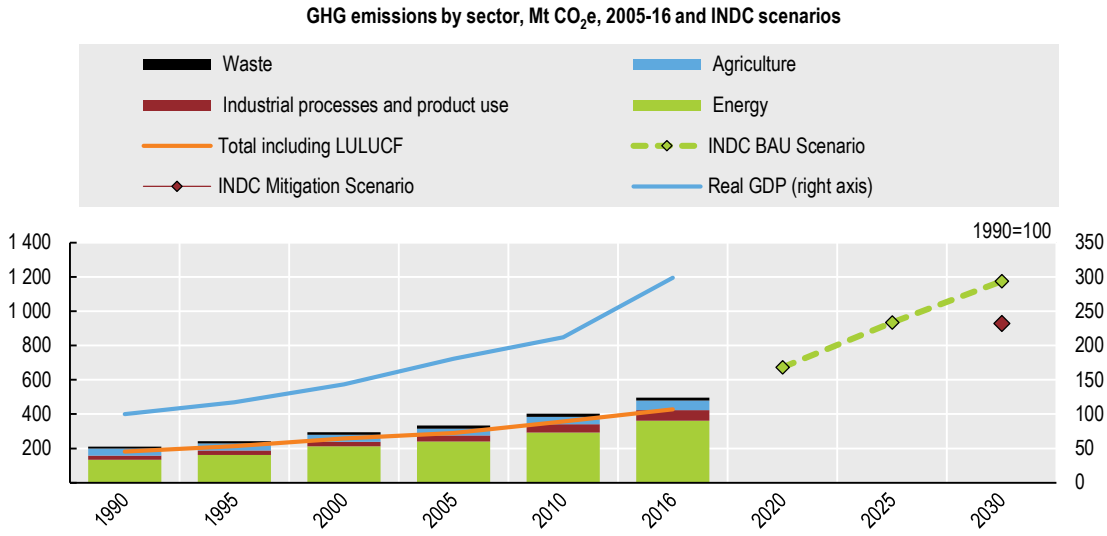
Climate change impacts are already being observed in Turkey, with an increase in annual mean temperature, changes in precipitation patterns across the country and the seasons, and increasing numbers of climate-related hazards such as floods and droughts (TSMS, 2018). Turkey needs to ramp up both mitigation and adaptation to reduce the risks and costs arising from climate change to the society, the environment and the economy.

GHG emissions profile and trends

Driven by strong economic and population growth, rising income levels and continued reliance on a carbon-intensive fuel mix, Turkey's increase in GHG emissions over the past decade (+49% over 2005-16, excluding land use, land-use change and forestry, LULUCF) was the largest in the OECD. Although there has been a relative decoupling in emissions in recent years and a decline in emissions intensity due to accelerated renewable energy development and improvements in energy efficiency, this decline is lower than in other member countries. Although still below the OECD average, emissions per capita are rapidly increasing. Turkey is in the top ten most emitting OECD countries, with close to 500 $MtCO_2e$ in 2016. The growing economy and population are expected to continue pushing GHG emissions upwards.

Despite its continued growth in GHG emissions, Turkey is alone within the OECD in not putting forward any mitigation target for 2020. It did, however, set a mitigation target for 2030 as part of its Intended Nationally Determined Contribution (INDC) under the UN Framework Convention on Climate Change. Turkey ratified the Kyoto Protocol in 2009 and has signed, but not yet ratified, the Paris Agreement. The country aims to limit the increase in GHG emissions to up to 21% below its business-as-usual scenario. This means that absolute levels of GHG emissions can still more than double between 2015 and 2030 in the mitigation scenario (Figure 3). At this stage, Turkey does not plan a peak in its GHG emissions. CO_2 savings from current and planned policy measures have not been estimated (UNFCCC, 2016).

Figure 3. Greenhouse gas emissions are expected to continue growing rapidly



Note: Projections include emissions/removals from land use, land-use change and forestry (LULUCF). GDP is expressed in 2010 USD prices, purchasing power parities.
Source: OECD (2018), "Air and climate: Greenhouse gas emissions by source", *OECD Environment Statistics* (database); OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database); MEU (2016b), Turkey's Sixth National Communication under the UNFCCC, Ministry of Environment and Urbanization, Ankara.

StatLink http://dx.doi.org/10.1787/888933892212

Policy and institutional framework

Since the 2008 Environmental Performance Review (EPR), Turkey has taken the important step of developing and adopting its National Climate Change Strategy and Action Plan (NCCS 2010 and NCCAP 2011). These aim to lay the ground for the transition to a low-carbon economy. However, the NCCAP lacks verifiable and quantifiable targets related to emission levels, as well as information on the expected mitigation impact and cost of the policies and measures. The overall status of implementation of mitigation and adaptation actions in the NCCAP remains unknown due to limited monitoring and evaluation. In addition, Turkey has announced targets for renewable energy and energy efficiency, which, however, vary from one policy document to another.

Renewable energy sources are developing rapidly but Turkey still relies heavily on fossil fuels. In order to reach its INDC, it aims to continue to increase the use of renewable energy (solar, wind, hydro and geothermal) and develop nuclear energy, increase energy efficiency in power plants and industrial installations, and improve its transport system. However, more efforts are needed in power generation and transport, where there is potential for decreasing CO_2 intensity through fuel switching and energy efficiency. Turkey also relies on the sink capacity of its expanding forests to partially offset its increasing emissions.

Maintaining warming below 2°C relative to pre-industrial levels requires cutting GHG emissions levels to near zero by the end of the century (IPCC, 2014). It is advisable for Turkey to develop a long-term low-carbon strategy that would set a peak in GHG emissions and ensure that infrastructure investments are compatible with both energy security and climate goals (e.g. any new coal plants use best available technologies, and/or are compatible with carbon capture and storage). Energy and climate policies are not aligned and could potentially lead to some assets no longer able to provide an economic return due to changes associated with the transition to a low-carbon economy.

Climate change policies are developed by the Co-ordination Board on Climate Change and Air Management. This board gathers public and private institutions, as well as observers from other organisations, academia and NGOs on an ad-hoc basis. Tasked with implementation of the NCCS, it should also facilitate the discussion and integration of climate issues into other multi-stakeholder mechanisms such as the Economy Co-ordination Board.

As a centralised state, Turkey is equipped to ensure top-down measures, but local aspects of climate change need to be better integrated into adaptation policies and measures. Action at the local level is starting to pick up with about ten municipalities (covering about 16% of the population) adopting climate change plans, but most of them only cover mitigation. The government needs to support local authorities in developing climate change adaptation plans both technically and financially.

Under the UNFCCC's Paris Agreement, developed countries have committed to mobilise climate finance to assist developing countries in implementing climate change activities. This includes funding via bilateral and multilateral funds, such as the Global Environment Facility, the Green Climate Fund and other specific funds. Turkey sees access to the Green Climate Fund as one of the key negotiation points before ratifying the Paris Agreement. Turkey seeks to ensure equal treatment with countries having similar economic development levels under the UNFCCC and to receive international financial, technological, technical and capacity building support.

Turkey benefits from significant levels of funding through bilateral and multilateral channels, especially for mitigation activities. About USD 3 billion per year in climate finance was committed to Turkey in 2015-16, primarily in loans provided by multilateral banks. Further information on the use of public and private domestic finance would be required to properly analyse all financing trends for mitigation and adaptation.

Mitigation efforts across sectors

Mitigation in energy supply and power generation

Energy use, which accounts for most of Turkey's GHG emissions, is expected to continue to increase. About half of Turkey's carbon emissions from energy use do not face a price signal (Section 3). Renewables are growing, but Turkey's energy supply is still highly reliant on fossil fuels (88%). It imports three-quarters of its energy supply, making energy security a concern. Turkey intends to make further use of domestic coal to strengthen energy security, but domestic supply has been complemented by growing imports of coal. Coal accounts for a large proportion (33%, 2017) of Turkey's electricity supply, and the Ministry of Energy and Natural Resources' Strategic Plan indicates that coal-fired power will remain an important part of the electricity mix. The carbon-intensity of electricity generation from coal is above the OECD average and – unlike in many other member countries – has been increasing (IEA, 2018). In addition to carbon-intensive coal plants, Turkey also has the largest coal power plant development programme in the OECD (IEA, 2016). This is creating a high carbon lock-in risk due to the large capital costs and long infrastructure lifetimes.

Turkey has almost reached its renewable energy target (30% of renewable energy in its electricity mix) set for 2023, in part due to the introduction of feed-in tariffs. It has a significant potential for further developing renewable energy sources (for electricity and non-electricity uses) and recognises their critical role in reducing import dependence and mitigating climate change. It will be important to continue to increase the proportion of

low-carbon electricity and define a new and more ambitious longer-term target for renewable electricity that would send a clear signal to investors. In this context, the implementation of the National Renewable Energy Action Plan (NREAP) should be monitored without further delay.

Mitigation in energy use

Continued efforts to improve energy efficiency are needed to support climate change mitigation, as well as energy security. Energy efficiency gains have contributed only marginally to reducing energy consumption (IEA, 2016). Turkey has recently adopted a NEEAP with a set of measures (Section 1), but it lacks official sectoral targets (MENR, 2018). Some measures (mainly grants) to encourage industry to adopt energy-efficient practices have been implemented. Turkey has developed a regulation in line with the EU 2002 Directive on Energy Performance of Buildings, but still does not reflect all the changes made to the directive in 2010, notably on minimum energy performance requirements.

Further efforts are needed to progress towards the 2011 NCCAP aim to reduce GHG emissions from transport. They have nearly doubled since 2005 and are expected to continue to rise. Most of these emissions come from road transport due to increasing road use and of relatively old and diesel cars that are taxed lower than gasoline cars on a carbon content basis (Section 3). There has been some development in the use of different transport modes in freight and passenger transport and clean vehicle technologies.

Mitigation in other sectors

Turkey has been successful in increasing its forest area, which represents an important sink for CO_2 emissions. It intends to increase the sink capacity of its forests as a measure to reach the INDC, but this action represents a small part of the country's mitigation potential. Continuing to improve monitoring is essential to explore possibilities of enhancing the role of the LULUCF sector in sequestrating carbon. Improving waste management is also important for mitigation and brings other co-benefits (Section 1).

Although emissions from agriculture have increased less dramatically than in other sectors, they are still on the rise. Emissions from this sector are difficult to address as there are fewer low-cost mitigation options. Some support measures for farmers to improve the sustainability of their practices have emerged (e.g. payments for soil conservation, concessional loans for adoption of good agricultural practices). Agricultural policies need to continue to integrate both mitigation and adaptation and encourage the uptake of cost-effective climate-friendly measures (OECD, 2016).

Adaptation to climate change

Climate change impacts and vulnerability

Turkey is already experiencing an increase in annual mean temperature, number of climate-related hazards and changes in precipitation patterns. Projected climate change impacts include reduced availability of surface water and more frequent arid seasons, with changes occurring unevenly across regions. Growing demand coupled with altered water regimes is expected to put further pressure on the water sector, already exposed to water stress. Droughts are expected to become more frequent and affect yields, putting food security at risk.

Adaptation efforts to date have concentrated on understanding risks arising from change in the climate, particularly to water resources. Progress has been made in modelling future changes, with the first national projections prepared by the Turkish State Meteorological Service. Continuing to fine-tune these projections, including clarifying the treatment of uncertainty, is important to better understand the degree of probability and related adaptation costs.

Building a solid evidence base will help Turkey make a socio-economic case for action and prioritise policy options. The knowledge gap is still important in terms of understanding sectoral vulnerability, and socio-economic impacts at the regional and local scales, as well as quantifying costs of these impacts. Turkey needs to sustain efforts to assess the vulnerability to climate change of its ecosystems (e.g. forests, biodiversity), economy (e.g. agriculture, tourism) and society (e.g. health). Other cross-cutting issues such as infrastructure (e.g. energy, water and transport) and disaster risk management also deserve particular attention, as they will be directly affected by climate change and can in turn contribute to aggravating exposure to risk and vulnerabilities.

Implementation and monitoring

Following the NCCS and its action plan, Turkey published a National Adaptation Strategy and Action Plan (NASAP) in 2011, which contributed to better understanding the impacts of climate change across its economy and society. Acknowledging the potential for improvement, Turkey is planning revision of the NASAP. The cross-ministerial adaptation working group convenes regularly and has the possibility of bringing adaptation to the attention of the Co-ordination Board on Climate Change and Air Management. There is considerable scope for better mainstreaming climate change adaptation into public sector operations such as policy or project appraisal.

Monitoring and evaluation of adaptation actions is useful for assessing whether policies have reached their stated goals cost-effectively and for ensuring accountability. However, it has been limited to date. It is difficult to assess progress towards the NASAP objectives, which are too broadly defined and not supported by measurable indicators. The absence of monitoring and evaluation also limits the possibility of identifying barriers to implementation. Some potential barriers include the lack of priority setting among actions and identified budget allocated to adaptation measures.

Mainstreaming adaptation

Adequately mainstreaming adaptation is key to ensuring that different sectors and people, whose vulnerability can be exacerbated by climate change, are prepared. Although Turkey has indicated that it aims to integrate climate adaptation into actions in relevant sectors, mainstreaming activities are still at an early stage and have largely focused on developing the evidence base. There is limited consideration of adaptation issues in many socio-economic sectors. Work is ongoing to better understand the diseases linked to climate change and to build capacity in the health sector.

Efforts to mainstream adaptation are mainly taking place in the water sector, where water plans need to take into account future climate impacts on water regimes. All 25 river basins have protection plans (Section 5). Expected to be completed by 2023 for all basins, comprehensive river basin management plans (RBMPs), as well as flood and drought management plans, require prior study of climate change impacts.

Forests, which are central to Turkey's mitigation efforts, are at risk from climate change impacts (e.g. due to forest fires). Efforts to address these risks are focusing on monitoring the impacts and taking related precautionary measures. As a party to the UN Convention to Combat Desertification, Turkey has established a range of targets in its National Report 2016-30 related to land degradation neutrality and has taken initial steps in mainstreaming adaptation into the LULUCF sector.

Several climate-sensitive economic sectors need to anticipate and better prepare for climate impacts through vulnerability assessments. Turkey needs to continue to increase efficiency of its massive water use in agriculture (e.g. by modernising the irrigation network) to increase resilience to drought. There is also a need to further integrate adaptation in infrastructure planning as climate change and extreme weather events can alter demand patterns and cause damage to energy, waste and transport infrastructure. Turkey is making progress on integrated coastal zone plans. These plans are important to address the risk of erosion, flooding, sea level rise and saltwater intrusion, aggravated by intensive economic activity. It is equally important to better mainstream adaptation in tourism, which accounts for about 4% of GDP and 10% of employment.

To date, response to natural disasters has largely been in reaction to earthquakes. With increasing climate-related extreme weather events (heat waves, floods, droughts), Turkey is shifting towards a disaster risk management approach to anticipate, reduce and address these events. The development of early warning systems to protect human lives from extreme weather events needs to continue. The Disaster and Emergency Management Authority has presented the Climate Change and Disasters Related to Climate Change Roadmap (2014-23) whose implementation needs to be monitored.

Recommendations on climate change

Policy framework and international commitments

- Ratify the Paris Agreement and strengthen the INDC; establish a long-term (2050) low-emission and resilient development strategy that integrates climate and energy objectives.
- Formulate a sector-by-sector action plan to 2030 with emissions reduction goals for mitigation and updated adaptation objectives, prioritised short-term actions aligned with 2050 goals; identify resource requirements and financing for implementation.

Monitoring and evaluation

- Establish a comprehensive monitoring and evaluation system with clear roles and responsibilities overseen by the Co-ordination Board on Climate Change and Air Management; identify and use suitable performance indicators for each action; prepare regular reports and make them available to the public; regularly monitor and evaluate the implementation of all other climate-related policy documents (e.g. Drought Management Plans, the NREAP and the NEEAP).

Mitigation

- Reduce carbon intensity of power and heat generation by increasing energy efficiency and renewable energy use (e.g. through co-firing of biomass) and by closing or renovating old coal-fired power plants; ensure that new coal plants are efficient, equipped with carbon capture and storage or can be retrofitted with it.
- Promote clean transport by encouraging a modal shift to public transportation, cleaner freight and passenger vehicles (e.g. with taxes and regulatory instruments).
- Set priority actions and quantitative energy efficiency targets by sector, support measures across sectors and regularly monitor and evaluate their cost-effectiveness as part of the implementation of the NEEAP.
- Increase the short-term renewable energy target and set longer-term targets; clarify subsector targets and ensure consistency across targets and objectives; encourage the use of renewable energy sources in transport.

Adaptation

- Strengthen mainstreaming of adaptation into relevant policy areas (e.g. key economic sectors, ecosystems, infrastructure) and in policy and project appraisal.
- Further improve scientific knowledge on climate change vulnerability and impacts, including social aspects, to make an economic case for action; continue to develop early warning systems for extreme weather events; design an online platform for climate data that is user-friendly for policy makers and other stakeholders.
- Support local authorities in preparing their climate change adaptation plans by building technical capacity and improving access to geographically disaggregated data at the local level; ensure that adaptation plans are supported by robust and realistic financing strategies.

5. Urban wastewater management

Turkey has made significant progress in urban wastewater management as a result of continuous investments of national and international funds, increase in institutional capacity, and legal and institutional reforms (including amalgamation of small municipalities). In particular, access to wastewater collection network and treatment facilities has increased, but remains among the lowest in the OECD. Approximately 14% of residential wastewater is discharged without treatment, and 38% of industrial wastewater is not treated before being discharged into water bodies (TurkStat, 2018b). Water quality monitoring has improved considerably since the 2008 EPR, and similar progress is needed in the wastewater sector.

At the same time, strategic documents focus on investment in line with the stringent national effluent standards that in some aspects go beyond EU requirements. This may carry risks of excessive capital costs, technology lock-in, a knock-on increase of operation and maintenance (O&M) costs and, ultimately, rising consumer tariffs.

Population growth, agricultural activities and energy production will increase pressure on water quantity and quality. Climate change will add more uncertainty to water availability and needs. In this context, Turkey is committed to further improving planning and monitoring at the river basin level to target and manage priority water-related risks.

Institutional and regulatory framework

Two ministries regulate and monitor performance of water supply and sanitation (WSS) services. The MEU determines treatment standards for wastewater treatment plants, and issues and enforces discharge permits. The MAF develops policies for protection and sustainable use of water resources, regulates water supply and co-ordinates national water management. Each ministry regulates and monitors performance of its respective aspects of WSS services.

Turkey is committed to strengthening the national Water Management Co-ordination Board and similar lower-level boards, created in 2012 to foster co-operation across government bodies and with other stakeholders, including water users (Section 2). A successful transition towards more efficient wastewater collection and treatment requires engagement with stakeholders at the national, basin and local levels, to set realistic levels of ambition, priorities and financing strategies.

The forthcoming Water Law is expected to clarify roles and responsibilities of different government authorities, as well as enable public participation in water management practices. Turkey is moving towards regulating and monitoring water pollutants based on conditions of receiving water bodies at the basin level. This is a key issue to be addressed in RBMPs, as it will drive requirements for additional effluent treatment.

Strategic planning

Turkey has started to integrate water-related SDGs into planning documents (Section 3). The government has invested considerable resources in recent years in preparing RBMPs, as well as drought and flood management plans. Consistent with the principles of the EU Water Framework Directive, Turkey has identified 25 hydrological basins, defined "sensitive water bodies, urban-sensitive areas and nitrate-sensitive areas" within them, and completed 25 river basin protection action plans.

Several ministries have drafted strategies to support WSS development in their respective areas. The MEU has prioritised investments in wastewater and sanitation services. The MAF prepared a Drinking Water Action Plan for settlements. The National Water Information System gathers all water-related data to support integrated planning and decision making in the water sector.

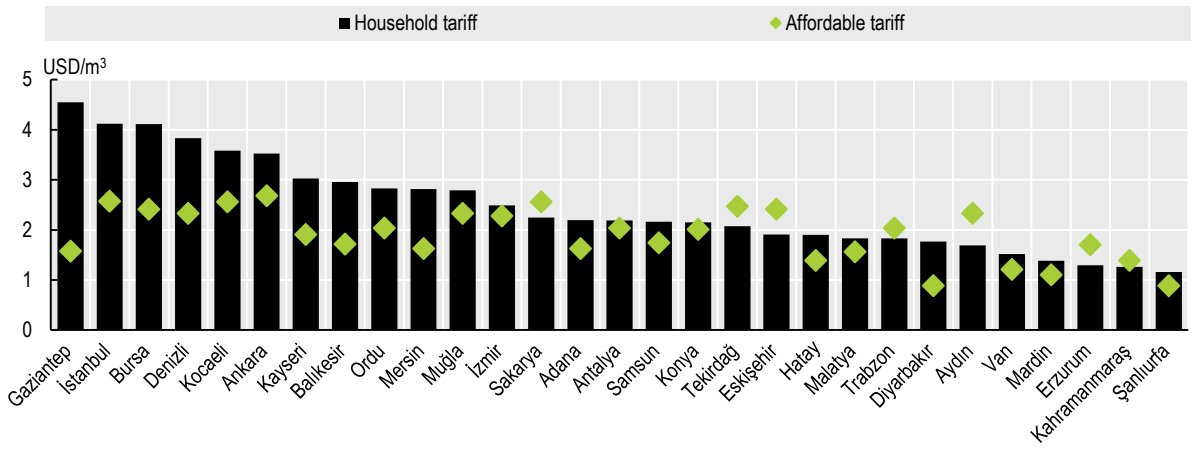
Turkey has several strategies, plans and programmes that deal with water resource management. However, an overall national water strategy would help to reflect progress to date, consolidate the efforts and streamline criteria of allocating funding for infrastructure development. At the local level, priorities set through river basin planning need to be reflected in urban development plans.

Investment and financing

Turkey's Environmental Law requires polluters to contribute to all investment, operation and maintenance in proportion to their pollution load and wastewater flow rate. In line with this principle, all wastewater infrastructure administrations have established full cost-recovery wastewater tariffs.

Turkey has identified water bodies sensitive to eutrophication. It has transposed relevant provisions of the EU Urban Wastewater Treatment and Nitrates Directives into national legislation. However, in some cases treatment requirements may go beyond what is necessary to achieve quality standards of receiving water bodies. This may increase investment costs and have lasting consequences for O&M costs. For example, additional nutrient removal can increase operating costs by more than 40% and generate 30% more sludge. These considerations could lead Turkey to review its designation of sensitive areas. Only a small number of Turkish water utilities have potential for tariff increase to finance new investments without harming the poorest households (Figure 4). Affordability of wastewater services should be monitored in view of potential social implications.

Figure 4. Household water and wastewater tariffs exceed affordability limits in many provinces



Note: The data are from 2016 and expressed in USD 2010 PPP; the threshold used for calculation of the affordable tariff per cubic metre is 2.5% of household income of the lowest quintile in the SKI service area.
Source: World Bank (2016); OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892231

The MEU has prepared regulations and guidelines for determination of wastewater tariffs. Indeed, most utilities will have to implement cost efficiency measures to accommodate growing capital costs in tariffs. Turkey may benefit from prioritisation and stepwise design and construction of wastewater infrastructure. This approach is applied by a number of EU Member States, including Croatia and Bulgaria.

The MAF has taken first steps to establish a benchmarking system for the provision of WSS services, including the structure and level of tariffs, and quality of service. These efforts are worth pursuing and expanding. Such a system should allow monitoring of actual performance of WSS facilities and costs of their services. This is critical for evaluating the impact of the sector's policies and programmes, and ensuring public accountability for tariffs and public investments.

Innovation

A number of innovative practices to drive progress in the water and wastewater sector, such as wastewater reuse and sludge digestion, are being explored in Turkey. They combine both technical and non-technical innovations and are applied at different scales. Innovative technical practices have potential to reduce capital and operational costs and contribute to water and energy security. For example, biogas production through sludge digestion can help meet wastewater utilities' energy needs. Looking for new management solutions, Turkey plans to extend PPPs, already implemented in other sectors (Section 3), to construction and operation of wastewater treatment plants.

Recommendations on urban wastewater management

Institutional and regulatory framework

- Continue to strengthen the institutional framework by clarifying roles and responsibilities in the water sector.
- Adjust wastewater treatment standards based on consideration of carrying capacity of receiving water bodies and robust cost-benefit analysis to avoid excessive capital and operational infrastructure costs; consider phased implementation of treatment requirements.
- Consider consolidating responsibilities for regulating economic aspects of WSS service provision within one government body.

Strategic planning

- Develop a single water strategy that would cover all water management aspects at the national level and be aligned with economic development and urban planning objectives.
- Harmonise national and municipal planning of water infrastructure development and management; use river basin planning to determine the level of ambition, priorities and financing needs.

Investment and financing

- Develop and endorse robust and realistic financing strategies that cover O&M costs of existing assets, new investments and further developments identified in RBMPs.
- Issue national guidelines for improving WSS services; encourage better utility O&M performance to facilitate financing of further investments and O&M costs and keep tariffs affordable.

Innovation

- Continue aggregating small utilities to generate economies of scale and make the best use of larger infrastructure; introduce other new business models for water and wastewater utilities.
- Continue expanding the role of the private sector to improve performance and leverage private financing, particularly from domestic sources.

References

EC (2016), *Turkey 2016 Report. Communication on EU Enlargement Policy*, European Commission, Brussels, https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/pdf/key_documents/2016/20161109_report_turkey.pdf.

Ecofys (2016), "Roadmap for the consideration of establishment and operation of a greenhouse gas emissions trading system in Turkey", report commissioned by the Ministry of Environment and Urbanisation, Ankara, www.ecofys.com/en/publications/roadmap-for-an-emissions-trading-system-in-turkey/.

Garanti and PwC (2017), *Capital Projects and Infrastructure Spending in Turkey: Outlook to 2023*, Garanti BBVA Group and PwC Turkey, January 2017, www.pwc.com.tr/en/hizmetlerimiz/danismanlik/sirket-birlesme-ve-satin-almalari/yayinlar/turkiye-altyapi-yatirim-harcamalari-raporu.html.

IEA (2016), *Energy Policies of IEA Countries: Turkey 2016*, Energy Policies of IEA Countries, International Energy Agency, Paris, https://doi.org/10.1787/9789264266698-en.

IEA (2018), "Emissions per kWh of electricity and heat output", *IEA CO_2 Emissions from Fuel Combustion Statistics* (database), International Energy Agency, https://doi.org/10.1787/data-00432-en (accessed 2 September 2018).

IPCC (2014), Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Pachauri, R.K. and L.A. Meyer (eds.), www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf.

Janssen, R. (2016), "Turkey: Industrial energy efficiency strategy", 17 October 2016, Energy Efficiency in Industrial Processes, Brussels, www.ee-ip.org/articles/detailed/7cc969ab93f80c76a54ecc339c544ae9/turkey-industrial-energy-efficiency-strategy/.

MENR (2018), Energy Efficiency Action Plan (2017-23), Ministry of Energy and Natural Resources, Ankara, www.yegm.gov.tr/document/20180102M1_2018_eng.pdf.

MEU (2016a), *Environmental Indicators 2015*, Ministry of Environment and Urbanization, Ankara.

MEU (2016b), Turkey's Sixth National Communication under the UNFCCC, Ministry of Environment and Urbanization, Ankara.

MEU (2016c), EU Integrated Environmental Approximation Strategy 2016-2023, Ministry of Environment and Urbanization, Ankara.

OECD (2018a), *Effective Carbon Rates 2018: Pricing Carbon Emissions Through Taxes and Emissions Trading*, OECD Publishing, Paris, https://doi.org/10.1787/9789264305304-en.

OECD (2018b), *OECD Analysis of Budgetary Support and Tax Expenditures*, OECD Publishing, Paris, www.oecd.org/site/tadffss/data/.

OECD (2018c), *OECD Economic Surveys: Turkey 2018*, OECD Publishing, Paris, https://doi.org/10.1787/eco_surveys-tur-2018-en.

OECD (2018d), "Creditor reporting system: Aid activities", *OECD International Development Statistics* (database), http://dx.doi.org/10.1787/data-00061-en (accessed 30 October 2018).

OECD (2016), "Innovation, agricultural productivity and sustainability in Turkey", OECD Food and Agricultural Reviews, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264261198-en.

REN21 (2018), *Renewables 2018. Global Status Report,* Renewable Energy Policy Network for the 21st Century, Paris, www.ren21.net/wp-content/uploads/2018/06/17-8652_GSR2018_FullReport_web_final_.pdf.

TomTom (2018), "TomTom Traffic Index: Measuring Congestion Worldwide" website, www.tomtom.com/en_gb/trafficindex/list?citySize=LARGE&continent=ALL&country=ALL (accessed 26 February 2018).

TSMS (2018), *State of the Climate in Turkey in 2017*, Turkish State Meteorological Service, Ankara, www.emcc.mgm.gov.tr/files/State_of_the_Climate_in_Turkey_in_2017.pdf.

TurkStat (2018a), *Transportation Statistics: Number of Road Motor Vehicles by Kind of Fuel Used* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreTablo.do?alt_id=1051 (accessed 11 June 2018).

TurkStat (2018b), *Sectoral Water and Wastewater Statistics* (database), Turkish Statistical Institute, http://www.turkstat.gov.tr/PreTablo.do?alt_id=1019 (accessed 16 October 2018).

UNFCCC (2016), Report of the Technical Review of the Sixth National Communication of Turkey, UN Framework Convention on Climate Change, New York.

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

Recommendations	Actions taken
Chapter 1. Environmental performance: Trends and recent developments	
Continue, and strengthen, efforts to improve energy efficiency in the energy, transport, industry, residential and services sectors, to capture related multiple benefits, including those of reduced air pollution and reduced greenhouse gas (GHG) emissions.	Turkey adopted a National Energy Efficiency Action Plan in 2017, building on the 2012 Energy Efficiency Strategy. The plan does not contain sectoral targets or indicators to measure progress.
Continue to promote the use of cleaner fuels for motor vehicles and for residential uses.	Motor vehicles produced after 1 January 2018 are subject to the latest EU emission limits. Coal will be gradually replaced by natural gas in residential heating.
Strengthen efforts to integrate air quality concerns into transport policy, including modal shift from road to public transport (e.g. railways), with appropriate cost-benefit analysis of investments and co-operation among levels of government and relevant sectors; extend the use of cleaner motor vehicles.	The government is implementing a scrapping programme for old vehicles and plans to stimulate domestic demand through investments in charging infrastructure and incentives for clean vehicle use. Tram and train routes are expanding, but private road vehicles largely dominate.
Continue and strengthen efforts to improve the information base for air management, including additional pollutants in the air emission inventories; extending ambient air quality monitoring; adopting and implementing the draft Regulation on Air Quality Evaluation.	The Air Quality Assessment and Management regulation (2008) is being revised to harmonise it with the EU Clean Air for Europe Directive. Ambient standards for pollutants will become more stringent by 2024 (no timeframe yet for $PM_{2.5}$). New air quality monitoring stations meet EU requirements.
Reduce water pollution from agriculture (e.g. identification of nutrient vulnerable zones, action plans to address pollution, codes of good agriculture practices, effective inspection and enforcement).	A Regulation on the Protection of Waters against Agricultural Nitrate Pollution was adopted in 2014. Nitrate pollution is monitored. Support payments are made for environmentally friendly agricultural techniques.
Continue efforts to promote water monitoring, promote the analysis of health and economic impacts of water pollution.	A Regulation on Monitoring of Surface Water and Groundwater was adopted in 2014. Monitoring programmes have been prepared for several river basins.
Prepare and adopt a framework law to cover all areas of nature and biodiversity.	A Biodiversity Strategy and Action Plan for 2018-28 is under preparation. Framework legislation on biodiversity protection has not yet been adopted. Turkey has not submitted national targets under the Convention on Biological Diversity.
Create protected areas so as to reach the 10% domestic target by 2010; establish them in an interconnected network; complete, adopt and implement management plans for all protected areas.	The share of protected areas has increased and reached 9%, which is still far from the Aichi targets. The shares of terrestrial and marine protected areas have not been made public.
Continue afforestation and sustainable forestry efforts; continue and expand all erosion combating efforts.	Turkey expanded natural and semi-natural forest areas and plans to further increase forest cover by 1.3 million hectares by 2023. Turkey is among the OECD member countries with the lowest forestry use intensity.
Finalise the inventory of endangered species; publish the corresponding Red List; improve statistics and indicators on biodiversity.	A nationwide biodiversity monitoring and inventory project is to be completed by 2019. Good inventory data have been collected on plants, but not on animal and fungi species. No Red List has been published; Turkey provides IUCN-compatible data only to the European Environment Agency.
Chapter 2. Environmental governance and management	
Continue to harmonise the national environmental legislation with the EU environmental acquis, following the EU Integrated Environmental Approximation Strategy, with particular attention to framework directives and EU emissions and quality standards.	Turkey has made significant progress in bringing its environmental regulatory framework closer to the EU acquis. It has aligned its water quality standards with EU ones, and plans to do the same for air quality standards by 2024.

Undertake strategic environmental assessment (SEA) concerning transport and agriculture policies.	A regulation on SEA entered into force in 2017. Its implementation for several sectors is phased in until 2023.
Strengthen the permitting system: moving from media-based permitting to integrated pollution prevention and control, distinguishing large and small/medium-sized installations; using periodic permit renewals to gradually introduce stricter emission standards; and promoting best available technology.	The 2010 regulation on environmental permitting introduced a single permit for air emissions, wastewater discharges, noise, and waste recovery and disposal. However, this consolidated permit is not yet based on best available techniques. A new regulation on integrated pollution prevention and control is expected in 2018.
Strengthen the enforcement system through an autonomous environmental agency in charge of inspection at national and territorial levels, increased resources for inspections and compliance monitoring, and increased training for inspectors; integrate environmental concerns (i.e. pollution, natural resources, nature concerns) at all levels of land-use planning, and strengthen enforcement of land-use plans.	Turkey is implementing risk-based inspection planning. Total annual amount of administrative fines almost doubled since 2008 in constant prices. However, less than 20% of inspections are planned, and detection of violations is low. Local spatial plans are exempted from strategic environmental assessment requirements and are dominated by development plans.
Continue to monitor the implementation of the right of access to environmental information and of access to courts concerning environmental issues, and correct implementation as needed.	Environmental information held by public institutions is accessible upon request. However, access is hampered by broad "economic interest" restrictions and processing fees. Non-governmental organisations (NGOs) have gained ability to bring environmental claims to court, but there are legal standing restrictions for both NGOs and individuals.
Continue to strengthen environmental education; develop further efforts by public authorities and environmental NGOs to increase environmental awareness.	Turkey has promoted environmental awareness mostly through distribution of printed materials on environmental impacts and good practices. The school curriculum integrates environmental matters into several courses.
Chapter 3. Towards green growth	
Maintain a focus on sustainable development within the government, and the country more broadly, through an inter-ministerial committee and associated advisory council that provide for broad participation by private sector institutions and the public.	National Development Plans include sustainable development as one of the main principles. The National Sustainable Development Commission, which invites non-government stakeholders, reviews implementation of Sustainable Development Goals (SDGs).
Integrate environmental and sustainable development concerns into regional development programmes, with particular attention to rural and disadvantaged regions.	In 2016, Turkey approved a rural development action plan that included environmental improvement and continuity of natural resources as one of its five strategies.
Develop the use of economic instruments, seeking an effective and efficient mix of instruments, with due regard to social issues; promote implementation of the polluter pays and user pays principles, with a progressive shift from public to private funding, and a time limit for environmental subsidy schemes.	Turkey has among the highest shares of environmentally-related tax revenues in the OECD, mainly from taxes on energy use in the transport sector. The government also uses feed-in-tariffs to encourage private sector investment in renewable energy.
Develop the use of economic instruments to reduce air emissions from stationary and non-point sources; review and revise, as appropriate, existing taxes on fuels and motor vehicles to support air pollution reduction objectives.	Motor vehicle taxes provide an incentive for smaller engines and electric vehicles, but do not incorporate other environmental criteria. Diesel is taxed at lower rates than gasoline. Outside of the transport sector, energy use is taxed at low levels or exempt from tax.
Establish a "green tax commission" to review and revise the full range of economic instruments of relevance for the environment (i.e. taxes, charges, trading, others); consider a comprehensive green tax reform, possibly in a revenue-neutral perspective; review motor vehicle related taxes; introduce taxes on polluting products and inputs (e.g. detergents, batteries, pesticides, fertilisers, CFCs).	A study commissioned by the Ministry of Environment and Urbanization analysed a potential roadmap for a GHG emission trading system, recommending a Turkish pilot ETS of two-three years. However, the government has no plans to introduce carbon pricing at this time. A new vehicle taxation measure was added in 2018, encouraging the scrappage of vehicles of 16 years or older.
Reduce environmentally harmful subsidies, in particular in the agriculture and energy sectors, with appropriate measures to deal with competitiveness and distributive implications.	Subsidies for water use in agriculture have been eliminated. Support for coal heating in poor households will be phased out as communities gain access to natural gas. However, substantial fossil fuel subsidies remain, in the form of fuel tax exemptions and subsidies for coal production and use.
Expand economic information on the environment (e.g. environmental expenditure, environmentally-related taxes, resource prices, employment); develop economic analysis (e.g. cost-benefit analysis of environmental projects).	Turkey is ready to publish a set of approximately 80 SDG indicators. New investment projects, including coal power facilities, do not undergo cost-benefit analysis to consider environmental externalities.

Develop public-private partnerships (PPPs) and industry-driven environmental initiatives with appropriate involvement of the Turkish Business Associations.	Turkey has successfully used PPP financial models for infrastructure, airports, highways, energy and health infrastructure, as well as some water and rail projects.
Increase the capacity of provincial and municipality authorities to prepare and implement environmental infrastructure projects, including those with EU funding; continue the reform of the Bank of Provinces to increase the efficiency in transfers of public funds to municipalities and in municipal investments.	ILBANK provides credit support to municipalities for infrastructure. The Industrial Development Bank of Turkey and the Turkish Development Bank use loans from the European Investment Bank to fund mainly renewable energy and energy efficiency projects.
Strengthen national policies, guidance and requirements governing the environmental performance of industry, both in Turkey and elsewhere. This would entail a "greening" of foreign direct investment and export credit decisions, as well as rigorous application to Turkish industry of the environmental aspects of the OECD Guidelines for Multinational Enterprises.	Turkey's stock exchange has established a Sustainability Index in 2014 to help institutional investors find companies that have high environmental, social and governance performance.
Introduce a dedicated environmental component into Turkey's expanding official development assistance (ODA) programme, including the possible establishment of an Environmental Focal Point in the International Co-operation and Development Agency to oversee and co-ordinate environmental assistance efforts, as well as help ensure the environmental soundness of the overall ODA programme.	Turkey does not have a strong environmental focus in development co-operation, though it does provide some aid for water, sanitation and hygiene, as well as a training programme for industrial energy efficiency.
Chapter 4. Climate change	
Maintain progress in contributing to international efforts to address climate change by preparing a comprehensive National Climate Change Plan, with clear goals, priorities and milestones, which also sets out responsibilities for all sectors of Turkish society; consider setting nationally-determined voluntary targets (e.g. for energy use, renewable energy, afforestation and greenhouse gas emissions). This would maintain momentum in pursuing the national strategy and to provide an important signal to other countries of Turkey's commitment and intent.	Turkey developed its first National Climate Change Strategy (2010-20), covering both mitigation and adaption. It was complemented by the National Climate Change Action Plan. The plan does not have a mitigation target and has not been monitored adequately. Renewable energy and energy efficiency targets were further detailed in the 2014 National Renewable Energy Action Plan and in the 2017 National Energy Efficiency Action Plan.
Continue efforts leading to accession to the Kyoto Protocol.	Turkey joined the Kyoto Protocol in 2009. It signed the Paris Agreement in 2016, but has yet to ratify it.
Strengthen the emergency preparedness and response system (e.g. establishing a commission to support the implementation of legislation concerning natural and industrial disasters, extending institutional co-ordination, acquiring appropriate equipment, performing regular drills and simulations).	Turkey is developing disaster risk reduction plans at the national and provincial levels. All 81 provinces should have a plan by 2020. The Disaster and Emergency Management Authority was established in 2009 to better manage risks.
Chapter 5. Urban wastewater management	
Adopt a comprehensive water law, balancing the demand and supply side of water resource management; further develop water resource management by river basin, addressing both quantity and quality issues; establish basin councils to reinforce co-operation and partnership among authorities and water users (municipalities, industries, farmers), on the basis of pilot projects.	Turkey has identified 25 hydrologic basins, defined "sensitive water bodies, urban-sensitive areas and nitrate-sensitive areas", and completed a river basin protection action plan (a precursor of a river basin management plan, RBMP) for each. RBMPs are expected to be developed by 2023 for all basins. A Water Law is under preparation.
Promote better water supply and wastewater infrastructure; encourage water saving and investment to reduce water losses.	In 2016, 92% of the population was served by water supply networks. Access to wastewater collection network and treatment facilities has increased to about 70%, but remains among the lowest in the OECD. About 16% of residential wastewater and 38% of industrial wastewater is discharged untreated.
Promote adequate pricing of water services, for household, industry and agriculture, with attention to efficiency, cost-recovery and affordability.	Turkey is committed to full cost recovery in water pricing, based on the 2010 Regulation on Procedures and Principles for Determination of Tariffs for Wastewater Infrastructure Facilities. However, few water utilities have potential for tariff increase to finance new investments without harming poor households.

Part I. Progress towards sustainable development

Chapter 1. Environmental performance: Trends and recent developments

Robust economic growth, coupled with rapid population growth, industrialisation and urbanisation have put considerable environmental pressure on Turkey. Some progress has been made in municipal waste generation and collection, and in forest cover, but important challenges remain in other areas, such as air pollution and energy consumption. This chapter provides a snapshot of key environmental trends in Turkey since 2005. It highlights the progress made in decoupling economic activity from environmental pressures and sketches out major policy developments.

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

As a rapidly growing economy, Turkey faces a range of environmental pressures, such as water scarcity and increasing air pollution and greenhouse gas (GHG) emissions, exacerbated by strong population and urbanisation growth.

In response to these pressures, and in an effort to comply with the European Union (EU) environmental acquis, Turkey has developed a number of strategies and adopted a range of laws in different environmental sectors, such as climate change, biodiversity and waste. The legislation is rapidly evolving. Since the opening, in 2009, of the environment chapter for EU accession, legislation has been largely aligned with key European standards. Turkey has been referring to sustainable development policies in its National Development Plans since 1992, following the Rio Summit. The 10th Development Plan (2014-18) has sustainability at its core, while the 11th plan, in preparation, is based on the Sustainable Development Goals (SDGs) (MoD, 2016). The Turkish Statistical Institute (TurkStat) is about to publish 80 SDG indicators. Turkey is also a party to many important international environmental conventions.

Since the last Environmental Performance Review (EPR) in 2008, Turkey has made progress in relatively decoupling its strong economic growth from a range of environmental pressures (air emissions, waste generation, energy and water consumption). However, despite these efforts and increasingly ambitious plans, environmental pressures remain strong. Furthermore, policy implementation is often hampered by lack of coherence, institutional clarity or the necessary financial and human resources. Ensuring the integration of environmental protection into economic plans remains a challenge.

1.2. Key economic and social developments

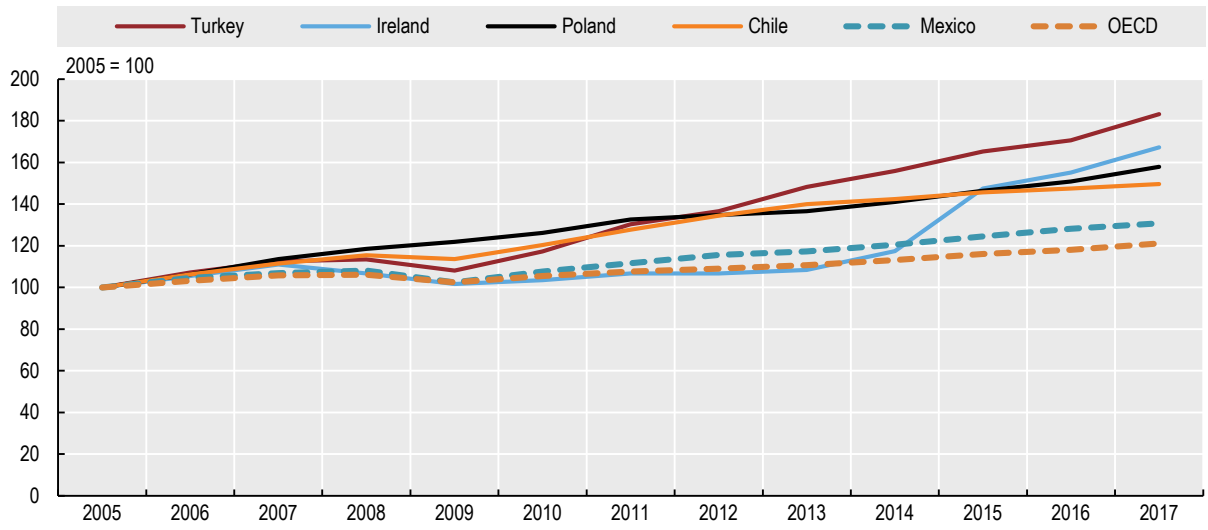
1.2.1. Economic performance

Turkey is the eighth largest OECD economy, but among the last in per capita terms, measured in USD 2010 purchasing power parity (PPP). It is, however, the fastest growing. The gross domestic product (GDP) per capita gap narrowed from 46% of the OECD average in 2005 to 63% in 2017. Despite adverse regional and domestic conditions, Turkey's real GDP increased by 83% during 2005-17, compared to 21% for the OECD area. This represents 16 percentage points more than that of Ireland, the second fastest growing OECD economy (Figure 1.1).

The global financial and economic crisis of 2008-09 hit the country through weaker economic demand in export markets. Despite a good recovery, growth rates have slowed. Economic growth is projected to hover around 5% in 2018 and 2019 (OECD, 2018a).

Turkey still lags behind in terms of exported value added per capita. Its remarkable economic performance has not been sufficiently backed by gains in export market shares. While its economy incorporates an increasing share of foreign value added in its exports, its capacity to provide intermediate inputs to other countries' exports is still limited. A recent OECD study reported that Turkey's participation in global value chains remains below potential due to inefficient allocation of capital and labour. Such obstacles are inherent in bilateral trade agreements and entry regulations, underdeveloped human capital, and insufficient investment in innovation, research and development (R&D) and knowledge-based capital (Ziemann and Guérard, 2017).

Figure 1.1. GDP growth is the highest in the OECD area



Note: GDP expressed at 2010 prices and purchasing power parities.
Source: OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892250

According to the OECD Economic Surveys of Turkey, economic growth remains disproportionately driven by domestic demand and is largely fuelled by debt-creating capital inflows (OECD, 2018a, 2016a). The large external deficit makes the economy vulnerable to financial uncertainty, changes in global investors' sentiment and political risks (EC, 2016; OECD, 2018a). Although the external deficit has declined thanks to falling oil prices and market share gains, especially in the European Union, it is still large. Domestic-led growth and low share of tradable goods and services create tension between strong growth and external sustainability (OECD, 2016a).

A stronger export sector would rebalance economic growth. Greater trade intensity would increase CO_2 emissions due to transport and higher industrial output, but it would also help align Turkish environmental standards to international best practices. This is particularly important given its less stringent environmental policies compared to other OECD member countries (Ziemann and Guérard, 2017; OECD, 2018b) (Chapter 2).

Public spending pressures have been strong and government spending rose considerably, but the fiscal deficit has been kept in check (OECD, 2018a; 2016a). The government has a strong fiscal position, with a budget surplus of 1.3% of GDP, against a deficit of 2.8% in the OECD area (Basic Statistics). The gross financial debt, at 27.4% of GDP, is much lower than the OECD average (Basic Statistics). Monetary policy has been supportive, despite a series of tightening measures since 2017 in response to drifting inflation expectations following sharp currency depreciation (OECD, 2018a).

1.2.2. Structure of the economy and employment

As an emerging economy, Turkey has a much larger agricultural sector than other OECD member countries – 7% of total valued added compared to 1.7% for the OECD area. Consequently, the service sector has a lower economic share, 61% (Basic Statistics). By

contrast, Turkey has a rapidly growing private industrial sector in basic industry, construction, transport and communication (IEA, 2016).

Despite this industrial dynamism, segments of the business sector, especially smaller businesses, operate on an informal basis. Institutional and regulatory settings for firms remain rigid despite recent reform efforts, notably in labour markets (OECD, 2018a).

Unemployment, especially among the young and women, is high, at 10.8% of the labour force, compared with 5.8% in the OECD area (Basic Statistics) (OECD, 2018a). At the same time, employment rates of the most vulnerable groups have increased, and rising labour force participation and job creation, mostly in service sectors, have strongly improved labour utilisation (OECD, 2017a).

1.2.3. Population, regional disparities and well-being

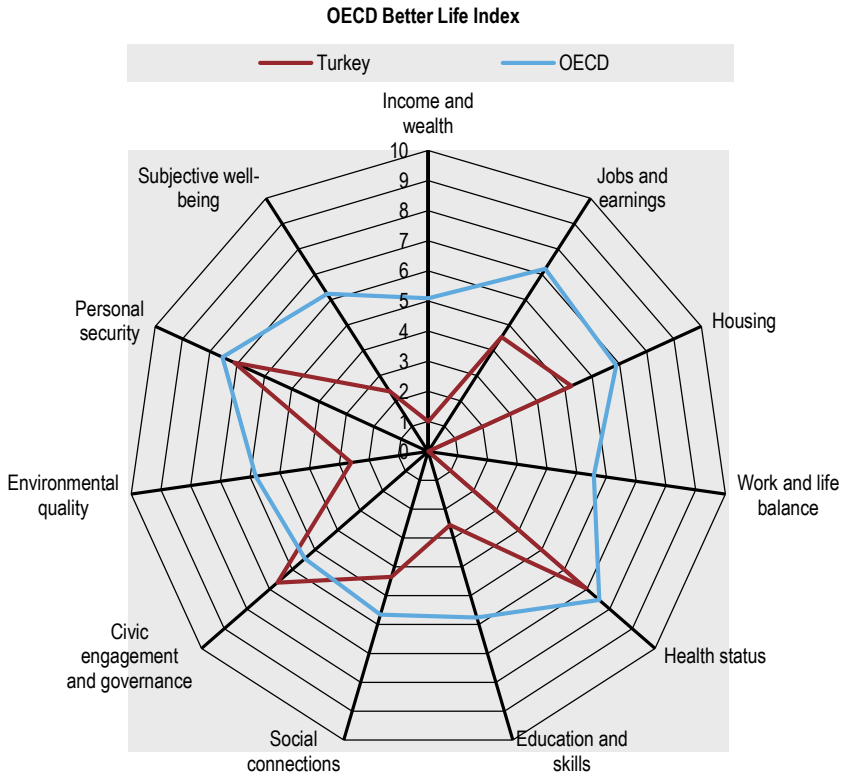
Turkey has a young and urbanising population. Population density is much higher than in the OECD area – 103 inhabitants/km^2 compared with 35 (Basic Statistics), but is rather low in most of the country. The exceptions are the key cities of İzmir, Ankara and Istanbul, the latter being the largest city in Turkey and in Europe (IEA, 2016), and where almost 20% of the population live (OECD, 2016a).

Strong growth over the past decade has paved the way for convergence in living standards with higher-income OECD member countries. Sustained job creation outside agriculture, which accelerated in the 2010s, has improved well-being, notably in less-developed regions (OECD, 2018a). Life expectancy and expected years of schooling have improved. In addition, absolute poverty, measured as the share of people living below the national poverty line, declined sharply, from 28.8% to 13.3% over 2003-06. It settled at 1.6% in 2014 according to national sources (OECD, 2016a).

Nevertheless, this progress over the last two decades still falls short of OECD living standards. Turkey performs well in only a few dimensions of well-being relative to most other countries in the OECD Better Life Index. It ranks above average in civic engagement and governance (due to high voter turnout). Yet it ranks below average in income and wealth, health status, social connections, education and skills, jobs and earnings, subjective well-being, environmental quality (measured in terms of exposure to air pollution and water quality), work-life balance, housing and personal security (Figure 1.2).

Relative poverty, as measured by the share of the population earning less than 50% of the median disposable income, is higher than in the OECD area – 17.8% compared with 11.3%. Income inequality, as measured by the Gini coefficient, remains high, 0.4 compared with 0.32 in the OECD. Average household disposable income per capita was still 54% of the OECD average in 2014 (at current PPP). Educational achievements are modest, with 39% of Turkish adults aged 25-64 having completed upper secondary education (OECD, 2017a; 2016a), and 20% having attained tertiary education, against an OECD average of 36.9% (Basic Statistics).

Figure 1.2. Well-being indicators are below OECD averages



Source: OECD (2017), Better Life Index 2017.

StatLink http://dx.doi.org/10.1787/888933892269

Economic and social progress are not evenly distributed; regional disparities are large. Average household income in Istanbul is almost three times higher than in south-eastern Anatolia, the highest regional gap among OECD member countries. Furthermore, while less than 5% of people in Istanbul live with less than half of the national median income, this share is 50% in some areas of south-eastern Anatolia (OECD, 2016a). Regional disparities in terms of GDP per capita were the fifth highest in the OECD, as measured by the Gini index across small regions. Turkey has the widest regional variations in the OECD in terms of economic structures (e.g. share in industry). Regional disparities show also in youth unemployment rates, employment gender equality and functional literacy rates between rich and poor youth (OECD, 2016b; Spaull, 2017).

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

Strong economic and population growth has come at the price of increasing energy consumption, GHG emissions and air pollution. Despite having indigenous coal and renewable energy resources, Turkey is highly dependent on imported energy, notably oil and natural gas. As the pace of resource development fell further behind demand growth, energy self-sufficiency (production divided by total primary energy supply – TPES) declined from 28% to 25% between 2005 and 2017 (IEA, 2018).

Turkey plans to reduce import dependency and ensure energy security by diversifying imports, integrating regional markets (notably the European electricity market), increasing domestic production (notably coal and renewables, but also nuclear), fostering energy efficiency, preventing waste in all processes and reducing consumption through awareness campaigns. These measures have not yet paid off, and numerous challenges remain on the path towards a more energy-efficient and low-carbon economy.

1.3.1. Energy structure, intensity and use

Turkey's energy demand growth is among the highest in the OECD. TPES increased by 76% over 2005-17, compared with a decrease of 4% for the OECD area (IEA, 2018). Population has grown by 1.5% annually since 2005 and is projected to grow by another 3.8% by 2020. Consequently, projections by the Ministry of Energy and Natural Resources (MENR) show that this energy trend will continue for the medium and long term (MEU, 2016a).

Turkey is endowed with large reserves of lignite and some hard coal, but has few oil and gas resources (IEA, 2016). About half of domestic energy production in 2017 came from fossil fuels, of which 43% of coal, 7% of oil and 1% of natural gas, and the rest from renewables (IEA, 2018). The energy mix is very carbon-intensive, with a predominance of fossil fuels, and the share of renewables is still below potential. Given the trend and the government policy to increase use of domestic coal, the energy sector is likely to remain carbon-intensive (Chapter 4).

Energy mix

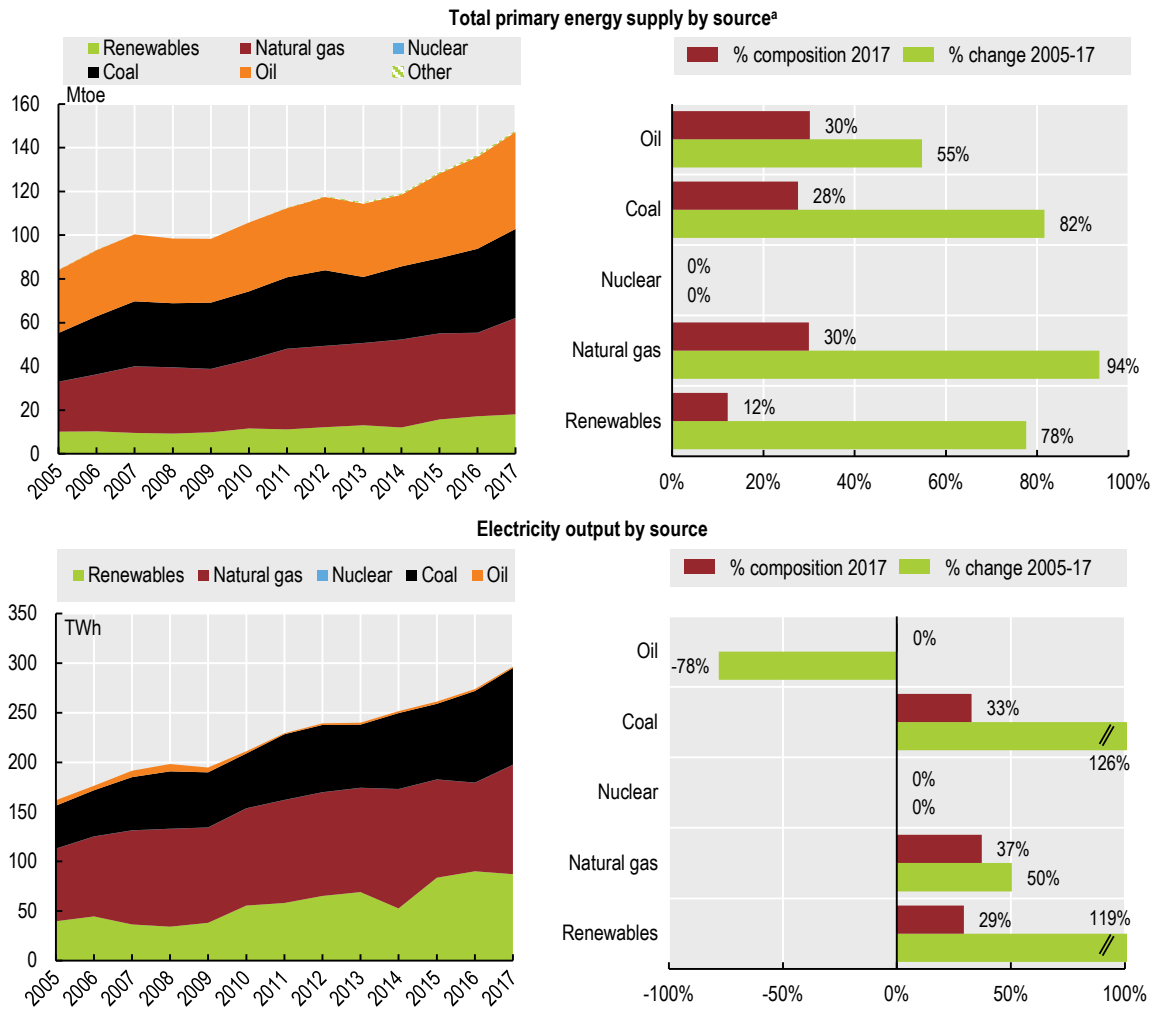
Fossil fuels represent 88% of TPES, with the remainder supplied by renewables (mostly hydro and geothermal). Renewables posted a high growth during 2005-17, but less than coal and natural gas. Their share in total TPES is higher than the OECD average (Basic Statistics), but it has remained stable at 12%. Energy supply from fossil fuels increased by 75% during the same period (Figure 1.3). While the share of coal has remained stable, the part of natural gas has increased at the expense of oil.

Natural gas is increasingly used in the residential, power and industry sectors, and imports have increased as a result. Still, the residential heating and industry sectors consume a large share of coal, which is uncommon by international comparison (most coal is normally used in power generation) (IEA, 2016). Oil is mostly used in the transport sector.

Electricity consumption has also increased considerably, by 91% over 2005-17. Around 70% of electricity is produced from coal and natural gas, and the rest from renewables. Electricity supply from coal and renewables has more than doubled since 2005, while the use of oil has decreased (Figure 1.3).

The government expects demand for primary energy to reach 218 million tonnes of oil equivalent (toe) in 2023 (more than the double of 2016 total consumption). The share of coal is predicted to increase, while the part of natural gas is expected to decrease (to reduce imports) and that of oil to remain stable (MEU, 2016a). To meet this growing demand and reduce import dependency, the government plans to increase domestic production, especially of coal and renewables. Turkey still imports most of the coal used in power generation, given the international hard coal price decrease and the low quality and calorific value of local lignite. However, there could be tension between the objectives of reducing import dependency (by relying on domestic coal) and curbing air emissions (by replacing coal with imported natural gas in heating systems).

Figure 1.3. Energy supply is heavily dependent on fossil fuels



Note: a) Breakdown excludes electricity trade.
Source: IEA (2018), *World Energy Statistics and Balances* (database).

StatLink http://dx.doi.org/10.1787/888933892288

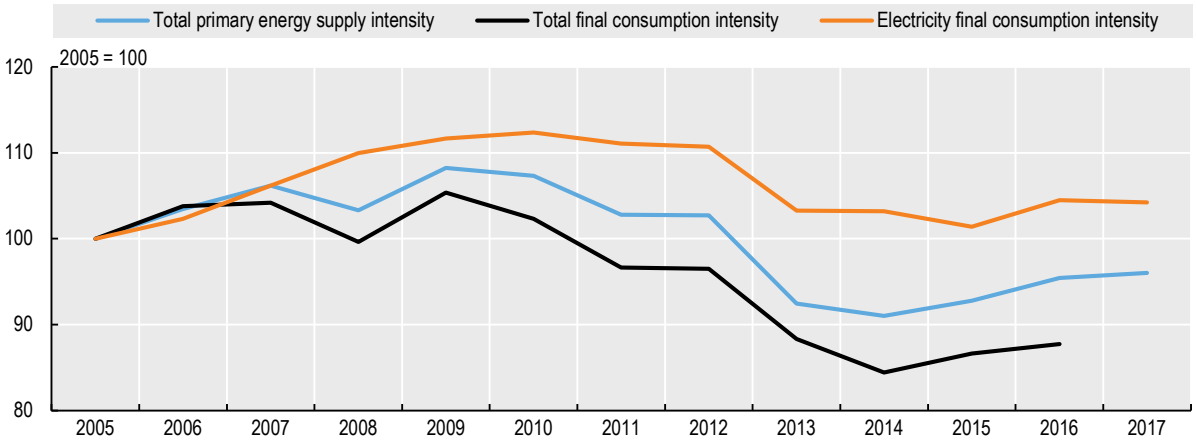
The MENR Strategic Plan for 2015-19 sets a target of increasing the amount of electricity generated from domestic coal to 60 TWh/year by 2019, that is, almost doubling the production in less than five years. Given the plants announced, proposed and under construction, Turkey has one of the largest coal plant developments in the world (auctions for coal mines will be launched in 2018-23), outside the People's Republic of China and India. Turkey is also progressing with its plans to deploy three nuclear power plants in the next decade, and has accelerated the deployment of renewable energy. Nuclear power is absent from Turkey's energy mix, but it is one of the strategic objectives of the MENR. Turkey already ratified agreements with the Russian Federation and Japan to construct two nuclear power plants, which are expected to add 9.2 GW of baseload capacity. A third plant is planned for after 2023. These nuclear power plants, once operational, are expected to meet 10% of electricity consumption.

Energy intensity

Expected steep future growth of energy consumption is reflected in the relatively low energy consumption per capita. TPES per capita is still low compared to other OECD member countries – 1.8 toe/capita in 2017 compared to 4.1 for the OECD area. It is, however, growing fast, 47.9% over 2005-17 compared to a decrease of 11.3% in the OECD area (IEA, 2018).

Energy intensity (TPES divided by GDP) is around the OECD average. Turkey's target to reduce energy intensity by 20% by 2023 (from 2011) requires additional efforts to be reached (IEA, 2016) (Chapter 4). TPES intensity has decreased to 96% of the 2005 value, whereas total final consumption intensity has decreased more (88%). By contrast, electricity consumption intensity has remained relatively stable. The decrease in energy intensity is, however, not steady. It remains dependent on external economic conditions, as the effects of the 2008-09 global financial crisis show (Figure 1.4).

Figure 1.4. Energy intensity is decreasing, but not at a steady pace



Note: Per unit of GDP (at 2010 prices and purchasing power parities).
Source: IEA (2018), *World Energy Statistics and Balances* (database); OECD (2018), "Environmental Performance Indicators", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892307

There is no comprehensive assessment of the actual energy savings achieved from the numerous measures presented by the government. An evaluation of the gap between targets and the actions taken is missing, and the government has not developed methodologies and indicators to measure progress (IEA, 2016). Judging by the trends in energy supply and consumption (relative decoupling of TPES and GDP since 2005) and in emissions (see below), these measures do not seem to have had a significant impact so far (Figure 1.4).

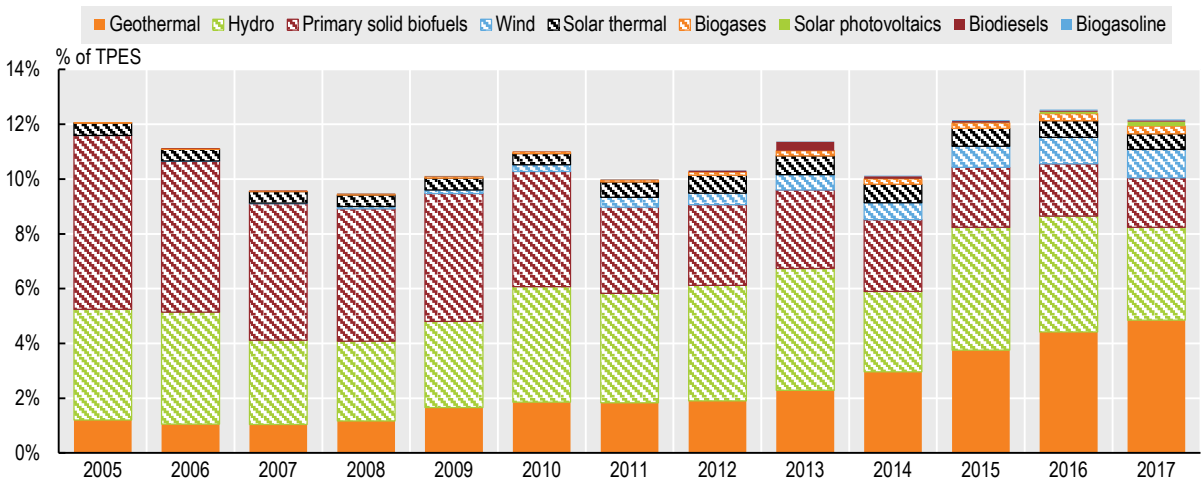
Renewable energy supply

Turkey has important wind, water, geothermal and solar resources to explore the potential of renewable energy (World Bank, 2012). The country has been diversifying its energy mix by increasing investment in these sources. In one decade, installed renewable energy capacity has almost doubled (IEA, 2016). Turkey figures among the top world performers in installed capacity in 2017, especially in solar, wind, geothermal and hydro-power (REN21, 2018). The tenth Development Plan had a target of increasing the share of

renewables in electricity production from 25.3% in 2006 to 29% in 2018. In addition, the Electricity Energy Market and Supply Security Strategy had a target of 30% by 2023 (EC, 2016). This target has almost been reached, at 29.3% in 2017.

The sector is, however, still in its development phase and the share of renewables is fluctuating, depending on hydropower production and the use of coal and gas. Over two-thirds of renewable energy comes from geothermal and hydro sources, followed by solid biofuels. Recent competitive auctions for large-scale solar and wind electricity projects (1 GW each) have been successful in driving investment. Other off-shore wind and on-shore wind and solar projects have been planned. The installed capacity is expected to further increase. Yet wind and solar still command a low share of TPES, and tidal energy is not utilised (Figure 1.5).

Figure 1.5. Renewables' share in TPES has remained relatively stable



Source: IEA (2018), *World Energy Statistics and Balances* (database).

StatLink http://dx.doi.org/10.1787/888933892326

Notwithstanding the increase in installed capacity, the share of renewables in TPES has remained fairly stable. This is because conventional energy sources and imports met most of the increase in energy demand (IEA, 2016), and renewables do not play a major role in the growth of transport and heating sectors. Renewables are still exploited below potential. For example, around 1 150 MW of geothermal power are installed, with a target of 1 500 MW by 2018. However, only a part of the country's geothermal potential, probably less than half, has been put to use. A similar picture holds for solar power (Chapter 4).

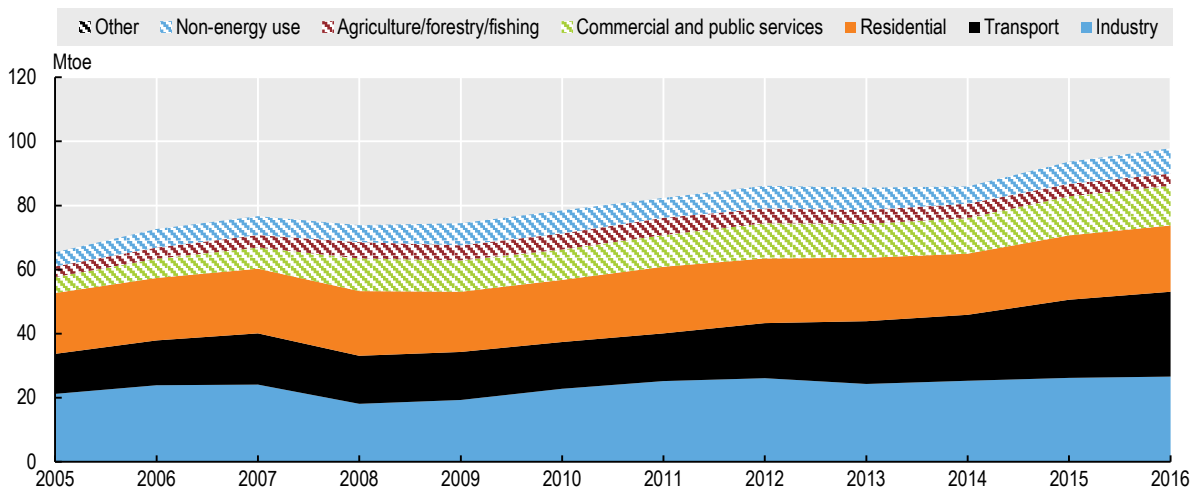
The government expects to further increase the use of renewables, especially hydro and geothermal, and envisages exploiting the maximum potential (MEU, 2016a). However, the government's plans are unclear. While it has technology-specific targets in different strategies and plans for 2023, as well as the 2030 Agenda for Sustainable Development, some are inconsistent. For example, the indicative target in Turkey's Intended Nationally Determined Contribution for increasing wind capacity is less ambitious than the one presented in the National Renewable Energy Action Plan (Chapter 4). Furthermore, despite the interest of private investors, the electricity network is not adequate to satisfy the demand for renewable energy (IEA, 2016). There are also some concerns that fees stemming from

tenders and other investment requirements are delaying or stalling installation of some licensed solar projects (Chapter 3).

Energy consumption

Total final energy consumption (TFC) has increased by 50% over 2005-16, compared to a decrease of 2.3% for the OECD area. Industry (notably non-metallic minerals) and transport are the largest consumers (27% each in 2016), followed by the residential sector. Transport is the sector that, after the commercial and public services sector, has shown the highest consumption growth over 2005-16 (IEA, 2018) (Figure 1.6).

Figure 1.6. Industry and transport are the largest energy consumers



Source: IEA (2018), *World Energy Statistics and Balances* (database).

StatLink http://dx.doi.org/10.1787/888933892345

The government adopted a National Energy Efficiency Action Plan in 2017. However, this plan has no sectoral targets and does not spell out actions to be taken. Developed with the help of the European Bank for Reconstruction and Development (EBRD) and funded by the European Union, it targets a 14% reduction of primary energy consumption by 2023 from business-as-usual, for a cumulative savings of around 23.9 Mtoe (Chapter 4). Another objective is to reduce energy intensity by at least 20% below 2011 levels by 2023, mainly through improved efficiency. The MENR Strategic Plan 2015-19 does not contain any new energy efficiency target (IEA, 2016).

Energy efficiency is regarded as one of the most important components of national strategies (Chapter 4), but several measures need to be strengthened to reach the stated objectives. For example, the building sector – one of the most energy consuming in many countries – could make a larger contribution to energy efficiency. The tenth Development Plan sets the target of reducing energy consumption of public buildings only by 10% by 2018 compared to 2002. The main measures in the residential sector are compulsory "energy consumption class" labels and promotion of renewable energy for buildings larger than 20 000 m^2; a central heating system for those larger than 2 000 m^2; and tax breaks for real estate income for energy saving expenses. New buildings must have at least a "C-class" certificate. Thermal insulations and solar-powered energy systems for private buildings are

not subject to a construction permit if the energy performance certificate has at least a C-class rating. Energy performance certificates are expected to become compulsory for all buildings by 2020 (Chapter 4).

However, only about 8% of buildings have such certificates. There are no quantitative targets and timeframes for reducing energy consumption in private buildings. There are low-interest loans for renovation works to obtain A- and B-class energy certificates, but no incentives for insulation works. Financing of building and renovation works mainly comes from international sources. For example, the Turkish Residential Energy Efficiency Financing Facility developed by the EBRD provides loans to owners who wish to invest in energy efficiency projects.

1.3.2. Transport

Transport is a major source of energy consumption and air pollution, especially in densely populated cities. This is due to the dominance of road transport and an ageing vehicle fleet. Although the road vehicle stock per capita is still low compared to other OECD member countries, it is growing fast – by 72% over 2005-16 (OECD, 2018c).

Istanbul has recently made efforts to enhance the public transport system. While tram routes in metropolitan municipalities and train routes within and between cities are expanding, these efforts still fall short of expectations. The railway network grew faster than the road network in 2005-16 (by 14.5% and 12.8%, respectively), but roads largely dominate the transport system. Railway is hardly used for freight (3.7%) or passenger transportation (1.4% in 2016) (ITF, 2018).

The average age of registered cars was 13.2 years in 2017 (TurkStat, 2018a). The share of diesel cars has strongly increased over the past decade, from 6.8% to around 37% between 2005 and 2018 (Chapter 3). The share of diesel in final energy consumption by road transport increased from 56% in 2005 to 69% in 2015, compared with 34% and 37%, respectively, for the OECD area (ITF, 2018).

The government is implementing a scrapping programme for old vehicles. However, over 2005-17, fewer than 1% of vehicles were withdrawn annually from traffic in return for a payment (TurkStat, 2018a). There are targets to reduce the share of domestic passenger transport on highways to 72% of the current level by 2023. At the same time, Turkey wants to increase the share of rail in freight to 15% in 2023 and 20% in 2035 and in passenger transportation to 10% in 2023 and 15% in 2035. Although rail infrastructure investment, given its low starting base, grew faster than road over 2005-16, most investments are concentrated on road transport. The share of infrastructure investment in 2016 was 15% for rail, 65% for road and 20% for airports (ITF, 2018). Roads are expected to account for one-quarter of future infrastructure investment, compared to railways at 9% (Chapter 3). Seaway freight and passenger transportation is also slated to increase by 2023 (MEU, 2016a). Air passenger traffic is projected to almost double, from about 193 million passengers in 2017 to 350 million in 2023.

A Transport Master Plan outlining investment priorities for inter-regional and international transport has been prepared, but the implementation schedule is, as of November 2018, uncertain. Turkey is also amending the 2008 transport legislation to establish low emission zones, which would be managed at the local level. The government plans to stimulate domestic demand through investments in charging infrastructure and incentives for widespread clean vehicle use (Chapter 3). Motor vehicles produced after 1 January 2018 are subject to the latest emission limits of the EU Framework Directive for the approval of

motor vehicles. Fuel distribution companies and refineries are obliged to blend 3% of domestically produced bioethanol to gasoline and 0.5% of domestically produced biodiesel to diesel.

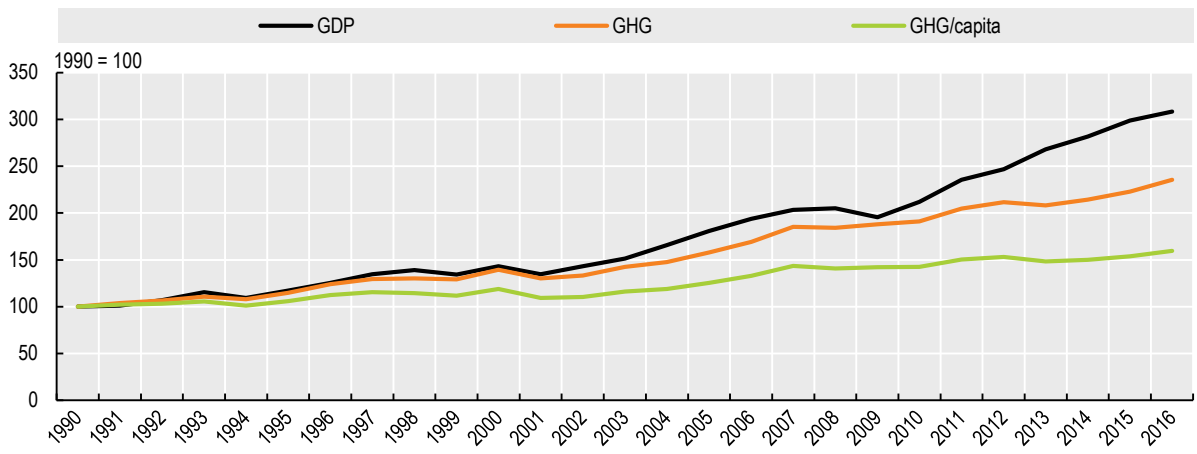
The 2008 OECD EPR of Turkey recommended to strengthen efforts to integrate air quality concerns into transport policy. Specifically, Turkey should shift from road to public transport (e.g. railways), with appropriate cost-benefit analysis of investments and co-operation among levels of government and relevant sectors, and extend the use of cleaner motor vehicles (OECD, 2008). This recommendation is still valid.

1.3.3. Greenhouse gas emissions

Emissions profile

Growing energy consumption and transportation have caused important GHG emission increases. Given the economic and population growth, the government expects emissions to increase further. Turkey is the OECD country with the highest GHG emission growth, 49% over 2005-16. GHG emissions have followed closely GDP growth and have been relatively decoupled only in recent years. Emissions per capita, although among the lowest in the OECD, have increased by 60% since 1990 (Figure 1.7).

Figure 1.7. GHG emissions have started to relatively decouple in recent years



Note: GHGs exclude emissions/removals from land use, land-use change and forestry (LULUCF). GDP at 2010 prices and purchasing power parities.
Source: OECD (2018), "Environmental Performance Indicators", *OECD Environment Statistics* (database).

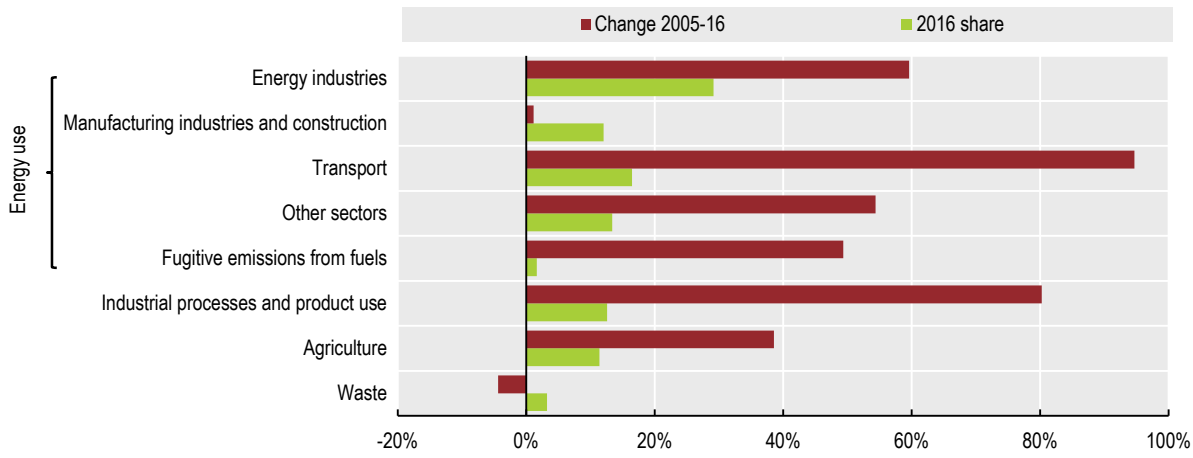
StatLink http://dx.doi.org/10.1787/888933892364

Most and fastest growing GHG emissions come from power production and transport, followed by industrial production. Only the waste sector witnessed a small decline (Figure 1.8). As in most OECD member countries, CO_2 is the main contributor to GHG emissions, amounting to 81% of the total in 2016. This is followed by methane (11%), nitrous oxide (6%) and hydrofluorocarbons (1%) (OECD, 2018d). Although the Turkish economy is still less CO_2-intensive than the OECD average, it is not making much progress. Production-based CO_2 intensity (CO_2 over GDP) declined from 0.2 kg/USD 2010 in 2005 to 0.18 in 2015, compared to a decrease of 0.31 to 0.24 for the OECD area over the same period (OECD, 2018e).

A National Climate Change Strategy was adopted in 2010, followed by the National Climate Change Action Plan in 2011. Their adoption was a positive step to lay the ground for action, with short- and long-term qualitative objectives and a set of actions for mitigating GHG emissions and for adapting to climate change. While some actions have been taken, adequate monitoring and evaluation of the plan has largely been missing (Chapter 4).

Although Turkey has not yet ratified the Paris Agreement, it announced that it would reduce GHG emissions by up to 21% from the "business-as-usual" level by 2030. This entails more than doubling emissions between 2015 and 2030 (OECD, 2016a, Chapter 4). The government expects part of GHG emission mitigation to come from significant development of renewable energy, especially in the power sector, by increasing solar and wind generating capacity and utilising the large geothermal potential (Chapter 4).

Figure 1.8. Energy industries and transport are the largest GHG contributors



Note: GHGs exclude emissions/removals from land use, land-use change and forestry (LULUCF).
Source: OECD (2018), "Air and Climate: Greenhouse Gas Emissions by Source", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892383

Limiting emission growth of GHGs and other air pollutants from coal-fired power plants and industrial installations, as well as from road transportation, is among the goals of the National Climate Change Action Plan. However, given the planned increase of domestic coal-fired electricity generation, ubiquitous use of coal, and unsteady growth of renewables, achieving this goal will be challenging.

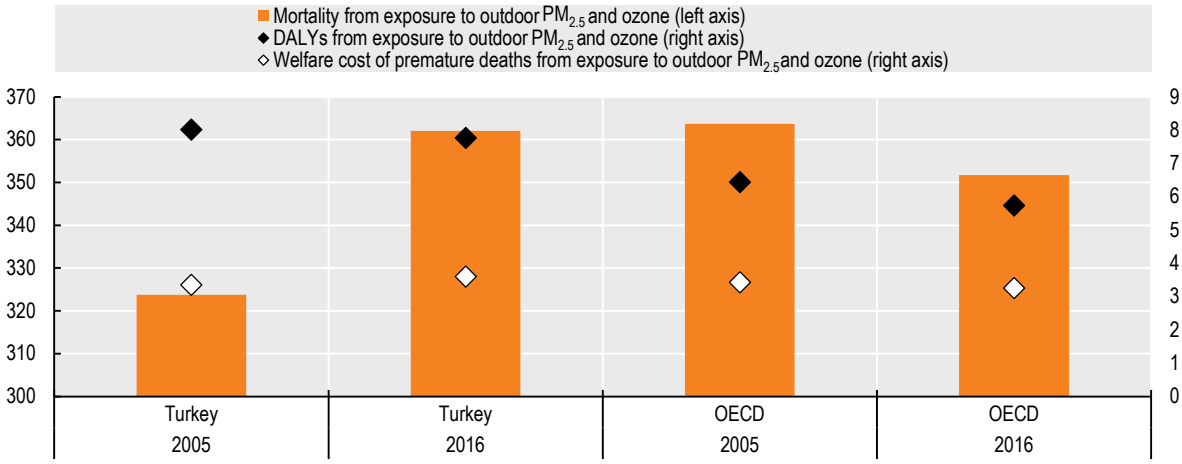
1.3.4. Air emissions and air quality

Air quality is a major concern, especially in large cities and industrialised regions. Population exposure to fine particulate matter is higher than the EU and OECD averages, and the World Health Organization's guidelines (OECD, 2018c).

Unlike in other OECD member countries, mortality and welfare costs of premature deaths from exposure to outdoor $PM_{2.5}$ and ozone have increased since 2005. Disability-adjusted life years (number of years lost due to exposure to air pollution) have slightly declined, but remain above the OECD average (Figure 1.9).

Coal-based heating systems, especially the use of low-quality fuel and burning systems (MEU, 2016a), and industrial and mobile sources are the main factors of $PM_{2.5}$ emissions growth. In a recent EU review, Turkey was ranked highest, at 29%, among 19 regions and countries with respect to the share of industry in $PM_{2.5}$ sources (EU, 2015). The regional distribution of $PM_{2.5}$ exposure analysed by the OECD (Mackie, Haščič and Cárdenas Rodríguez, 2016) shows that industrial regions display particularly high pollution levels, with no tangible improvement over the last two decades (OECD, 2016a). Recorded air pollution is highest in Eastern Turkey (IEA, 2016) and in provinces where coal plants are concentrated, such as Çanakkale, İzmir and Tekirdağ.

Figure 1.9. Rising mortality and welfare costs of air pollution



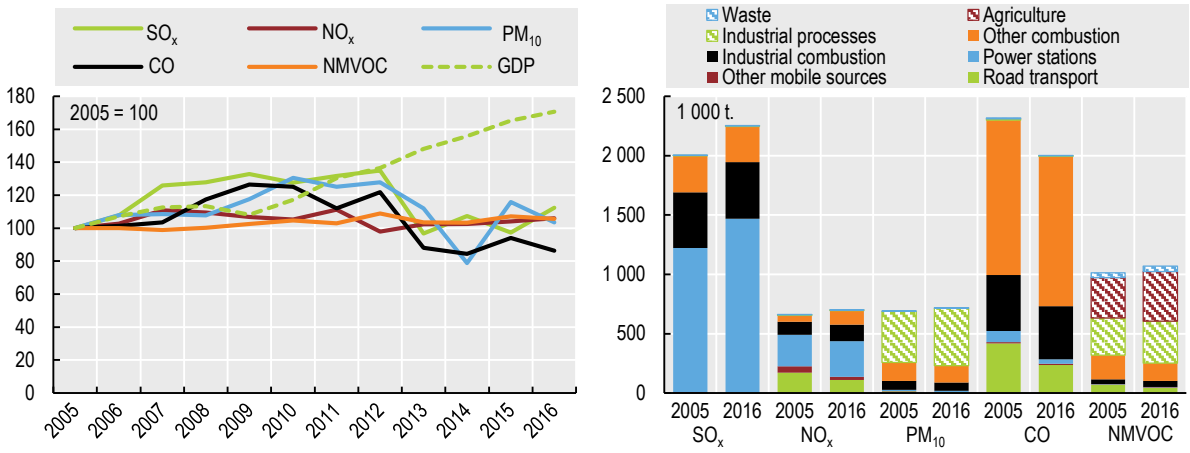
Note: Mortality is expressed in per million inhabitants; DALYs is expressed in per thousand inhabitants; welfare cost is expressed as percentage of GDP equivalent.
Source: OECD (2018), "Mortality and Welfare Cost from Exposure to Air Pollution", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892402

Emissions profile

Emissions of major air pollutants have broadly followed the growth in GDP. They decreased when the effects of the global economic crisis kicked in, then grew again in 2014-15 (Figure 1.10).

Figure 1.10. Relative decoupling of air emissions from economic growth in recent years



Note: In panel 1 GDP is expressed in 2010 USD in purchasing power parities.
Source: OECD (2018), "Air and Climate: Air Emissions by Source", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892421

The bulk of SO_x emissions is produced by power generation (60%), followed far behind by industrial combustion (23%). More than half of NO_x emissions come from road transport (16%) and power stations (43%). Industrial processes and product use, especially cement factories, are primarily responsible for PM_{10} emissions (68%). Industrial and other combustion represents 85% of carbon monoxide emissions, while industrial production and agriculture are responsible for more than two-thirds of non-methane volatile organic compounds (NMVOCs).

The trends are mixed across sectors. Road transport emissions declined for all pollutants except SO_x. Power stations witnessed a decrease in PM_{10} (-11%) and carbon monoxide (-62%), but saw an increase in all other pollutants. Industrial combustion PM_{10} and carbon monoxide emissions have decreased, but all other pollutants' emissions have increased. Industrial production and product use posted a decrease only for carbon monoxide. Waste is the sector showing a more consistent emissions decline during 2005-16, except for NMVOCs.

Main policies and measures

The Regulation on Air Quality Assessment and Management (BAQAM) is being revised to harmonise it with the EU Clean Air for Europe Directive (2008/50/EC). BAQAM is partially aligned with the EU acquis, and the timeframe for full transposition remains uncertain. Other regulations govern emissions from residential heating, exhaust gas emissions of motor vehicles and industry. Ambient air quality standards were revised in 2009 and will gradually become more stringent. Most of these standards are expected to align with the EU ones by 2019, while those for NO_2 in 2024. There is no established date for the alignment of standards for ozone and heavy metals.

BAQAM is mainly implemented through Clean Air Action Plans (CAAPs) at the provincial level. The work is co-ordinated by provincial directorates of the Ministry of Environment and Urbanization (MEU). Provinces and cities are categorised as having a high or low "pollution potential". Based on the 2012-13 air quality assessment, 64 of 81 provinces had high pollution potential. CAAPs have been prepared and enacted in these provinces, while

for the remaining 17 provinces the plans are voluntary. The main measures in the CAAPs relate to industry, residential heating and road transport. They stipulate bicycle lanes, city railway networks, filters for industrial processes, closed systems for coal storage, central heating for specific industrial sites (e.g. shoe manufacturing), building insulation, smart traffic control systems, etc. When limit values are exceeded, local environmental boards may enforce some measures, such as alternate vehicle circulation and restrictions on residential heating.

Several institutions at the provincial level are involved in the preparation and implementation of CAAPs, but the main responsibilities lie with municipalities. Implementation of the CAAPs is slow, however, due to various factors. These include high municipal staff turnover, frequent amendments to the legislation regulating roles and responsibilities, and limited technical and human resource capacity at the provincial and municipal levels, especially in less-developed regions.

Industrial emissions are governed by the 2014 regulation on Industrial Air Pollution Control. It includes 27 groups of industries, with different emission limits, which are only partially harmonised with the EU standards. The MEU and Dokuz Eylül University are conducting a project over 2017-20 to determine the emission limits for industrial air pollution to further align legislation with EU standards.

Given their weight in air emissions, road transport and power stations are key areas for policy intervention. In the transport sector, the government needs to stimulate a modal shift from road to public transportation, use integrated urban planning and promote alternative fuels and renewal of the truck fleet. The government is preparing amendments to legislation that would introduce low-emission zones (congestion pricing and restrictions on heavy duty vehicles) (Chapter 3). In the power sector, the use of coal should rely on efficient and clean coal technology. This would mean refurbishing or closing old plants. Turkey has transposed the EU Large Combustion Plant Directive and invested in clean coal research and development, but existing coal plants have not yet been refurbished (IEA, 2016). The envisaged gradual substitution of coal with natural gas in residential heating would reduce local air pollution. However, better exploiting the geothermal potential for heating would be more sustainable and would reduce import dependency.

1.4. Transition to a resource-efficient economy

The tenth Development Plan aims at more sustainable consumption by raising awareness about avoiding and minimising waste, recycling and more sustainable resource use. Several policy documents highlight the need to change consumer behaviour. To achieve the double objective of reducing import dependency and making consumption sustainable, the government aims at more effective use of the domestic natural resource potential. This is to be achieved by harnessing the economic benefits of recyclable waste; supporting efforts to increase use of domestic scrap; and initiatives for scrap collection, separation and processing centres. One of the National Eco-Efficiency/Cleaner Production Programme's (2014-18) objectives is to increase resource efficiency by reducing resource use throughout the life cycle of a product, preventing waste at the source and encouraging use of new production technologies (EEA, 2015a).

In waste management, legislation is largely aligned with the EU acquis. The government plans to move away from a disposal-centred approach and emphasises circular economy and zero waste. Material consumption per capita is lower than the OECD average.

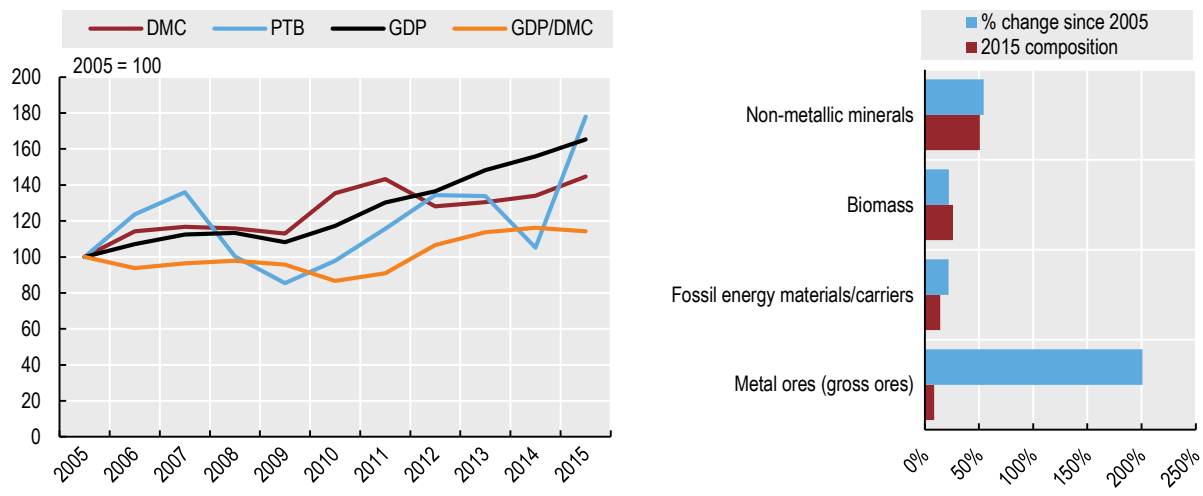
However, it has not decoupled from economic growth, and the great majority of municipal waste is still sent to landfills.

1.4.1. Material consumption

Turkey is endowed with some natural resources, such as antimony, coal, chromium, mercury, copper, borate, sulphur and iron ore. However, it is not self-sufficient in terms of energy raw materials (Section 3) and its iron ores are low-grade, which causes import dependency. The increase in imports of intermediate goods is the main concern that drove the Programme for Reducing Import Dependency (EEA, 2015a).

Turkey is well below the OECD average in terms of material productivity, and the consumption of materials has not decoupled from economic growth. Domestic material consumption (DMC) grew faster than GDP during 2005-11, particularly during the 2008 economic crisis, when the physical trade balance (import minus exports) deteriorated rapidly. As a consequence, material productivity (GDP over DMC) has been decreasing since 2005. It has only picked up in recent years thanks to high economic growth (Figure 1.11).

Figure 1.11. Material consumption has not decoupled from economic growth



Note: GDP is expressed in 2010 USD prices, purchasing power parities. DMC = domestic material consumption. PTB = physical trade balance.
Source: Eurostat (2018), "Material Flow Accounts", *Material Flows and Resource Productivity* (database); OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892440

As in many other OECD member countries, construction constitutes the bulk of materials used. Fossil energy materials/carriers, especially coal, lignite, oil and natural gas, represent an important share, but grew less than ores and minerals over 2005-15. Metal ores are the material category showing the highest growth, mainly due to non-ferrous and precious metals, which are mostly domestically produced.

Turkey does not have a dedicated material resource policy. The tenth Development Plan emphasises waste management and circular economy, especially the use of waste as fuel and recycled materials. It envisages increasing domestic extraction and materials reuse to reduce import dependency, assigning priority to iron ore, marble and boron. The Input

Supply Strategy and Action Plan (2013-15) prioritised iron/steel, non-iron metals and raw materials, as well as intermediate goods for the plastic, petroleum chemicals and pharmaceuticals sectors (EEA, 2015a). The MENR's Strategic Plan (2015-19) aims to increase exploration by facilitating the permitting process, as well as to obtain valuable minerals from import and domestic concentrates, and by recycling from secondary (waste) products (MENR, 2014).

1.4.2. Waste management

Waste management is key to reducing import dependency by promoting a more circular economy and mitigating climate change. Although emphasised in development plans, waste management has not been a policy priority historically. Duties and powers have been distributed among many institutions, with inadequate co-ordination and co-operation. Furthermore, the waste fees and taxes collected are inadequate (there is no landfill tax) (Bakas and Milios, 2013).

In 2015, the MEU adopted a new regulation, replacing previous ones and providing a single comprehensive waste management framework. This regulation has transposed the EU Waste Framework Directive (2008/98/EC), introducing the concepts of waste reuse and extended producer responsibility. Policy documents have also emphasised recycling, reuse, recovery of waste and special waste streams (oils, tyres, accumulators and packaging).

Some progress has been made in expanding waste treatment infrastructure, including sorting, recycling and medical waste treatment. However, further work is needed to increase separate collection of different types of waste, reduce the amount of biodegradables going into landfills and better manage hazardous waste. Local waste management plans have been put in place in some municipalities, while in others they are expected to be introduced by 2023. Economic instruments to promote recycling and prevention of waste generation remain limited (EC, 2016).

Municipal waste

At 425 kg/capita/year in 2016, generation of municipal waste in Turkey is below the OECD average of 523 (Basic Statistics). It has also been decreasing faster over 2005-16 – by 8% compared to a 5% decrease for the OECD. Generation of municipal waste has therefore decoupled from economic growth (Figure 1.12). The share of the population served by municipal waste services increased from 81% to 93% over 2006-16 (TurkStat, 2018b). During the same period, the share of waste collected in total municipal waste generated increased from 84% to 94%.

However, despite this progress, waste management does not live up to the ambitious goal of a circular economy. About 90% of municipal waste is sent to landfills (one of the main sources of methane emissions). The rest is burned in open areas, buried or discarded in the environment. Only a small quantity is sent to composting plants or other recovery facilities (Figure 1.12).

Turkish authorities are seeking solutions to reduce the amount of municipal solid waste, especially biodegradable waste, going to landfills, and to increase recycling of materials (Box 1.1). The Climate Change Action Plan 2011-23 set the objectives to:

- reduce the quantity of biodegradable waste sent to landfills to 75% of the 2005 quantity by 2015, 50% by 2018 and 35% by 2025
- dispose all municipal waste in integrated disposal facilities by 2023
- put an end to all uncontrolled waste disposal by 2023.

The 2017 regulation on Packaging Waste Control, aligned with the EU Directive 94/62/EC on packaging and packaging waste, sets annual recovery targets for glass, plastic, metal, paper/cardboard and wood. The National Waste Management and Action Plan for 2023 sets the objectives to:

- recycle 35% of generated waste (estimated at 13%), mainly through the extended producer responsibility
- reduce the share going to landfills to 65%
- increase waste collected separately at the source from 5.3% in 2014 to 12% in 2023
- increase the recycling ratio of municipal waste over 2014-23 by biological treatment from 0.2% to 4%, by mechanical-biological treatment from 5.4% to 13%, and by thermal treatment from 0.3% to 8%.

Box 1.1. Zero-waste project in public buildings

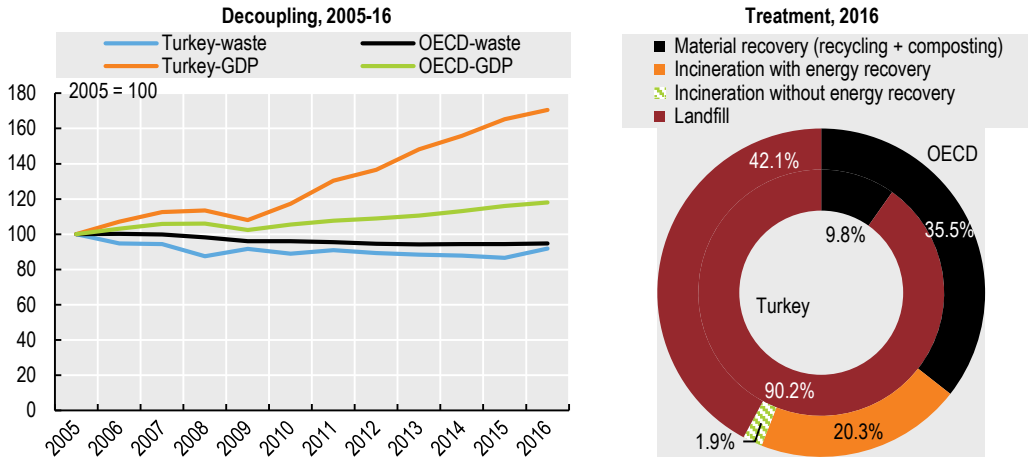
In the context of the "zero-waste" initiative, under the patronage of the First Lady, the MEU has recently implemented a zero-waste project in the ministry's premises. Waste is collected separately, and food leftovers are sent to animal shelters. Compost units have been installed to produce manure. Thanks to this initiative, waste from the ministry's premises is no longer sent to landfills.

Awareness campaigns are organised across the country and the government aims to expand this project to all ministries in 2018 and to all public institutions and public spaces by 2023.

Source: Country submission

In 2016, 9.2% of municipal waste was collected separately and sent to licensed recovery facilities, as well as to biogas facilities (TurkStat, 2018b). Infrastructure for waste disposal and recovery has increased from 28 licensed facilities to 521 for collection and separation, and 676 for recycling over 2003-15. Progress was also made in collecting recyclables, such as electrical and electronic equipment (55 000 tonnes in 2017) and tyres (54% recycling). Around 2.5 million tonnes of packaging waste are collected annually and the recovery rate for recyclables (glass, paper, plastic and metal) is around 60%. Charges may be applied to plastic bags as of 2019; 7 composting facilities and 20 facilities for electricity production from methane gas are in operation. On the other hand, separate waste collection at the household level is not widespread. Therefore, extended producer responsibility mainly covers waste from industrial and commercial premises.

Figure 1.12. Municipal waste generation has decoupled from GDP growth, but most waste is landfilled



Note: Panel 1: municipal waste is expressed in per capita terms. GDP is expressed in 2010 USD prices at purchasing power parities. In Turkey data include estimates for population not served by waste services. Panel 2: total treatment excludes lake, sea and river disposal, and burning of waste in open areas.
Source: OECD (2018), "Waste: Municipal Waste", *OECD Environment Statistics* (database); OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892459

Low investments at the local level remain a challenge. The recent administrative reform, which has created new municipalities and metropolitan areas, allows for economies of scale. However, smaller areas face operational and implementation challenges. For these areas, the government counts on participation of the private sector (i.e. private-run waste collection services), which is not yet actively engaged.

Hazardous waste

Generation of hazardous waste per capita is still much lower than the EU average, 70 kg/capita compared to an estimated 197 kg/capita for the EU-28 in 2016 (Eurostat 2018b). It is, however, growing fast: almost fivefold over 2004-16. The bulk is chemical and combustion waste, mainly from the mining and quarrying sector (Eurostat, 2018a). According to TurkStat data, about 7% of the waste generated in 2016 by the manufacturing industry was hazardous, of which 71% was sent to licensed waste treatment facilities (TurkStat, 2018a). Hazardous waste producers are registered and obliged to report to authorities. In addition, Turkey is testing a global positioning system to track hazardous waste movement. The number of hazardous waste recovery facilities increased from 185 in 2010 to 468 in 2017. These include 46 energy recovery facilities such as incineration plants and cement factories (MEU, 2016b). However, Turkey has been slow in improving hazardous waste treatment, and relevant legislation has not yet been fully implemented.

Chemicals management

Over the past years, Turkey has made efforts to strengthen its legal framework in the area of chemical safety. The new regulation on chemicals registration, evaluation, authorisation and restriction came into effect in December 2017, replacing three existing laws. The MEU has been appointed as the competent authority. Turkey is therefore in a good position to improve the protection of human health and the environment from the potential risks posed

by chemicals. However, thorough implementation of the law will be critical. This will largely depend on both technical and financial resources.

A pollutant release and transfer register (PRTR) is an essential component of chemical management systems, as recommended by the 2018 OECD legal instrument on PRTR. It provides and tracks publicly accessible data on chemicals or pollutants released to air, water and soil and transferred off-site for treatment. The establishment of a PRTR largely depends on a legal framework that allows the necessary infrastructure and administrative capacity to maintain it. This legal framework is still lacking in Turkey, and its absence undermines numerous environmental safety policies. To address this issue, Turkey drafted a PRTR regulation. Once adopted, the regulation should allow the transposition and implementation of the European Pollutant Release and Transfer Register (E-PRTR). In addition, in 2017, Turkey launched a two-year project to build technical capacity for implementation of PRTRs.

The Rotterdam Convention on international trade of hazardous chemicals was ratified in 2017, and draft regulations have been prepared to align legislation with EU requirements for export and import of hazardous chemicals and on persistent organic pollutants. Turkey has made progress in harmonising its legislation with the EU Seveso II Directive. In 2013, it adopted a regulation on the prevention and mitigation of major industrial accidents. Despite the legislative and institutional efforts, many accidents have occurred in the past ten years (180 incidents were identified in 2017), including several major ones (KMO, 2017).

Turkey is vulnerable to natural and human-made disasters. Indeed, the level of exposure to human-made hazards is growing at a faster pace than the country's capacity to manage risks. The 2008 OECD EPR recommended increasing communication between local authorities and the central Disaster and Emergency Management Authority, as well as granting open-access to information related to chemical accidents. Despite the mounting risk to human-made hazards, Turkey has not yet implemented this recommendation.

1.4.3. Agriculture

Agriculture is both a key economic sector and an important source of pollution and water use. It represents 7% of the economy, accounts for more than 11% of total exports and employs more than 20% of the workforce (Basic Statistics; OECD, 2017b). The sector is a large user of land and energy, as well as a large emitter.

The intensity of input use per hectare of agricultural land is, in general, lower than in many other OECD member countries. However, phosphorus balance is particularly high in Turkey due to intensive livestock production (OECD, 2017b). Livestock density (head of sheep equivalent/km^2 of agricultural land) was 387 in 2016, compared to 232 for the OECD area. It grew by 38% over 2005-16, much faster than the OECD average increase of 8%. Consumption of nitrogen fertilisers at almost 5 tonnes/km^2 of agricultural land is above the OECD average of 2.7. Pesticide use (tonnes/km^2 of agricultural land) is not among the highest in the OECD, but is growing fast, showing a 28.6% increase over 2005-16 (OECD, 2018c).

Agriculture is also the sector that uses most of abstracted freshwater, almost 90%. The expansion of irrigated areas, combined with the expected decrease in precipitation due to climate change, may have contributed to increased water stress. Turkey introduced the Action Plan for the Program on Enhancing Efficiency of Water Use in Agriculture in 2015. The plan prioritises modernising irrigation infrastructure; extending water-saving practices

through training and extension programmes; revising support policies based on water scarcity; and improving water governance. It aims to decrease use of underground water and increase use of water-saving irrigation technologies (OECD, 2017b). However, most agricultural water pricing is not yet tied to the volume of water used (Chapter 3).

The area under organic agriculture has grown from 0.5% of total agricultural land in 2005 to 1.4% in 2016 (FAO, 2018). The government aims to increase this share to 3% by 2023 (MEU, 2016a). The Ministry of Agriculture and Forestry (MAF) is developing a certification system for organic agriculture, support-related research, and development, demonstration and awareness campaigns. Concessional loans for organic agriculture have been provided since 2009, but represent a small share of total support to agriculture (Chapter 3).

The objective of environmental sustainability has been progressively integrated into agricultural policy. MAF, for example, implements an Environmentally Based Agricultural Land Protection Scheme. It started with external financial support in 2006 and, since 2009, has continued with national resources. The scheme will be extended to 57 provinces in 2018. Support payments, based on land area, are made annually for three years for agricultural practices with minimum soil tillage (to conserve soil and water structure and prevent erosion) and environmentally friendly agricultural techniques (water and fertiliser savings, and organic agriculture). Turkey has also made progress by eliminating subsidies for agricultural water use. However, environmental sustainability and rural diversification measures attract a relatively small share of government spending (OECD, 2016c) and subsidies for good practices represent a small share of total support (Chapter 3).

1.5. Managing the natural asset base

Turkey's geographical position and geomorphological configuration make it a hotspot of biodiversity, but also a water-scarce and erosion-prone country. Over 60% of the country territory faces severe or very severe water erosion problems (MEU, 2016b). Efficient use of land and water resources is considered a priority in the tenth Development Plan. The EU Integrated Environmental Approximation Strategy (2007-23) emphasises rational and sustainable use of natural resources, particularly efficient use of water and energy in households and industry (EEA, 2015a).

Unlike many other OECD member countries, Turkey expanded natural and semi-natural areas – a 2% net increase over 1992-2015 – mainly thanks to afforestation and reforestation. On the other hand, rapid urbanisation has led to urban sprawl, mainly around major cities. Built-up area increased by 57% over the same period, compared to 32% for the OECD area (OECD, 2018f).

1.5.1. Biodiversity

Turkey has exceptionally rich biodiversity, both in flora and fauna species, 31% of which are endemic. About three-quarters of European flora and fauna species can be found here (OECD, 2016b). There are different micro-climatic zones and biogeographic regions, each with its own natural ecosystems. Because Turkey is located at the intersection of the Mediterranean and Near Eastern gene centres, it is genetically very diverse. There are five micro-gene centres, offering important genetic resources for the future sustainability of many plant species cultivated across the world. Many domestic animal races were originally bred in Anatolia and spread to other regions of the world (EEA, 2015b).

Furthermore, Turkey is located on two major bird migration routes, making it an important place for feeding and breeding (MEU, 2016a).

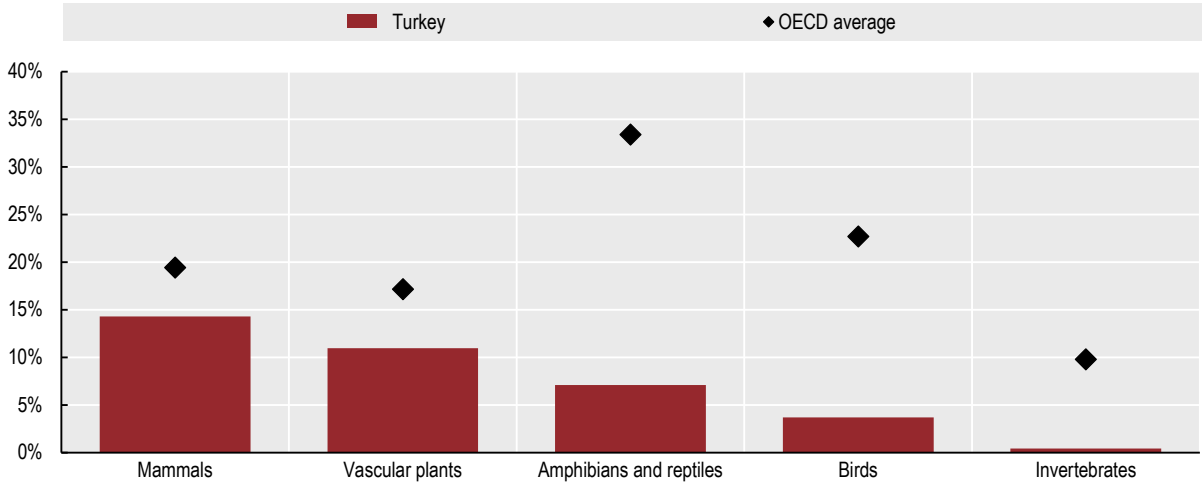
The government signed the United Nations Convention on Biological Diversity in 1992 and ratified it in 1996. To meet obligations under the Convention, the National Biological Diversity Strategy and Action Plan (NBDSAP) was prepared in 2001 and updated in 2007. A new biodiversity plan for 2018-28 is under preparation. However, framework legislation on nature protection has not yet been adopted (EC, 2016).

Turkey has made progress in biodiversity conservation, increasing protected and forest area. However, it has not submitted national targets under the Convention on Biological Diversity. Habitat loss and fragmentation continue as a result of urban, transport and industrial expansion. Pollution, water use, climate change and invasive species are also increasing pressure on ecosystems and species. Overlapping responsibilities across ministries and lack of expertise and financial resources limit the scale of initiatives.

Threatened species

Some of the many endemic plant species are endangered. According to the criteria of the International Union for Conservation of Nature (IUCN), approximately 600 endemic species are in the category "seriously endangered", and 700 are categorised as "endangered". Among wild animals, 121 mammals, 378 birds and 130 reptiles have been put under protection. While the number of invasive alien species in Turkish seas was 263 in 2005, it increased to 422 in 2011 and approached 475 in 2015. In inland water bodies, 25 invasive alien species have been identified (MEU, 2016b). Compared to other OECD member countries, however, Turkey has a relatively low share of threatened species (Figure 1.13).

Figure 1.13. Turkey has a relatively low share of threatened species



Note: OECD values are simple averages of available country data.
Source: OECD (2018), "Biodiversity: Threatened Species", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892478

Protected areas

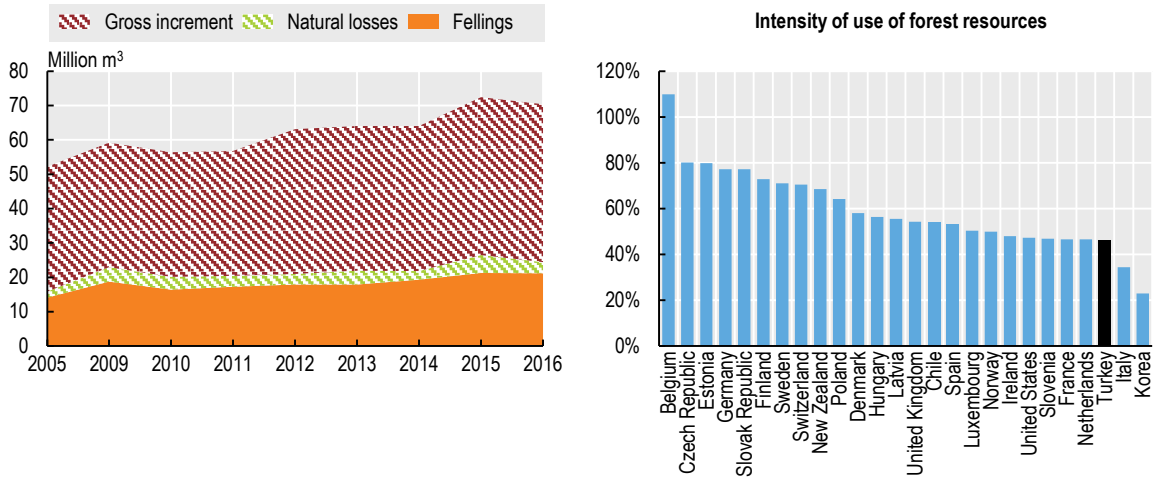
The share of protected areas in the total surface area has increased over the years (EEA, 2015b). According to national data, terrestrial and marine protected areas accounted for almost 9% of the national territory in 2017. This is still significantly lower than the Aichi target of 17% for terrestrial areas and inland waters, and 10% for coastal and marine areas. The total budget allocated to nature conservation was TRY 227.7 million (USD 48.8 million) in 2016, a mere 0.01% of GDP, against an average of about 0.1% in EU-28.

Turkey has started working with the European Union towards designation of Natura 2000 areas (which do not align with the IUCN categories), but progress has so far been modest. Lack of expertise and financing have been identified as key constraints to making progress. In terms of internationally recognised sites, Turkey has 1 UNESCO-MAB Biosphere reserve, 2 World Heritage Sites and 14 Ramsar Wetlands of International Importance.

Forests

Although forest cover in Turkey is well below the OECD average, it is among the fastest growing in recent years. Forest as a percentage of land area increased from 13.9% in 2005 to 15.4% in 2016. This compares to a decrease of 0.3 percentage points globally (FAO, 2018) over the same period. Forest stock is increasing thanks to afforestation, erosion control, rehabilitation of degraded forests and pasture, and artificial regeneration (MEU, 2016a). Illegal deforestation is still a problem, but has diminished with increased urbanisation. Although fellings grew faster than gross increments (annual productive capacity) during 2005-16, increments are still much larger. As a result, Turkey is among the OECD member countries with the lowest forestry use intensity (Figure 1.14). The government plans to further increase forest cover (an additional 1.3 million hectares by 2023) and the amount of carbon absorbed by forest areas through afforestation and erosion control (MEU, 2016a).

Figure 1.14. Turkey is among the OECD countries with the lowest forest use intensity



Note: Panel 1 data contain estimates. Panel 2 shows the intensity of use of forest resources, which is the share of actual fellings to annual productive capacity (i.e. gross increment); 2016 or latest available year (no further back than 2010).
Source: OECD (2018) ,"Forest Resources", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892497

Main policies and measures

The 2007 NBDSAP provides the main framework for biodiversity protection. Although nature conservation dates to the designation of the first national park in 1958, the NBDSAP acknowledges challenges in institutional co-ordination and lack of financial and human resources. The MAF formulates policies on conservation and biological diversity and maintains a large plant breeding programme. A new draft law on nature and biological diversity is to detail roles and responsibilities across ministries.

A number of protection activities are carried out *in-situ* (national parks, protected areas, wildlife reserves) and *ex-situ* (gene banks, orchards and a planned national botanical garden). There are plans to build bio-corridors along major roads. A nationwide project on biodiversity monitoring and inventory (2013-19), with a budget of TRY 28 million (2017 USD 4.5 million), focuses on indicator species, endemic endangered species and habitat, and nesting areas for important species. A national biodiversity database will be available to the public at the end of the project. Good inventory data have been collected on plants. However, identifying animal and fungi species remains a challenge due to a lack of qualified personnel and incomplete spatial coverage.

Turkey carries out research on site detection, protection of biodiversity and restoration of endangered species habitat, as well as agro-biodiversity research and genetic characterisation studies. Regular monitoring studies are carried out in 50 provinces. These monitoring and research initiatives are a positive step, and the pending adoption of an updated action plan and legislation should help clarify roles and responsibilities across ministries and continue to address gaps in protection. It is, however, unclear how monitoring will continue after 2019 given the lack of financing and qualified personnel.

The new action plan awaiting government approval aims to align with new developments in the Convention on Biological Diversity. Guidance is needed on what to do once pressures are identified. Responsible authorities lack enforceable tools to address human-caused pressures, relying instead on their role in the environmental impact assessment process and in the provision of information to relevant communities and stakeholders.

1.5.2. Management of water resources

Turkey is not a water-rich country, and water resources are not distributed evenly. Effective and integrated management of water resources is therefore of great importance (EEA, 2015b). Turkey also faces important problems of water pollution, especially in the Black Sea.

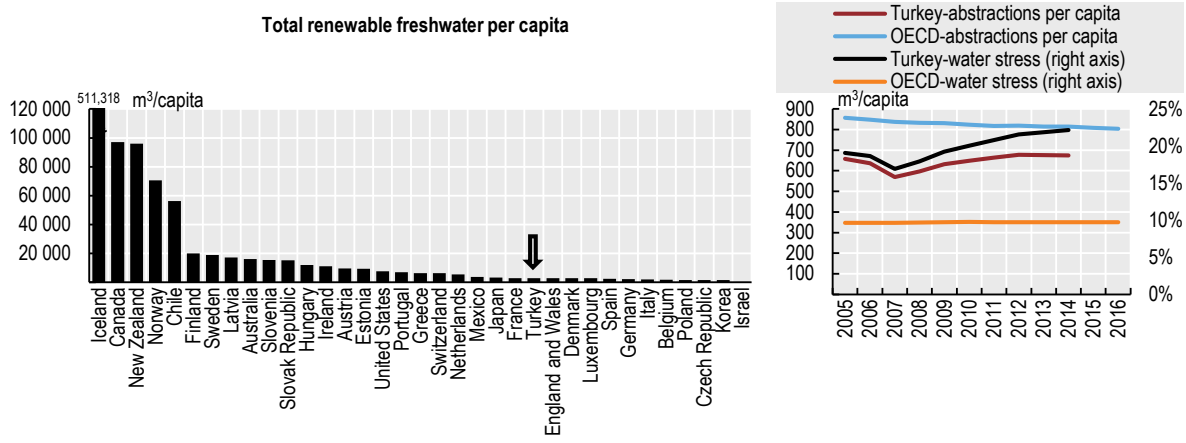
Available projections show expected increases in water use and a consequent decrease in available water per capita. As highlighted in the tenth Development Plan, water tends to be insufficient to meet the needs stemming from increasing demand, drought and pollution in catchments. A National Water Information System has been established to gather all water-related data to support integrated planning and decision making. These efforts are worth pursuing and expanding (Chapter 5).

Water resources and abstractions

With about 3 000 m^3 of renewable freshwater resources per capita, Turkey is well below the OECD average (Figure 1.15). According to national sources, this figure is above the actual water availability. The total amount of usable water is estimated at 112 billion m^3, i.e. less than 1 400 m^3 per capita. The population of Turkey is expected to reach 100 million in 2030, and the amount of water resources per capita will decrease to 1 120 m^3, thus further

exacerbating water stress (MEU, 2016a). Although freshwater abstractions per capita are below the OECD average (Basic Statistics), they have been growing steadily, along with water stress (Figure 1.15).

Figure 1.15. Turkey is a water-stressed country



Note: In panel 2 water stress (right axis) is defined as: low<10%; 10%<medium<20%; 20%<medium-high<40%; high>40%. OECD values are estimates based on linear interpolations.
Source: OECD (2018), "Environmental Performance Indicators", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892516

Growing water access competition across sectors, such as tourism and agriculture, is expected to become more challenging with increased urbanisation, expansion of irrigation areas and climate change (OECD, 2016a). Agriculture is responsible for almost 90% of freshwater abstractions, the rest being mainly for public water supply. Agricultural freshwater withdrawals have trended upward over the last two decades. Uncontrolled use of groundwater for irrigation has been growing so disproportionately that wells must now be registered for use. Water stress tends to increase with rising demand by agriculture. This stress could worsen in view of the potential impacts of climate change on both water supply and demand. Although drip irrigation has increased in recent years, around 85-90% of irrigation water abstractions are used for surface irrigation, which is inefficient compared to drip or spray irrigation, thereby suggesting room for improvement (OECD, 2016b). Water use shows a similar picture, with 40 billion m^3 used for irrigation, 7 billion m^3 for drinking water and 7 billion m^3 for industry, and projected increases across all sectors (MEU, 2016a).

Water stress is aggravated by losses throughout the network, estimated at 44% for water for human consumption. A regulation on the "Control of Water Leakages of Drinking Water Supply and Distribution System" (2014) requires administrations to reduce water leakages to specific levels according to their population and to prepare an annual report (MEU, 2016a). It set targets of reducing water loss and leakages in drinking water supply systems by 30% within five years and 25% within the following four years in metropolitan municipalities, and by 30% within nine years and 25% within the following five years in other municipalities (EEA, 2015b).

Water quality

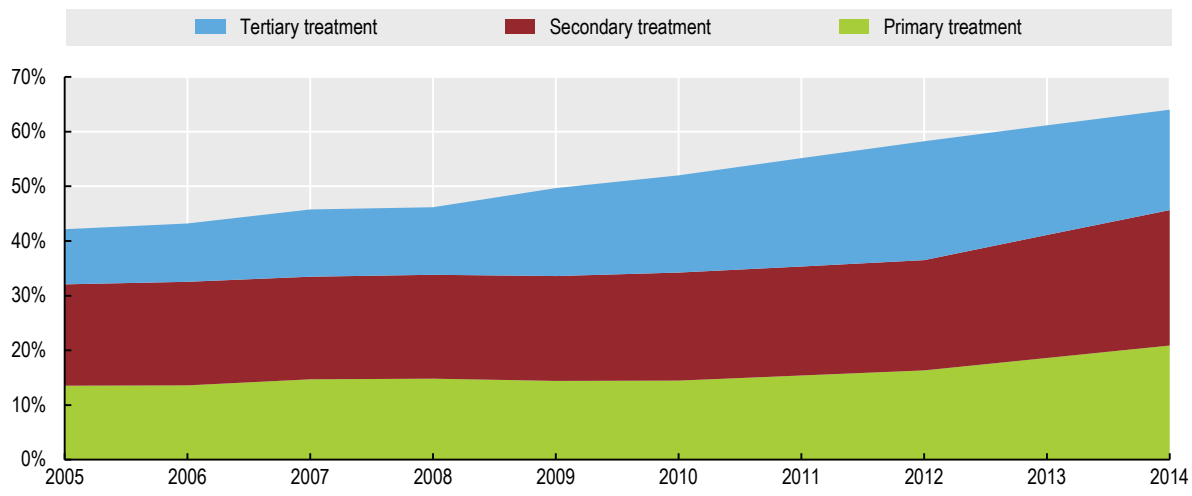
Water quality is a serious concern due to several factors. These include overuse of natural resources, discharge of untreated industrial and domestic wastewater into freshwater bodies and the sea due to unplanned and rapid urbanisation, insufficiency of wastewater treatment facilities and diffuse pollution from agriculture.

Approximately 14% of residential wastewater is discharged without treatment, and 38% of industrial wastewater is not treated before being discharged into water bodies (TurkStat, 2018c) (Chapter 5). Given its economic importance and high usage of water, agriculture contributes significantly to water pollution. Despite the relatively low intensity of fertiliser use, 20-50% of surface water is polluted by nitrogen. This includes the Ergen, Akarçay, Gediz, Sakarya and Susurluk watersheds. Several lakes also show significant levels of phosphorus pollution (OECD, 2016c). A marine pollution monitoring programme is being carried out, but eutrophication is a problem in several coastal areas of the Black, Marmara, Aegean and Mediterranean Seas. It is, however, difficult to assess the broader picture as monitoring has been primarily conducted in most polluted areas, where population and industrial activities concentrate (MEU, 2016a).

Water supply and wastewater treatment

Although still below OECD standards, water supply and treatment have improved. The share of the municipal population (excluding villages) supplied with drinking water increased from 95% to 97% over 2001-14 (MoD, 2016). The share of the population served by a sewage system increased from 68% to 84% over 2004-16, and the share served by wastewater treatment plants from 36% to 70% over the same period (TurkStat, 2018c). Wastewater treatment capacity has increased as a result of continuous investments (EC, 2016). However, only a small share (18%) of wastewater is treated with advanced methods; this share has been increasing slowly since 2005 (Figure 1.16) (Chapter 5).

Figure 1.16. Wastewater treatment has improved, but advanced treatment remains low



Source: OECD (2018), "Environmental Performance Indicators", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892535

The tenth Development Plan sets targets of increasing the share of municipal population with access to drinkable water to 100%. It also targets increasing the share served with sanitation networks and with wastewater treatment plants to 95% and 80% respectively by 2018. Thanks to investments, the number of municipalities providing wastewater treatment services increased from 319 to 581 between 2004 and 2016. Furthermore, the number of treatment plants increased from 172 to 967 between 2004 and 2017 (MEU, 2016a). A revised Wastewater Treatment Action Plan was prepared for 2014-23. According to this plan, the MEU aims at ensuring that all municipalities have wastewater treatment plants by 2023 (MEU, 2016a).

Main policies and measures

Similarly to other environmental domains, developments in water management have been driven by Turkey's alignment to the EU acquis. At the end of 2017, the government adopted a regulation on the preparation, implementation and monitoring of river basin management plans. The government has prepared but not yet implemented monitoring programmes for all basins and expects to complete management plans for all basins by 2023. Turkey has several strategies, plans and programmes on water resource management. However, an overall national water strategy would help to reflect progress to date, consolidate the efforts and streamline criteria for allocating funds for infrastructure development (Chapter 5).

Turkey has identified sensitive water quality areas to be protected from urban wastewater discharges. Partial alignment with the EU legislation has been achieved thanks to changes in secondary legislation on water quality standards, nitrates pollution and flood management plans, but in general transboundary issues are not aligned (EC, 2016).

Works are being carried out to rehabilitate existing treatment facilities and to use recycled water in irrigation. In the Aegean and Mediterranean regions, where tourism-oriented investments are concentrated, effluents from treatment facilities have been used in irrigation only recently. Some treated water is used for watering parks and gardens, while some is stored in stabilisation pools for use in irrigation (MEU, 2016a) (Chapter 5).

Recommendations on energy, air pollution and natural resource management

Energy

- Reduce the share of fossil fuels, especially coal, in the energy mix and increase the share of renewables, especially geothermal (in residential heating), solar and wind; set a revised energy transition roadmap with quantifiable targets by energy source to provide clear signals to investors.
- Set measurable objectives in the NEEAP in the power, residential and transport sectors; provide more economic and fiscal incentives for energy efficiency investments in public and private buildings.

Air pollution

- Formulate a comprehensive nationwide air pollution reduction strategy, integrated with energy and transport policies and plans; strengthen the implementation of local clean air programmes and ensure their alignment with nationwide objectives.

Material resources, waste and chemicals

- Adopt a comprehensive and dedicated material resource policy going beyond waste management, with quantitative targets and an appropriate monitoring system.
- Promote separate collection of different types of municipal solid waste; reduce the volume of biodegradable waste going into landfills and increase biogas generation; prepare local waste management plans while promoting inter-municipal collaboration.
- Strengthen the institutional and administrative capacity to implement national programmes for prevention, preparedness and response to accidents involving hazardous substances; adopt a legal framework for collecting, and providing public access to, information on pollution releases by industry sector and by pollutant.

Biodiversity

- Clarify roles and responsibilities for biodiversity protection across ministries; improve routine biodiversity monitoring and inventory activities; continue the work to establish bio-corridors connecting protected areas.

References

Bakas, I. and L. Milios (2013), "Municipal waste management in Turkey", *ETC/SCP Working Paper*, European Environment Agency, Copenhagen, www.eea.europa.eu/publications/managing-municipal-solid-waste/turkey-municipal-waste-management.

EC (2016), *Turkey 2016 Report. Communication on EU Enlargement Policy*, European Commission, Brussels.

EEA (2015a), "Turkey" in *More from Less – Material Resource Efficiency in Europe*, European Environment Agency, Copenhagen, www.eea.europa.eu/publications/more-from-less/at_download/file.

EEA (2015b), *Turkey Country Briefing – The European Environment – State and Outlook 2015*, European Environment Agency, Copenhagen, www.eea.europa.eu/soer.

EU (2015), *Urban Air Pollution: What are the Main Sources across the World?*, European Union Joint Research Centre, Brussels, https://ec.europa.eu/jrc/en/news/what-are-main-sources-urban-air-pollution.

Eurostat (2018a), *Waste Generation and Treatment* (database), http://ec.europa.eu/eurostat/web/environment/waste/database (accessed 8 May 2018).

Eurostat (2018b), "Material Flow Accounts", *Material Flows and Resource Productivity* (database), http://ec.europa.eu/eurostat/web/environment/material-flows-and-resource-productivity/database (accessed 17 April 2018).

FAO (2018), *FAOSTAT* (database), www.fao.org/faostat/en/#data (accessed 8 May 2018).

IEA (2018), *World Energy Statistics and Balances* (database), International Energy Agency, http://dx.doi.org/10.1787/enestats-data-en (accessed 1 June 2018).

IEA (2016), *Energy Policies of IEA Countries: Turkey 2016*, Energy Policies of IEA Countries, International Energy Agency, Paris, https://doi.org/10.1787/9789264266698-en.

ITF (2018), *Transport Statistics* (database), International Transport Forum, http://dx.doi.org/10.1787/trsprt-data-en (accessed 15 December 2017).

KMO (2018), *Industrial Fires and Explosions Report 2017*, Turkish Chamber of Chemical Engineers and Architects, Ankara.

Mackie, A., I. Haščič and M. Cárdenas Rodríguez (2016), "Population exposure to fine particles: Methodology and results for OECD and G20 Countries", *OECD Green Growth Papers*, No. 2016/2, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlsqs8g1t9r-en.

MENR (2014), *Strategic Plan 2015-2019*, Ministry of Energy and Natural Resources, Ankara.

MEU (2016a), *State of the Environment Report for Republic of Turkey*, Ministry of Environment and Urbanization, Ankara.

MEU (2016b), *Environmental Indicators 2015*, Ministry of Environment and Urbanization, Ankara.

MEU (2012), *Climate Change Action Plan 2011-2023*, Ministry of Environment and Urbanization, Ankara.

MoD (2016), *Report on Turkey's Initial Steps towards the Implementation of the 2030 Agenda for Sustainable Development*, Ministry of Development, Ankara.

OECD (2018a), *OECD Economic Surveys: Turkey 2018*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-tur-2018-en.

OECD (2018b), "Environmental Policy: Environmental Policy Stringency Index", *OECD Environment Statistics* (database), http://dx.doi.org/10.1787/env-data-en (accessed 1 June 2018).

OECD (2018c), "Environmental Performance Indicators", *OECD Environment Statistics* (database), (accessed 1 June 2018).

OECD (2018d), "Air and Climate: Greenhouse Gas Emissions by Source", *OECD Environment Statistics* (database), http://dx.doi.org/10.1787/data-00594-en (accessed 1 June 2018).

OECD (2018e), "Green Growth Indicators", *OECD Environment Statistics* (database), http://dx.doi.org/10.1787/data-00665-en (accessed 1 June 2018).

OECD (2018f), "Land Cover", *OECD Environment Statistics* (database) (accessed 1 June 2018).

OECD (2017a), "Turkey", in *Economic Policy Reforms 2017: Going for Growth*, OECD Publishing, Paris, http://dx.doi.org/10.1787/growth-2017-50-en.

OECD (2017b), "Turkey", in *Agricultural Policy Monitoring and Evaluation 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/agr_pol-2017-27-en.

OECD (2017c), "Better Life Index 2017", *OECD Social and Welfare Statistics* (database), www.oecdbetterlifeindex.org (accessed 17 April 2018).

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

OECD (2016b), Turkey, in *OECD Regional Outlook 2016: Productive Regions for Inclusive Societies*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264260245-46-en.

OECD (2016c), "Innovation, agricultural productivity and sustainability in Turkey", *OECD Food and Agricultural Reviews*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264261198-en.

OECD (2008), *OECD Environmental Performance Reviews: Turkey 2008*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264049161-en.

REN21 (2018), *Renewables 2018. Global Status Report,* Renewable Energy Policy Network for the 21st Century, Paris, www.ren21.net/wp-content/uploads/2018/06/17-8652_GSR2018_FullReport_web_final_.pdf.

Spaull, N. (2017), "Who makes it into PISA?: Understanding the impact of PISA sample eligibility using Turkey as a case study (PISA 2003 - PISA 2012)", *OECD Education Working Papers,* No. 154, OECD Publishing, Paris, http://dx.doi.org/10.1787/41d175fc-en.

TurkStat (2018a), *Transportation Statistics* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreTablo.do?alt_id=1051 (accessed 1 June 2018).

TurkStat (2018b), *Municipal Waste Statistics* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreTablo.do?alt_id=1019 (accessed 1 June 2018).

TurkStat (2018c), *Municipal Water Statistics* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreTablo.do?alt_id=1019 (accessed 1 June 2018).

World Bank (2012), *Clean Technology Fund Drives Turkey's Renewable Energy Growth*, World Bank, Washington, DC, http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTENERGY2/0,,contentMDK:23322468~pagePK:210058~piPK:210062~theSitePK:4114200,00.html.

Ziemann, V. and B. Guérard (2017), "Reaping the benefits of global value chains in Turkey", *OECD Economics Department Working Papers,* No. 1366, OECD Publishing, Paris, http://dx.doi.org/10.1787/d054af64-en.

Chapter 2. Environmental governance and management

Turkey has strengthened its regulatory framework for environmental management. However, institutional capacity constraints impede more effective implementation of environmental law and the uptake of good regulatory practices. More needs to be done to enhance environmental democracy. This chapter analyses Turkey's environmental governance system, including horizontal and vertical institutional co-ordination, and setting and enforcing 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

Turkey has strengthened its environmental regulatory framework since 2008. This progress is primarily due to continued efforts to harmonise environmental legislation with directives of the European Union (EU) as part of the accession process. Progress in implementing EU standards and best practices has been better in some areas (e.g. environmental impact assessment and permitting) than in others (e.g. compliance monitoring and liability). However, the country's ambition to upgrade and modernise its environmental regulation is commendable and should be pursued further.

At the same time, according to the World Bank 2016 Worldwide Governance Indicators, Turkey's scores on all measured parameters – accountability, political stability, government effectiveness, regulatory quality, rule of law and control of corruption – had deteriorated since 2011 (World Bank, 2018). This trend has undoubtedly had ramifications for the country's environmental governance, particularly environmental democracy.

2.2. Institutional framework for environmental governance

Turkey has a distinctly centralised governance system with ministries playing a strong executive role at the central and provincial level. The 81 provincial administrations represent the decentralised organs of central government authorities (in addition, several ministries have regional directorates). The central government appoints provincial governors. Provincial directors representing ministries are formally subordinated to the governors, but responsible to the minister for execution of sectoral policy.

Turkey has about 1 400 municipalities, including 30 metropolitan municipalities (which are also provincial centres), 51 non-metropolitan provincial centres, over 900 district municipalities and about 400 town municipalities. The law establishes a relation of tutelage between metropolitan and district municipalities within the same province. In non-metropolitan provinces, there is one-tier local government: all municipalities in these provinces have the same organisation, functions and powers. About half of municipal budget revenues comes from the central treasury; the other half is raised primarily through user fees on municipal services.

2.2.1. Central government and horizontal co-ordination

In 2011, the Ministry of Environment and Forestry was divided into two separate ministries: Ministry of Environment and Urbanization (MEU) and Ministry of Forestry and Water Affairs. The MEU is in charge of environmental regulation, environmental impact assessment (EIA), permitting and inspections. In 2018, the Ministry of Forestry and Water Affairs was merged with the Ministry of Food, Agriculture and Livestock to form the Ministry of Agriculture and Forestry (MAF).

The MEU determines and oversees almost the entire workload of its 81 provincial directorates. Although these directorates are part of provincial administrations, their staff are employed by the MEU. The ministry has started to develop performance indicators for its activities. However, so far there are very few such indicators, and all of them are focused on activities rather than their results.

Water-related competencies are divided between the MEU and the MAF. The MEU oversees wastewater management, monitors and controls water pollution. The MAF is responsible for river basin management, protection of water resources, water quantity management, and ambient water quality monitoring.

Other ministries also have environment-related responsibilities. The Ministry of Health oversees the protection of drinking and bathing water quality in collaboration with the MEU. The Ministry of Energy and Natural Resources is, among other competencies, responsible for energy efficiency and renewable energy policies. In addition to its water-related responsibilities, the MAF oversees biodiversity protection, natural parks and forest management, and promotes good land management and agricultural practices.

Environmental boards are the main mechanism of horizontal co-ordination. Until recently, the Supreme Environmental Board, chaired by the MEU, promoted integration of environmental considerations into economic decisions and arbitrated disputes regarding environmental matters that concern more than one ministry. However, it was disbanded in August 2018. Its inter-ministerial co-ordination function has been transferred to the President and the Presidential Council for Local Administration Policies.

Local environmental boards, chaired by the provincial governor, co-ordinate implementation of environmental policies at the provincial level. They convene every three months and send their decisions to the MEU and other relevant institutions. Representatives of trade unions, non-governmental organisations (NGOs), and academic and scientific institutions are invited to these meetings on an ad hoc basis.

A Water Management Co-ordination Board (WMCB) at the ministerial/vice-ministerial level was established by the Prime Minister's ordinance in 2012. It is chaired by the MAF and includes key stakeholder ministries. It is supposed to determine national water policies, but had met only four times as of early 2018. There are also river basin councils chaired by a governor of one province within the basin and provincial water management councils chaired by the provincial governor. Both provincial and river basin councils report to the WMCB (Chapter 5). The membership of water management councils largely overlaps with that of environmental boards.

The July 2018 decree law transferred the responsibilities of most co-ordination and advisory boards established under ministries or other public institutions to newly created presidential councils. These councils are chaired by the President, who also appoints their members. The Council for Local Administration Policies is responsible for "developing policy and strategy recommendations for efficient environmental management". However, implications of this reform on local environmental boards remain unclear. The MEU may need to create another mechanism to better align environmental and sectoral policies, such as those related to climate and energy.

The National Sustainable Development Commission, established in 2004, does not meet often. It includes only the MEU, the Strategy and Budget Office of the Presidency (former Ministry of Development) and ministries of Foreign Affairs and Interior, and does not have a clear operational role (Chapter 3). The government plans to expand the commission's institutional membership and specify its responsibilities in a new regulation.

2.2.2. Municipalities

The core responsibilities of municipalities are planning, development control and promotion, and provision of public services (including transport, water supply and sanitation, and non-hazardous solid waste management). Metropolitan municipalities oversee land-use plans of district municipalities in the same province, as well as water supply and sanitation in both urban and rural areas across the province. In other provinces, Special Provincial Administrations oversee water supply and sanitation in rural areas, and smaller municipalities – in urban areas (Chapter 5). With regard to waste management,

district municipalities are responsible for collecting waste, while its treatment and disposal are under the remit of metropolitan municipalities. In provinces without metropolitan municipalities, district municipalities are increasingly pooling resources through waste management unions, in line with good international practices.

The MEU delegates the power of inspection on noise, construction and demolition waste and residential air pollution to metropolitan municipalities if they have environmental inspection units. The municipalities of Istanbul, Kocaeli, Mersin and Antalya have been delegated powers to control marine pollution from ships.

2.3. Setting of regulatory requirements

Environment Law No. 2872 (1983), substantially amended in 2006, is Turkey's main environmental statute. There are more than 50 regulations (by-laws) under the Environment Law, including Water Pollution Control Regulation (2004), Regulation on Management of Surface Water Quality (2012), Regulation on the Control of Industrial Air Pollution (2009, revised in 2014), and Regulation on Waste Management (2015). Turkey has aligned its surface water quality standards with EU ones, and plans to do the same for ambient air quality standards by 2024. Following a recommendation of the 2008 EPR, a new comprehensive Water Law based on a holistic watershed management approach has been prepared and is pending approval in parliament. It is also expected to clarify institutional responsibilities in the water domain (Chapter 5). Turkey has also adopted regulations on energy performance of buildings (2008, amended in 2013) and on energy efficiency (2011). These make an important contribution to its energy efficiency policies (Chapter 4).

Most regulatory changes over the review period have been driven by the strategy of approximation with legislation of the European Union after the environment chapter of EU accession negotiations was opened in December 2009. The EU Integrated Environmental Approximation Strategy for 2007-23 was last updated in 2016. This legal harmonisation process is in line with a recommendation of the 2008 EPR. However, Turkey has yet to align completely with directives on air and water quality, waste management and industrial pollution (EC, 2016). Despite the uncertainty of Turkey's EU accession process, aligning the country's legislation with best international practices needs to continue.

2.3.1. Regulatory and policy evaluation

Turkey introduced regulatory impact analysis (RIA) in 2006. It carries out RIA only for laws and decree laws (promulgated by the government and then approved by parliament), but not for regulations. According to the 2007 RIA guidelines, the analysis should consider potential impacts on air, water and soil pollution, land-use change, loss of biodiversity and climate change. If a regulation's total potential impact is estimated at less than TRY 30 million, only partial RIA is undertaken. In principle, the full RIA includes cost-benefit analysis (this rarely happens in practice) and evaluates the draft law's economic, social and environmental impacts more in-depth than in a partial RIA. It also includes stakeholder consultations. Turkey does not conduct *ex post* evaluation of legislation or policies.

A regulation on strategic environmental assessment (SEA) entered into force in April 2017. SEA is supposed to be conducted by the authority developing the plan or programme. It targets agriculture, coastal zone management, forestry, fisheries, energy, industry, transport, waste and water management, telecommunications, tourism and land-use planning. For several of these sectors (e.g. waste management and energy), implementation

has been deferred until 2023. However, even for sectors subject to SEA as of 2017, the regulation has yet to be implemented. So far, Turkey has only carried out several donor-funded pilot projects and prepared an SEA manual. The government complains it lacks institutional capacity to implement the SEA regulation (MEU, 2016).

2.3.2. Environmental impact assessment

Turkey introduced EIA in the Environment Law, but the first regulation implementing this instrument went into force in 1993. The latest regulation on its administrative and technical procedures was adopted in 2017. The EIA system is mostly in line with EU EIA Directive 2014/52/EU. An online electronic system for EIA documentation was put in place in 2013, significantly simplifying the procedure.

However, Turkey is not party to the Espoo Convention on Environmental Impact Assessment in a Transboundary Context and has no legal provisions in this matter. Several OECD Council acts also recommend EIA as a key tool to address transfrontier pollution.[1]

According to the EIA regulation, Annex 1 projects (major infrastructure and industrial developments) are subject to mandatory EIA, conducted by the MEU's central office. Annex 2 projects (with a potentially smaller environmental impact) undergo screening by the MEU's provincial directorates. In practice, only 1.5% of over 55 000 EIA screenings between 1993 and 2016 resulted in a decision to require an EIA. Some facilities operating as of June 2013 are exempted from the EIA regulation (Roy, 2015). In addition, a September 2016 law allowed waivers for licensing and other restrictions for "strategically important" investment projects (EC, 2016).

Following an EIA, a positive or negative decision is issued by a commission comprising representatives of ministries with competencies over the project and of the local municipality. Only 1% of about 4 500 EIAs between 1993 and 2016 received a negative decision. A positive EIA decision refers to measures for mitigating expected environmental impacts in the EIA report, but there is no effective mechanism to ensure their implementation.

Developers must start construction within seven years of a positive EIA decision or within five years if an EIA is not required. A new EIA study is required if the facility increases its production capacity beyond a certain threshold. These long validity periods and limited review requirements reduce the effectiveness of EIA in mitigating environmental impacts.

2.3.3. Permitting

In line with the 2008 EPR recommendation, Turkey has made progress in moving from permitting from individual environmental media to integrated pollution prevention and control (IPPC). According to the 2010 regulation on environmental permitting and licensing (updated in 2014), all facilities are divided into two categories (Annexes 1 and 2) based on the degree of potential impact. Annex 1 facilities receive their permits from the central office of the MEU; Annex 2 facilities receive theirs from the MEU's provincial directorates.

The regulation introduced a single online environmental permit (for air emissions, wastewater discharges, noise and waste recovery and disposal) for Annex 1 and 2 facilities, based on an electronic application. However, this consolidated permit is not based on best available techniques (BAT) and tends to favour end-of-pipe pollution control over process-oriented solutions. Emission and effluent limit values in permits are set based on sector-specific standards, and rarely consider ambient air quality and quality of receiving water

bodies, respectively. An environmental permit is valid for five years. Over 14 000 such permits were issued in 2010-15.

In a peculiar feature of Turkey's environmental permitting regime, a temporary operation certificate (TOC) – a pre-permit valid for up to one year – can be approved. Applicants for a TOC must have cleared requirements for an EIA or an Environmental Monitoring and Management Programme. The rationale behind the TOC is to provide real pollution data from the operating installation as an input for the permit application process. A TOC cannot be appealed by the public (IMPEL, 2016). A TOC in effect allows operation of a facility without an environmental permit, which is inconsistent with good international practice.

In addition to a consolidated permit, permits for other environmental impacts may be needed. For example, operators discharging wastewater into the sewerage system require a wastewater connection certificate from the competent municipal body. Municipalities determine standards and permitting requirements for wastewater connection certificates and their validity terms.

A hazardous waste storage permit must be obtained from the MEU; a licensed waste management company must collect such waste at least once every six months. This permit is valid for the facility's lifetime unless its operation is expanded. Generators that produce less than 1 000 kg of hazardous waste are exempt from this permit.

With respect to the EU accession process, Turkey had deadlines for transposing, partially implementing and fully implementing the Industrial Emissions Directive (2010/75/EU) for 2012, 2015 and 2018, respectively. The National Action Plan for EU Accession Phase 2 (2015-19) makes transposing the acquis in the field of industrial pollution control and risk management a priority. A regulation on IPPC was planned for publication by the end of 2018. It would cover an estimated 6 000 installations, primarily in the chemical industry, production and processing of metals and minerals, and waste management. Most heavy industry is located in Istanbul, Kocaeli, Izmir and Hatay provinces.

The first IPPC permits are expected to be issued in 2024. Emission/effluent limit values would be set in accordance with BAT Conclusions specified in the EU Commission Implementing Decision 2017-1442. Turkey is planning to apply the high-end (least stringent) of the value ranges for emission/effluent levels specified in the EU decision.

2.3.4. Land-use planning

Turkey has made only limited progress in implementing the recommendation of the 2008 EPR to integrate environmental concerns into all levels of land-use planning. All spatial plans in Turkey should be in line with development plans, which weakens their environmental dimension. The Strategy and Budget Office of the Presidency prepares a National Development Plan in co-operation with the Ministry of Treasury and Finance, while the 26 regional development agencies produce regional development plans.

According to a 2011 decree law, the MEU is supposed to elaborate a national spatial strategy plan, but the work on it started only in 2018. Territorial development plans (TDPs) can be prepared at different scales and in different geographical borders. At the provincial level, they are prepared by the metropolitan municipality or, in non-metropolitan provinces, by the MEU. TDPs cover the country's entire territory and determine land-use decisions such as settlements, housing, industry, agriculture, tourism and transportation.

TDPs are expected to protect environmentally sensitive areas. They are particularly important in Turkey's coastal zones (Chapter 4), where the main challenges are increasing

pressure of urban settlements, poor environmental awareness in their development and marine pollution, as well as jurisdictional overlaps in planning and management. At the end of 2017, integrated coastal zone plans (ICZPs) covered 82% of coastal zones. The remaining ones are expected to be completed by the end of 2023.

At the local level, zoning plans and implementation plans are made by municipalities or by special provincial administrations for areas cutting across municipalities. The MEU controls the development of zoning plans through its provincial directorates. Territorial development plans are (in theory, but not yet in practice) subject to SEA. However, zoning and implementation plans are not creating an important gap.

2.4. Compliance assurance

Compliance assurance covers the promotion, monitoring and enforcement of compliance, as well as liability for environmental damage. Most compliance assurance activities are conducted by the MEU's provincial directorates. The police and gendarmerie also have the power to detect environmental crimes and misdemeanours and forward the respective cases to prosecutors or the MEU.

2.4.1. Environmental inspections

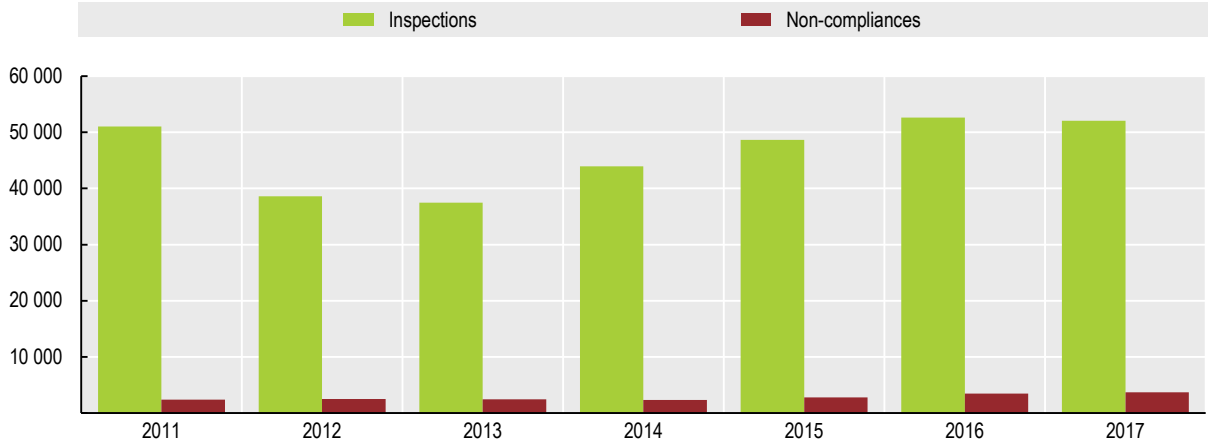
Environmental inspections are governed by a 2008 regulation. Integrated (combined) inspections are conducted for high-risk sites, while medium-based inspections are carried out for lower-risk sites. The regulation does not define minimum inspection frequency for any type of installation.

Turkey started developing a risk-based approach to inspection planning, consistent with good international practices, in 2013. The risk assessment of a facility is based on its environmental impacts and compliance record and results in a score that determines the frequency of inspection. Risk-based planning had been implemented in 22 provinces as of early 2018; it is expected to be extended to 12 more provinces in 2019 and to the entire country by 2023.

The number of inspections rose from about 37 500 in 2013 to 52 600 in 2016 after a decrease caused by the split of the environment ministry in 2011 (Figure 2.1). Although the MEU strives to expand risk-based targeting (a slight decline in the number of inspections in 2017 may stem from this), only 20% of resources are dedicated to planned inspections in an annual programme. Complaints triggered more than 16% of inspections. The rest of the inspections were conducted as part of a new permit application or renewal procedure, or in response to accidents (MEU, 2016). Planned combined inspections are announced to operators concerned; other types of inspection are not. The number of complaints, especially online ones, has been growing in recent years (IMPEL, 2016). As a result, responding to complaints is consuming an increasing amount of resources for Turkish inspectors.

Only 7% of inspections detected a violation in 2017. This is low compared to many OECD member countries, but may also signify poor targeting of compliance monitoring. Non-compliance is highest with waste regulations (21% of cases).

Figure 2.1. Inspection numbers are rising faster than non-compliance detection



Source: Country submission.

StatLink http://dx.doi.org/10.1787/888933892554

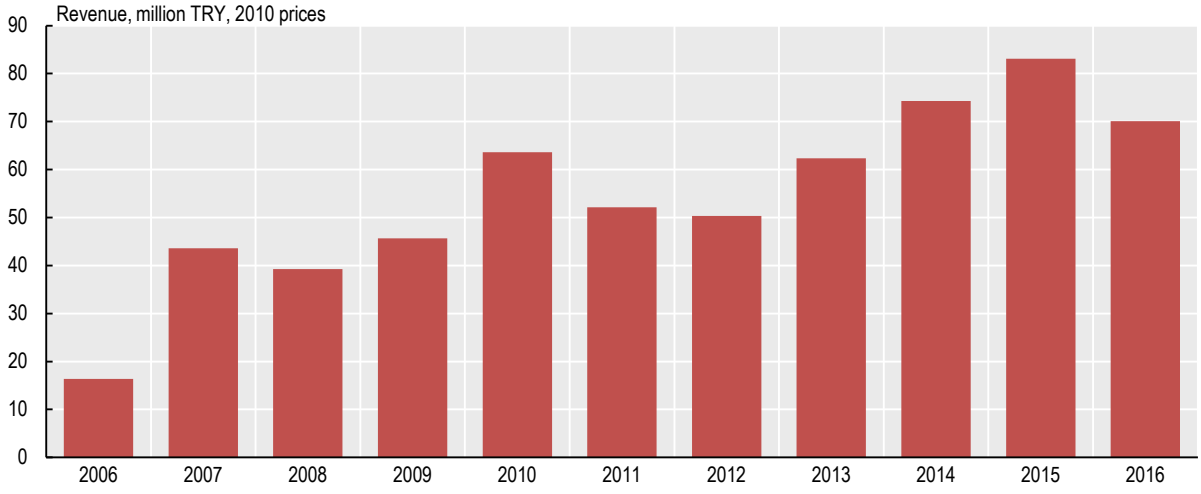
A software called "e-inspection" was developed in 2014 to plan, report and evaluate inspections. Consistent with good international practices, it includes inspection checklists, on-site inspection reports, information on sanctions and court cases. Annual inspection reports have been prepared since 2010. Training for inspectors has been expanded, as recommended by the 2008 EPR.

2.4.2. Enforcement tools

The Environment Law stipulates administrative sanctions (fines and activity cessation orders). The average administrative fine in 2016 was TRY 31 450 (over USD 6 700), which is relatively high compared to other OECD member countries. The amount of fines imposed annually has nearly doubled in constant prices since 2008 (Figure 2.2) because of the increased use of fines and annual adjustment of their rates. The rates increased by 125% over 2008-18 (by 14.5% in 2017-18 alone), on par with inflation, thereby maintaining their deterrent effect. Half of the revenue from fines goes to the MEU revolving fund that finances pilot projects, research, training and other ministry expenses; the other half goes to the general government budget.

The size of an administrative fine is set in the law. If the law specifies a minimum and a maximum fine, the actual amount depends on the gravity of the environmental impact. However, the fine does not reflect the operator's economic benefit from non-compliance. If a facility has started operation without an EIA process, it is shut down permanently, and an administrative fine equal to 2% of its investment value is imposed. Almost 40% of the fines' volume comes from EIA-related infringements (MEU, 2016). If the infringement is repeated within three years, the fine is doubled.

Figure 2.2. Administrative fines are increasingly used in enforcement



Source: MEU (2016), *Environmental Inspection Report of Turkey: 2015*, Ministry of Environment and Urbanization, Ankara.

StatLink http://dx.doi.org/10.1787/888933892573

The 2004 Criminal Code defines criminal sanctions for intentional or negligent pollution. The Code provides for imprisonment of between two months and five years for environmental crime, depending on the intent and gravity of the violation. Judges may replace a prison sentence with a fine at their discretion. In 2016, 33 of 204 criminal convictions for environmental offences were imprisonments. The number of prison sentences for environmental crimes has increased significantly since 2010, when only four were delivered (Ministry of Justice, 2017). Criminal sanctions may be imposed on top of administrative ones, which is rare in international practice.

2.4.3. Environmental liability

Liability for damage to the environment

According to the Environment Law, polluters are responsible for environmental damage regardless of any misconduct on their part (i.e. are subject to strict liability). In cases of damage to human health and property, compensation can be claimed in accordance with the Obligations Law. However, environmental liability is limited to five years from the moment of discovery of the damage and cannot be enforced thereafter.

Turkey has few liability provisions for damage to the environment itself. If the responsible party fails to stop pollution or mitigate environmental damage, competent authorities undertake those actions directly and then recover costs from the violator. However, a draft Environmental Liability Law that would create a legal framework for assessment and remediation of damage to soil, water bodies and ecosystems and implement the EU Environmental Liability Directive (2004/35/EU) is still under development. The government has postponed its enactment pending complete transposition of the EU Water Framework Directive, Marine Strategy Framework Directive, Habitats Directive and Birds Directive into Turkish law.

Operators handling hazardous chemicals or wastes are required to obtain liability insurance for bodily damage or loss of third parties, but not for damage to the environment. There is

also compulsory insurance for coastal facilities against damage to the marine environment. However, such insurance in Turkey covers only accidental pollution, but not gradual pollution as part of routine operations (Steward, 2010).

Contaminated sites

The Regulation on Controlling Soil Pollution and Point-Source-Polluting Fields of 2010 governs the detection, monitoring and remediation of contaminated sites, including soil and groundwater. All contaminated sites are registered via the online Contaminated Sites Information System, established in 2015. Each potential contaminated site is evaluated. One of 21 accredited firms undertakes any needed clean-up at the polluter's expense. The clean-up plan must be approved by the MEU. If the responsible party is unknown or financially insolvent, MEU provincial directorates are expected to carry out assessment and remediation. However, there is no planning and no regular budget allocated for remediation of such abandoned sites. Turkey could follow Estonia's example of earmarking revenues of environmental taxes for this purpose (OECD, 2017). Alternatively, it could impose decontamination fees on hazardous industrial installations and earmark the revenue for a fund to clean up past land and water pollution.

2.4.4. Promotion of compliance and green practices

Compliance promotion does not get the attention it deserves from Turkish environmental authorities. The government offers little guidance, if any, to economic entities on good environmental management practices. At the same time, several green certification initiatives have recently been launched in collaboration between government authorities and the private sector.

Greening public procurement

The integration of environmental aspects into Turkey's public procurement policies is at a very early stage. Basic environmental compliance is required: if an EIA is compulsory for the activity, a positive EIA decision must be obtained before procurement can begin. In addition, it is possible (but not mandatory) to consider environmental factors as non-price selection criteria. In a positive development, the Ministry of Treasury and Finance has recently issued an instruction for public institutions to consider energy efficiency criteria in purchasing goods or services.

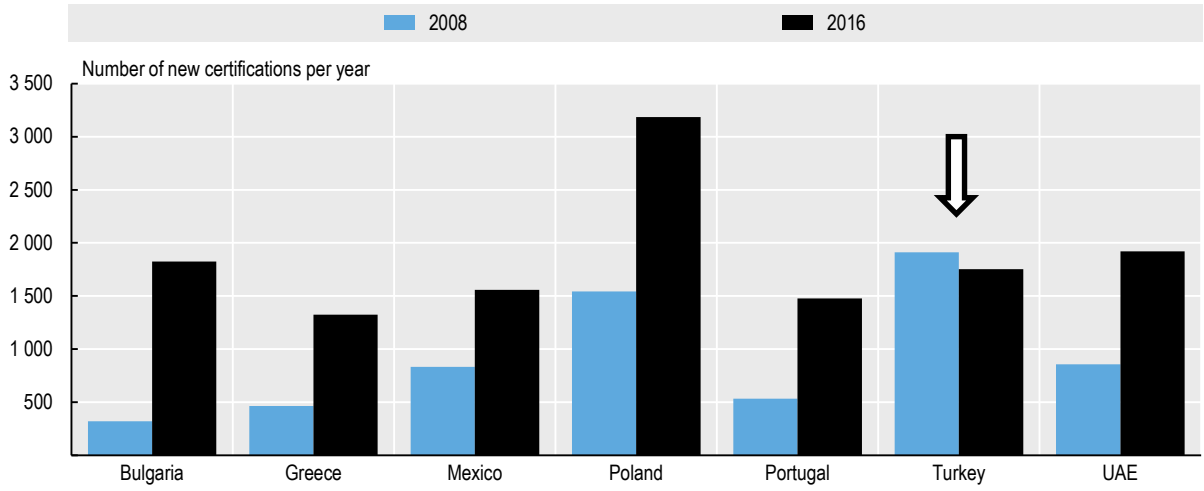
Environmental management system certifications

The Environment Law requires organisations and facilities with a potentially significant environmental impact to establish environmental management units. They must also either have a designated environmental representative (for higher-impact facilities), or procure services from institutions authorised by the MEU. Environmental representatives must prepare monthly environmental reports and an annual internal audit report. These requirements contribute to better corporate environmental management. Over 2010-17, the MEU issued almost 14 000 environmental representative certificates and 300 qualification certificates for environmental management units.

The number of new certifications to the ISO 14001 environmental management system (EMS) standard sharply declined in 2009-11 due to the economic crisis. Although their number has somewhat recovered, it was still lower in 2016 than in 2008 (Figure 2.3). This certification rate is close to that of Mexico and of European countries with much smaller economies, where EMS certifications have increased considerably since 2008. It is second

to that of the United Arab Emirates among Middle Eastern countries (ISO, 2017). The government does not provide any incentives for EMS certification.

Figure 2.3. Turkey lags behind in EMS certifications



Source: ISO (2017), *ISO Survey 2016*, International Organization for Standardization, Geneva.

StatLink http://dx.doi.org/10.1787/888933892592

A Green Star Certification Programme for environmentally friendly hotels was launched by the Ministry of Culture and Tourism in 2008. As of 2018, 443 Turkish hotels had obtained the certificate, which emphasises sustainable water, energy and waste management (Ministry of Culture and Tourism, 2018). There are also several green building certification schemes: the Turkish Green Building Council Association governs the "Green Building Certification System"; the Turkish Standards Institute manages the "Safe Green Building Certificate"; and a state university runs "Sustainable Energy Efficient Buildings-Turkey" (Cetik, 2014). The MEU is preparing legislation on a national eco-labelling system modelled after the EU system.

2.5. Promoting environmental democracy

Turkey ranks 47th in the world (next to Guatemala and Bolivia) according to the Environmental Democracy Index (WRI, 2018). It scored particularly low on public participation. Turkey has not signed the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters. A recent EU accession progress report (EC, 2016) noted Turkish civil society's complaints with respect to court rulings on environmental issues, public participation (particularly in EIA) and the right to environmental information.

2.5.1. Public participation in environmental decision making

The EIA regulation provides clear opportunities for public participation in site-specific environmental decision making. The EIA process includes a local public hearing. A draft EIA report is published on the Internet or on billboards for comments, which are considered by an evaluation committee charged with evaluating the project. SEA, when implemented

(Section 2.3.1), will also be open to the public. However, there is no public participation in the permitting process.

Territorial development and zoning spatial plans, including ICZPs, are prepared through a participatory process that includes on-site information meetings with the involvement of the private sector and NGOs. They are also publicly announced for comments on the MEU website. Public participation in drafting environmental legislation and policies takes place through special consultative committees.

2.5.2. Access to environmental information

The 2003 Law on Right to Information and its 2004 implementation regulation cover access to environmental information held by public institutions. This law explicitly excludes information or documents whose disclosure could "harm economic interests of the state" or "cause unfair competition". Public institutions have a right to charge fees for "research, copying, postage and other costs" related to information requests. Applicants refused information can appeal to the Review Board on Information Access; if the refusal is confirmed, applicants can appeal again to an administrative court. These appeals are free of charge. However, the law fails to ensure that the review board is independent or impartial (WRI, 2018).

The MEU publishes a state of the environment report every four years. Some additional environmental information is available to the public on the MEU and TurkStat websites and the e-government portal. The use of recently created electronic information management systems (for EIA, waste management, etc.) is expected to enhance data access. However, only synthesis reports rather than original data would be made public. Furthermore, the government is not obliged to make relevant and timely information available to the public during environmental emergencies (WRI, 2018).

Despite several EU-funded pilot projects since 2005, Turkey has not yet established a pollutant release and transfer register (PRTR) (Chapter 1).[2] It has committed to creating a PRTR only upon accession to the EU, citing resource constraints. Privately held environmental information is not publicly accessible.

2.5.3. Access to justice

Judicial review on environmental matters is conducted by civil courts for matters of liability and compensation, and by administrative courts for administrative decisions. There is restricted standing for the public and NGOs to bring environmental claims to court. The Council of State (top administrative court) has stipulated that a person must have "legitimate, actual and personal" interest to sue in an administrative court. Class action suits on environmental matters are not possible in Turkey, and the public cannot challenge decisions by private actors that affect the environment.

Environmental NGOs usually act through the courts. They have brought legal actions to invalidate environmental permits granted to major projects (e.g. gold mines, highways, power plants and dams). In recent years, the government has started to co-operate with NGOs to benefit from their environmental expertise (Mavioglu et al., 2017). However, no legal assistance is available to the public or NGOs in their pursuit of environmental justice.

The 2013 Law on the Ombudsman established an independent Ombudsman Institution under the auspices of parliament. This office audits the performance of government agencies and investigates complaints against administrative decisions, publishing reports about both. However, it has not been active in the environmental domain.

2.5.4. Environmental education

The tenth Development Plan (2014-18) aims to increase environmental awareness through education on sustainable development. A protocol signed in 2014 between the MEU and the Ministry of National Education calls for information dissemination and awareness-raising activities for students, teachers and parents. It also introduced a "Turquoise Flag" award for schools with best environmental performance (particularly with respect to energy efficiency and waste management). The new curriculum announced in 2017 by the Ministry of National Education integrates environmental aspects into science and social studies courses of the primary and secondary education curricula. A textbook for a dedicated (albeit elective) environmental education course for grades seven and eight was developed in 2018.

The MEU has provided an "Environment Handbook" covering waste management, air quality, water pollution and climate change to all primary and secondary school students (its third edition was published in 2010). Over 50 000 environmental awareness booklets were published and disseminated in 2012-13. Since 2015, almost 480 000 posters on waste management, pollution prevention and sustainable use of natural resources have been distributed to over 61 000 schools and 15.7 million students by MEU provincial directorates. In addition, the Ministry of National Education, MEU and Regional Environmental Centre (with donor support) jointly carried out the Green Pack project. This included publishing a variety of environmental educational materials such as a teacher's handbook.

Recommendations on environmental governance and management

Institutional and regulatory framework

- Strengthen the role of environmental boards in horizontal co-ordination of environmental aspects of energy, transport and other sectoral policies; reinforce the National Sustainable Development Commission and expand its institutional membership.
- Implement the regulation on SEA for public plans and programmes, including all local spatial plans, and build related institutional capacity; expand regulatory impact analysis to secondary legislation and ensure consideration of potential environmental impacts of all regulatory proposals; introduce ex post evaluation of policies and legislation.
- Strengthen the EIA system by systematically reflecting identified impact mitigation measures in environmental permits and implementing EIA in a transboundary context.
- Make best available techniques the basis for setting conditions in environmental permits for high-risk installations; phase out temporary operation certificates.

Compliance assurance

- Implement risk-based planning for environmental inspections in all provinces and define minimum inspection frequencies for different categories of installations.
- Adopt legislation to impose strict liability for damage to soil, water bodies and ecosystems and establish appropriate remediation standards; create a fund for remediation of abandoned contaminated sites.
- Use different information channels to deliver advice and guidance on green practices to the business community; expand sector-specific green certification programmes; establish binding environmental criteria for public procurement.

Environmental democracy

- Enhance mechanisms for public participation in drafting environmental legislation, policies and programmes, as well as in the permitting process.
- Remove restrictions and fees for access to environmental information held by public institutions; give the public access to environmental permits and compliance records using recently created electronic information systems; establish a PRTR open to the public.

Notes

[1] OECD Council Acts C(74)224, C(77)28/FINAL and C(78)77/FINAL recommend that member countries harmonise their environmental policies with a view to solving transfrontier pollution

problems based on the principles of equal right of access and non-discrimination, exchange of information and consultation.

[2] A 2018 OECD Council Recommendation recommends that OECD member countries establish and maintain a PRTR.

References

Cetik, M. (2014), "The governance of standardisation in Turkish green building certification schemes", https://dx.doi.org/10.2139/ssrn.2435160.

EC (2016), *Turkey 2016 Report, Commission staff working document SWD(2016) 366 final*, European Commission, Brussels, https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/pdf/key_documents/2016/20161109_report_turkey.pdf.

IMPEL (2016), *A Voluntary Scheme for Reporting and Offering Advice to Environmental Authorities*, European Union Network for the Implementation and Enforcement of Environmental Law, Brussels, www.impel.eu/wp-content/uploads/2016/12/FR-2016-22.1-IRI-Turkey.pdf.

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

Mavioglu, O.Y. et al. (2017), *Environmental Law and Practice in Turkey: Overview*, Thomson Reuters, https://uk.practicallaw.thomsonreuters.com/7-522-2040?transitionType=Default&contextData=(sc.Default)&firstPage=true&bhcp=1.

MEU (2016), *Environmental Inspection Report of Turkey: 2015*, Ministry of Environment and Urbanization, Ankara, www.csb.gov.tr/db/ced/editordosya/INSPECTION_REPORT_2015_ENG.pdf.

Ministry of Culture and Tourism (2018), "List of environmentally friendly hotels certified according to the communique on issuance of Environmentally Friendly Hotel certificate" (in Turkish), Ministry of Culture and Tourism, Ankara, http://yigm.kulturturizm.gov.tr/TR,9579/turizm-tesisleri.html.

Ministry of Justice (2017), *Judicial Statistics 2016*, General Directorate of Judicial Record and Statistics, Ministry of Justice, Ankara, www.adlisicil.adalet.gov.tr/AdaletIstatistikleriPdf/Adalet_ist_2016.pdf.

OECD (2017), *OECD Environmental Performance Reviews: Estonia 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264268241-en.

OECD (2008), *OECD Environmental Performance Reviews: Turkey*, OECD Publishing, Paris, www.sourceoecd.org/environment/9789264049154.

Roy, M. (2015), "Turkey: New environmental impact assessment regulation: Essential information for all new projects", Gide Loyrette Nouel, www.gide.com/fr/actualites/turkey-new-environmental-impact-assessment-regulation-essential-information-for-all-new (accessed 2 February 2018).

Steward, M. (2010), "Sea pollution liability insurance in the EU and Turkey", presentation at the conference on the implementation of coastal facilities, Istanbul, 19 October 2010, www.tsb.org.tr/images/Documents/Marcel_Steward.ppt.

World Bank (2018), Worldwide Governance Indicators website, http://info.worldbank.org/governance/WGI/index.aspx#reports (accessed 27 April 2018).

WRI (2018), Environmental Democracy Index: Turkey, World Resources Institute website, www.environmentaldemocracyindex.org/country/tur (accessed 4 January 2018).

Chapter 3. Towards green growth

Turkey has made some progress towards green growth, increasingly integrating sustainable development into National Development Plans and promoting high levels of investment in renewable energy. Further effort is needed to address environmental issues that will act as a constraint on economic growth, such as water scarcity and air pollution, and to capture market opportunities in growing environmental goods and services markets. This chapter considers several policy levers that could be used to accelerate green growth transition. These include reforming fossil fuel and vehicle taxation; putting a price on carbon, congestion and water; reducing subsidies for fossil fuel use and environmentally harmful agricultural activities; mobilising private sector investment in environmentally beneficial infrastructure; strengthening policy frameworks supporting eco-innovation; and promoting environmentally friendly foreign direct investment.

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.

3.1. Introduction

Sustainable development and green growth are important to Turkey's overall development, as environmental challenges are increasingly impacting economic growth and societal well-being. Water scarcity and quality, air pollution, coastal erosion and temperature extremes, all exacerbated by climate change, will increasingly constrain growth and impose costs on governments, businesses and households.

Turkey has put in place many tools to support a transition towards sustainable development and green growth. The government's growing emphasis on meeting Sustainable Development Goals (SDGs) holds significant promise to drive additional action to improve environmental performance, reduce health effects of air pollution and improve resilience to water stress. Incentives are helping to drive investment in renewable electricity generation. Increasing rail and other public transit, and the push to develop a national electric car combined with a charging infrastructure, could bring a much-needed shift towards cleaner cities.

However, Turkey faces challenges in transitioning to a more environmentally sustainable economic model. Large energy-intensive industries drive gross domestic product (GDP) growth, and fossil fuels dominate the energy mix. Several measures are slowing down progress. Subsidies for coal production, tax exemptions for petroleum use, and fuel and vehicle taxation that does not reflect environmental criteria are delaying the transition to cleaner energy. Infrastructure investment continues to be more heavily weighted towards road transport than alternatives. Furthermore, few measures are in place to address traffic congestion and urban air pollution.

Financing mechanisms for environmental projects are emerging, but not yet at the scale needed to maximise private sector involvement across all types of investments. Renewable energy investment, for example, is critical to addressing air pollution and greenhouse gas (GHG) emissions in Turkey. However, fees and other project requirements have limited or delayed uptake of renewable energy incentives for some solar projects. Turkey also risks failing to capture growing domestic and international opportunities in environmental goods and services (EGS) markets without further strengthening the policy framework supporting eco-innovation.

3.2. Framework for sustainable development and green growth

Turkey does not have a green growth strategy, but does incorporate the principles of sustainable development into National Development Plans (NDPs). Turkey's NDP provides overall strategic direction and identifies priorities. The tenth NDP for 2014-18 includes sustainable development as one of its main principles (Chapter 1). Environmental rights are also enshrined in Turkey's Constitution, which articulates rights to a healthy and balanced environment. It states that protecting environmental health and preventing pollution is a duty of government and citizens.

The 11th NDP is under preparation, with SDGs forming its central component. Turkey has already made significant progress in several areas, including reducing poverty, increasing enrolment in primary education, reducing rates of child and maternal mortality, and increasing development assistance to developing countries. A 2017 report comparing performance on SDGs across countries found that Turkey ranked 67th out of 157 countries. The report highlighted a need for further progress on a variety of issues. These included obesity rates, years of schooling, female labour force participation, youth unemployment,

number of researchers and patents, income inequality, air pollution, municipal solid waste, GHG emissions, protected areas and ocean water quality (BS and SDSN, 2017). To achieve better environmental outcomes, the 11th NDP would need to emphasise reform of tax systems that encourage fossil fuel use and improved incentives for investment in renewable energy, energy efficiency and cleaner vehicles. Improved evaluation is also needed to understand the aggregate and relative effectiveness of environmental measures included in NDPs. The Paris Collaborative on Green Budgeting launched by the OECD, France and Mexico in December 2017 is aimed at supporting governments in their efforts to green fiscal policy and embed environmental objectives into national budgeting and policy frameworks.

In 2016, Turkey approved a rural development action plan that included "environmental improvement and continuity of natural resources" as one of its five strategies. The increased emphasis on sustainable development in rural development programmes is consistent with recommendations made in the OECD's 2008 Environmental Performance Review (EPR) of Turkey.

The Strategy and Budget Office of the Presidency (former Ministry of Development) prepares NDPs in conjunction with the Ministry of Treasury and Finance and co-ordinates implementation. The National Sustainable Development Commission (NSDC), operating since 2004, follows up and reviews implementation of SDGs. Members include the Ministry of Foreign Affairs, Ministry of Interior, Ministry of Environment and Urbanization, and the Strategy and Budget Office. Other public institutions, private sector representatives and non-governmental organisations (NGOs) are invited to meetings depending on the agenda. The NSDC may grow in the future, as it takes on greater responsibilities related to SDGs. A strong role for the NSDC will be important to breaking down silos across policy institutions that have impeded transition to an integrated, cross-disciplinary approach; it would also help improve consistency across policies (MoD, 2016).

Indicators are key in assessing the effectiveness and efficiency of policies and programmes related to NDPs and SDGs. Turkey's sustainable development indicators are relatively comprehensive. However, additional and more disaggregated indicators are needed to monitor progress within the context of SDGs and NDP priorities (MoD, 2016; TurkStat, 2018a). Turkey is ready to publish a set of approximately 80 SDG indicators, which include 20 new indicators, in 2018. The initial set is drawn from the UN Global Indicator Framework of 230 indicators, and focuses on areas where data are available to produce SDG indicators. A number of proxy indicators have also been considered. TurkStat is continuing to explore the development of new indicators through stakeholder workshops. However, financing data collection and generation has been identified as an ongoing challenge (MoD, 2016).

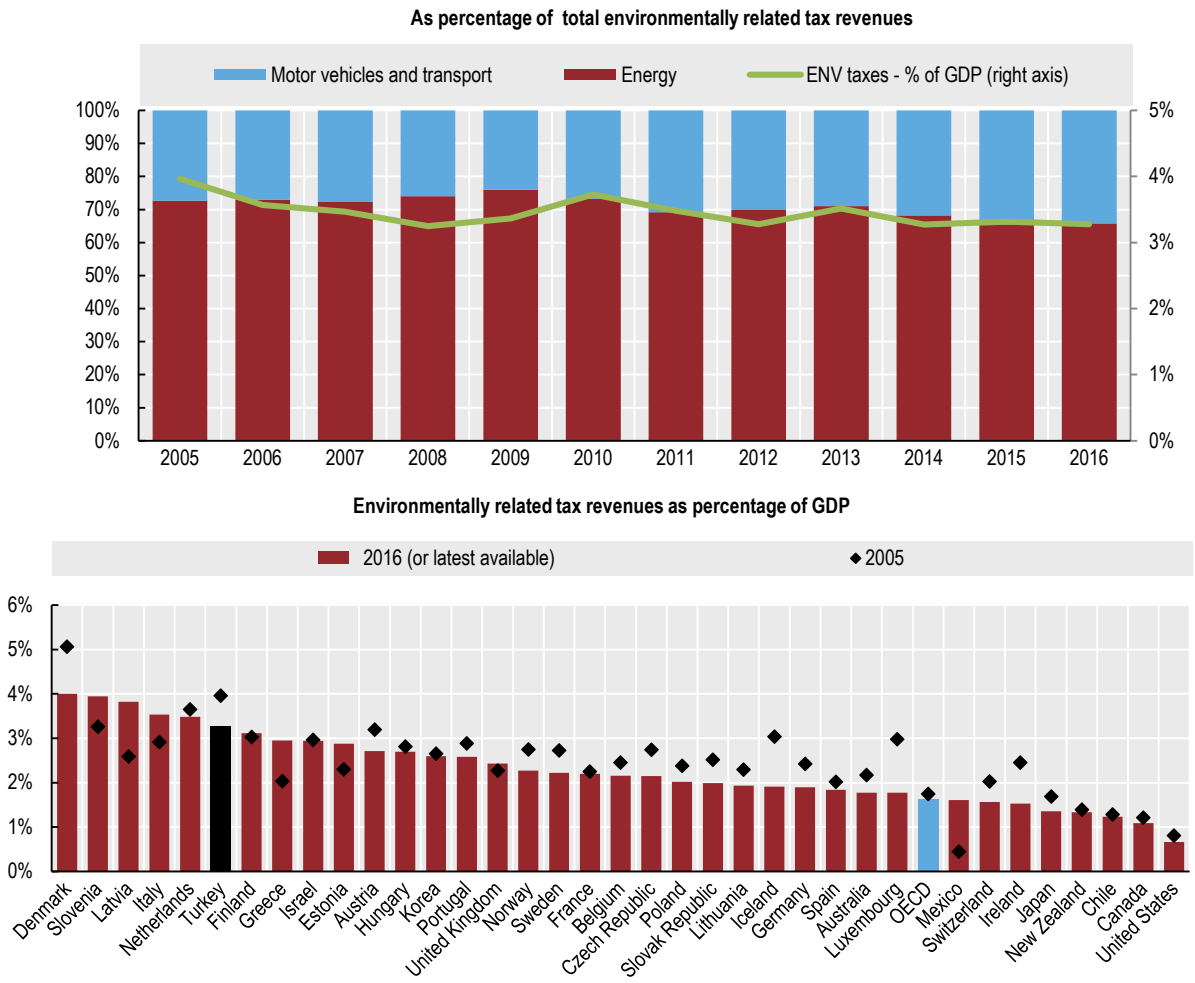
3.3. Greening the system of taxes and charges

Turkey's overall tax to GDP ratio is among the lowest in the OECD at 25.5% in 2016, compared to an OECD average of 34.3% (OECD, 2017a). Turkey also has higher tax revenues from goods and services taxes and a lower proportion of revenues from taxes on personal and corporate income than the OECD average. A 2018 economic forecast found that Turkey's Medium-Term Economic Programme provides a prudent fiscal framework (OECD, 2018a).

Revenue from environmentally related taxes decreased from 4% to 3.3% of GDP between 2005 and 2016. Despite the decrease, these taxes remain well above the OECD average of

1.6%. The relative proportion of revenue raised from energy taxes decreased over the period, with more revenue raised from motor vehicle and transport taxes (Figure 3.1). Despite high overall environmentally related taxes, gaps remain. For example, there are low taxes on coal and natural gas, higher taxes on gasoline than diesel, and vehicle taxes that do not fully reflect the environmental costs of their use. There are also substantial fuel tax exemptions.

Figure 3.1. Share of environmentally related tax revenues is among the highest in the OECD



Source: OECD (2018), "Environmental Policy: Environmental Policy Instruments", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892611

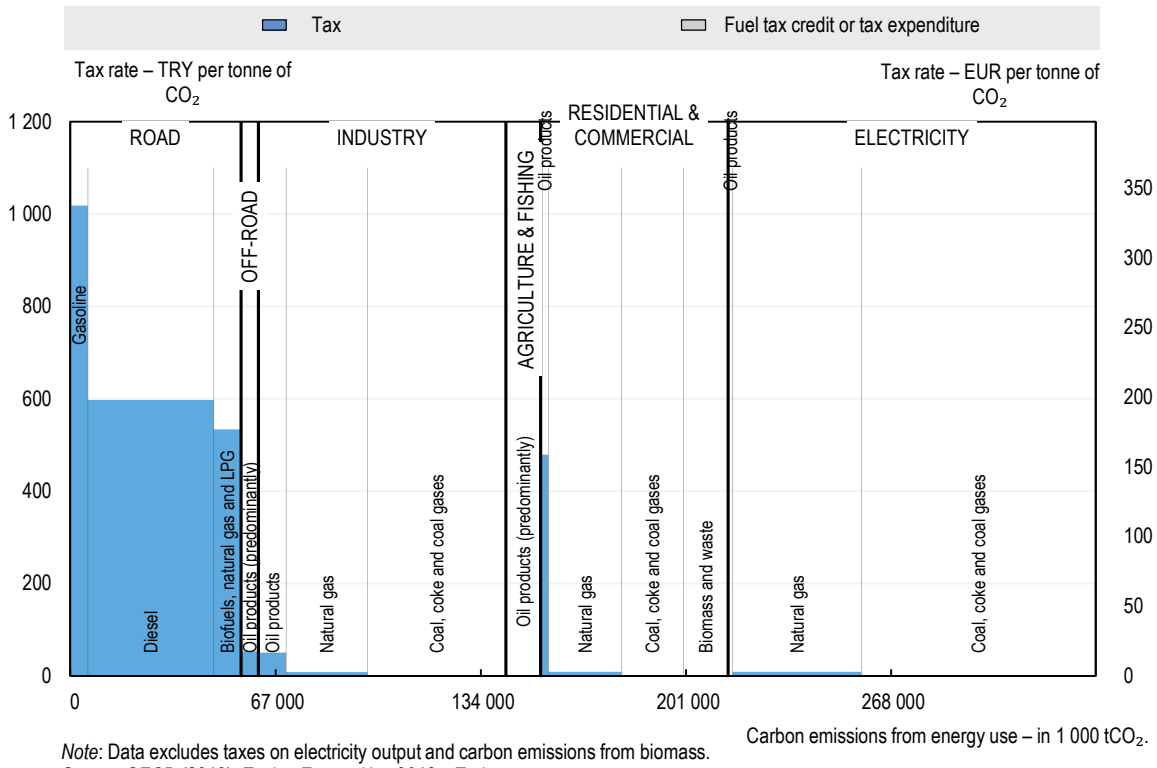
3.3.1. Taxes on energy products and carbon pricing

Taxes on energy products continue to provide the lion's share (66%) of revenue from environmentally related taxes. However, this share is lower than the OECD average of 72% (OECD, 2018b). There are two main taxes on energy products in Turkey. A special consumption tax targets oil products and natural gas across all sectors. An electricity consumption tax applies to both residential (5% of bill) and industrial and commercial (1% of bill) consumers. The road sector faces the highest tax rates, with much lower levels of

taxation for industry, agriculture and fishing, residential, and commercial and electricity sectors (OECD, 2018c) (Figure 3.2).

Oil products are taxed at much higher rates than coal or natural gas. Fuels used for domestic aviation and navigation are untaxed. Meanwhile, petroleum products used for oil exploration and production activities, or by vehicles carrying export goods, receive a full tax reduction (Section 3.4.1) (OECD, 2018c). Ideally, energy taxation should reflect the costs that environmental externalities such as air pollution and GHG emissions impose on society. This would imply a much higher level of taxation for coal in particular, though Turkey's tax profile does not differ markedly from many other OECD member countries.

Figure 3.2. High effective tax rates on energy use in the road sector, but low in other sectors



Note: Data excludes taxes on electricity output and carbon emissions from biomass.
Source: OECD (2018), *Taxing Energy Use 2018 – Turkey*.

StatLink http://dx.doi.org/10.1787/888933892630

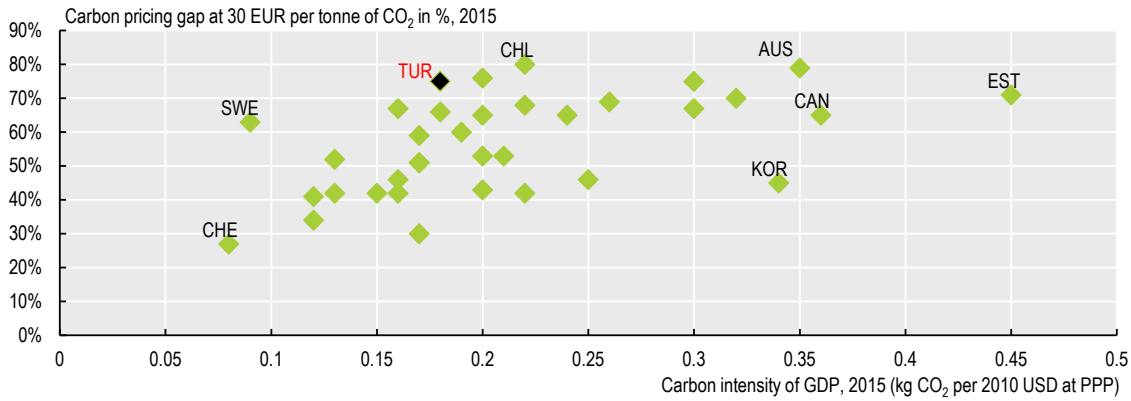
Though road fuels face relatively higher taxes, they do not reflect the environmental costs associated with their use. Like many OECD member countries, Turkey maintains a differential between gasoline and diesel tax rates that encourages diesel use. Diesel cars are growing in popularity in Turkey, which has contributed to high levels of air pollution (Chapter 1). In addition, diesel with higher sulphur content is taxed at a slightly lower rate, which is inconsistent with efforts to reduce air pollution from road transport. While Turkey's tax rates on vehicle fuels have increased since 2008, the differential between gasoline and diesel has remained constant. Effective carbon prices in road transport in Turkey are in the middle range of OECD countries (OECD, 2018d).

Overall, energy taxes do not reflect the climate costs of fuel use. In 2015, 51% of carbon emissions from energy use were unpriced. Furthermore, only 21% of emissions were priced above EUR 30 per tonne of CO_2 (a conservative estimate of the climate damage from 1 tonne of CO_2 emissions). This highlights a lag in implementing cost-effective policies to decarbonise the economy relative to other OECD countries (OECD, 2018a) (Figure 3.3). Turkey, however, has lower carbon intensity due to factors such as lower levels of car ownership, greater use of renewables in electricity generation and lower energy use intensity per capita.

As carbon pricing is gaining momentum worldwide, delaying abatement or pursuing mitigation policies in a way that is more costly than necessary may impair Turkey's long-term competitiveness. Such approaches, for example, may fail to stimulate low-carbon innovation and allow investment in long-lived, carbon-intensive infrastructure. Concerns related to the economic impact of carbon pricing could be addressed through careful design, gradual implementation, revenue recycling and complementary measures that support continued economic growth. Turkey has not committed to domestic carbon pricing, but is seeking carbon credits from international markets to help achieve its 2030 GHG target (Chapter 4).

A study commissioned by the Ministry of Environment and Urbanization analysed a potential roadmap for a GHG emissions trading system (ETS) in Turkey (Ecofys, 2016). The report recommended a Turkish pilot ETS of two-three years. This would consist of a dynamic allowance reserve to allow for growth, grandfathered allowance allocation with a certain share of auctioning, use of domestic offsets registered under existing voluntary standards and no linking of the pilot ETS to other trading schemes (Ecofys, 2016). The government has not announced plans to follow through on the recommendations.

Figure 3.3. Turkey has relatively fewer emissions priced at high levels



Note: The carbon pricing gap shows the extent to which countries price carbon emissions below the benchmark value, by measuring the difference between the benchmark and the actual rate for every percentile, and summing all positive differences. The gap is measured as a percentage. If the effective carbon rate on all emissions was at least as high as the benchmark value, the gap would be zero, and if the effective carbon rate was zero throughout, the gap would be 100%. EUR 30 is a conservative estimate of the climate damage from 1 tonne of CO_2 emissions.
Source: OECD (2018), *Effective Carbon Rates 2018*; IEA (2018) *IEA CO_2 Emissions from Fuel Combustion Statistics* (database, 2018 preliminary).

StatLink http://dx.doi.org/10.1787/888933892649

To help improve Turkey's readiness for carbon pricing, the Mid-size Sustainable Energy Financing Facility (MidSEFF) established by the European Bank for Reconstruction and Development (EBRD) has launched a carbon market development programme. It aims to

promote participation of Turkish banks and companies in carbon markets in Turkey and abroad through three key measures. It supports capacity building and policy dialogue; provides technical assistance for carbon asset development and monetisation of carbon credits; and trains Turkish partner banks on available carbon market services (MidSEFF, 2018a). Turkey is already the fourth largest supplier of voluntary carbon offsets after the United States, India and Indonesia (MidSEFF, 2018a).

3.3.2. Transport taxes and charges

The transport sector is, together with industry, the highest energy consumer and the fastest growing source of GHG emissions (Chapter 1). Revenue from motor vehicle and transport taxes increased from 27.3% of environmentally related tax revenue in 2005 to 34.2% in 2016 compared to an average of 24.5% in OECD member countries. Vehicle taxes are less efficient than fuel taxes and distance-based charges in reducing emissions of GHGs and local air pollutants. However, they can promote fleet renewal towards cleaner vehicles. As vehicles become more efficient, increased reliance on distance-based charges will better address road transport externalities and provide stable revenue (OECD, 2018e).

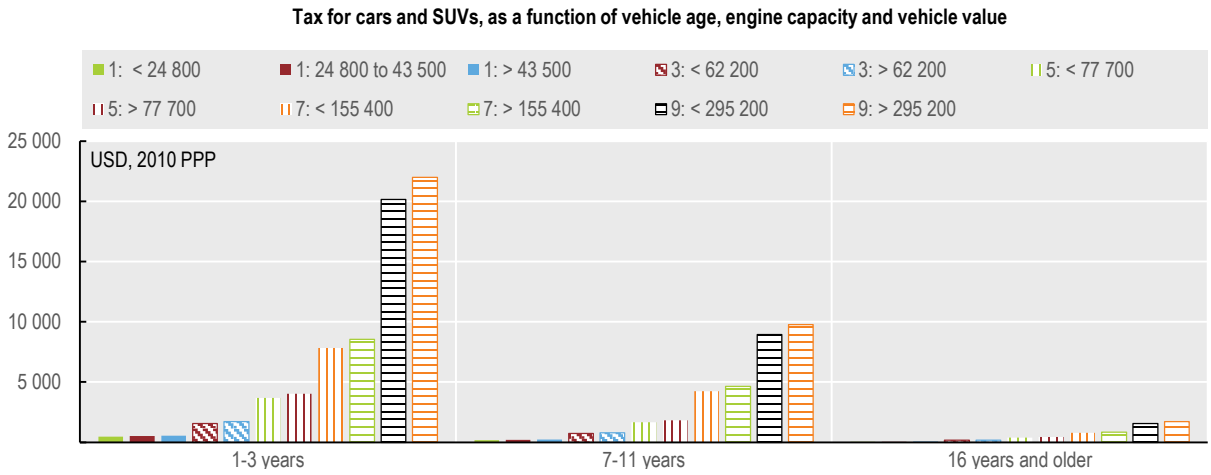
Taxes on vehicles

Turkey has two types of vehicle taxes: taxes on the value of the vehicle when purchased (a value-added tax, or VAT and a special consumption tax, or SCT); and an annual motor vehicle tax (MVT). The seller pays SCT on motor vehicles before they are first registered, meaning that purchases of used vehicles are not subject to the tax (as is standard practice). The SCT is a percentage of the net-of-tax price of the vehicle. It ranges from 0% to 160% depending on the type and value of vehicle, and its engine size. Vehicles with smaller engine prices pay a tax based on a smaller percentage of the vehicle value. Cars with an engine capacity over 2 000 cm^3 pay 160% of the net-of-tax price of the vehicle. Electric cars pay a lower rate, 3-15%.

This structure, combined with high tax levels, creates a strong incentive to buy new vehicles with small engines or used vehicles, or to lease instead of purchase (GlobalFleet, 2017). While smaller engines are environmentally preferable, used older vehicles are likely to have higher emissions. The average age of registered cars was 13.2 years in 2017, higher than the EU average (MEU, 2015; ACEA, 2018). There are also several exemptions from the SCT: for the disabled, diplomats and petroleum exploration. Renewal of taxis, public transport and commercial cargo vehicles is also exempted from the SCT until 30 June 2019. If a vehicle 16 years or older is exported or scrapped, Turkey allows for up to a TRY 10 000 SCT reduction. This measure, introduced in 2018, aims to encourage the scrappage of older vehicles.

Turkey's MVT also provides a financial incentive to use older vehicles with smaller engines (Figure 3.4). The previous motor vehicle tax was based on engine capacity and the age of the vehicle, with lower rates for smaller and older vehicles. Decreasing tax rates as the vehicle ages are meant to reflect depreciation of vehicle value over time. The revised tax brought into effect in the 2018 budget added the concept of vehicle value. This is based on the tax base value used to calculate VAT at the time of delivery, acquisition and importation. The budget also increased tax rates to 15% for cars under 1 300 cm^3 and 25% for other vehicles. Lower value vehicles now face a lower tax rate.

Figure 3.4. Motor vehicle taxes favour older cars with smaller engines



Note: The numbers in the legend refer to engine capacity (cylinder volume), with: 1=1 300 cm³ and lower; 3=1 601-1 800 cm³; ; 5=2 001-2 500 cm³; 7=3 001-3 500 cm³; 9=4 001 cm³ and higher. Intermediate engine capacities are not presented. The second element is the value of the vehicle in USD 2010 PPP. The conversion to USD is done using the 2017 consumer price index (at constant 2010 prices, PPP).
Source: Country submission.

StatLink http://dx.doi.org/10.1787/888933892668

Turkey's motor vehicle tax also has positive elements. For example, it applies broadly to cars, sport utility vehicles, motorcycles, buses, trucks, planes and helicopters. Vehicles with heavier weight, such as trucks, are taxed at a higher rate. Higher taxes for larger engine sizes and heavier vehicles are likely to mean that higher emitting vehicles are taxed more for a given vehicle age.

However, the tax is not differentiated based on fuel, air pollutant or GHG emissions. The share of diesel vehicles, which are a larger source of $PM_{2.5}$ and NO_x air pollution, rose from 39% in 2008 to 50% in 2017 (TurkStat, 2018b). The share of lower emitting liquefied petroleum gas vehicles also rose from 17% to 22% over 2008-16. Low-emitting electric or hybrid vehicles represented only 0.01% of vehicle purchases in 2017. Electric vehicles pay only 25% of the MVT imposed on equivalent vehicles, whereas hybrid vehicles are taxed according to their cylinder engine capacity (EAFO, 2018).

Tax treatment of company cars and commuting expenses

In Turkey, the number of commercial cars, small trucks and motorcycles is relatively small, growing from 2.5% of the total fleet in 2004 to 2.6% in 2017 (TurkStat, 2018c). Individuals are not taxed on the provision of a company car provided they use it for business (KPMG, 2017). Tax treatment of the benefit associated with the use of a company car for personal purposes and the treatment of commuting expenses can be environmentally significant in countries with a large proportion of company cars (Harding, 2014).

A company car used for personal purposes is considered in-kind remuneration, and thus taxed as personal income. Corporations can deduct the expense of vehicles owned or leased by the business from the net corporate income. However, they cannot deduct the VAT paid on the purchase of passenger vehicles, given the high likelihood of also using company passenger vehicles for personal use.

In Istanbul, government workers receive free transit passes for use in their duties. Corporations could also encourage public transit by providing free or discounted transit passes. The tax system could provide an incentive for this, allowing the expense to be deducted from net corporate income in the same way as vehicles.

Road pricing

Turkey has serious air pollution problems (Chapter 1). Four cities are among the top 100 most congested cities in the world, with Istanbul ranked sixth (TomTom, 2018). Congestion pricing can be an effective way to control traffic congestion and limit air pollution, particularly when combined with investment in public transit. Charges that apply to those that drive into a congested area of a city can encourage other forms of transportation. Charges that vary with the time of use of a highway or bridge can help reduce congestion at peak times of the day. Lanes on a highway can also be differentially priced. High occupancy toll (HOT) lanes, for example, encourage car-pooling. Lanes can also provide access to certain vehicle types such as electric cars. Technology has improved considerably to enable effective and efficient pricing systems.

In Turkey, all motorways charge tolls based on distance travelled. A number of bridges are also tolled. All other state roads in Turkey are free of charge. Toll revenue more than doubled between 2001 and 2012. The length of motorways increased from 1 667 km in 2005 to 2 542 km in 2016 (KGM, 2013; Turkstat, 2018d). Tolls have been an important source of financing for major bridge and motorway projects.

As a city of around 15 million people, Istanbul is a logical place to move beyond tolls on highways and bridges and consider other forms of congestion pricing. It could be introduced gradually, with district pilot projects. At the same time, an educational campaign could highlight the benefits of congestion pricing. A 2017 survey of people in the Taksim district of Istanbul found that the majority did not believe congestion pricing would be effective (Özgenel and Günay, 2017). International experience shows that public support for congestion pricing generally increases once the system is introduced. However, this support depends on whether the system demonstrably reduces congestion and pollution, and whether revenue is used for high-value transportation projects (Box 3.1. Lessons learned from congestion pricing experience).

Box 3.1. Lessons learned from congestion pricing experience

Experience with congestion pricing in London, Stockholm and Singapore has shown the importance of careful system design and effective public engagement. It has also demonstrated success in reducing traffic volume, limiting pollution and raising revenue that can be used to invest in valuable transportation infrastructure such as public transit.

	Type of System	Benefits
London (2003)	Cordon pricing using automatic plate recognition technology, plus addition of new buses, park-and-ride spaces and improved bicycle and pedestrian infrastructure.	Investment of approximately EUR 2.9 billion of revenue into public transit between 2003 and 2013. Traffic volume in 2013 was 9.9% lower than in 2000, despite 20% population growth. Particulate matter emissions declined by 15.5% after introduction.
Stockholm (2007)	Cordon pricing using automatic plate recognition technology, plus addition of new buses, park-and-ride spaces and improved bicycle and pedestrian infrastructure.	Net revenue of around EUR 131 million per year. Traffic delays decreased by 30-50%. Particulate matter emissions declined by 9% after introduction.
Milan (2012)	Cordon pricing using automatic plate recognition technology, with a flat daily fee.	Net revenue of around USD 20 million per year. Traffic reduction of 38%. Particulate matter reduction of 18%.
Singapore (1998)	Electronic road pricing on specific routes, with variable pricing responding to congestion in real time, plus increased parking fees in certain zones, new buses, high-occupancy-vehicle lanes, park-and-ride spaces, and improved bicycle and pedestrian infrastructure.	Net revenue of around EUR 80 million per year. Traffic in inner city reduced by 24% despite strong population growth. 10 kg reduction in particulate matter.

Sources: ED (2006); Croci and Ravazzi (2014); C40 (2015); Börjesson (2017); TSTC (2017).

The Ministry of Transport and Infrastructure is co-ordinating the drafting of a regulation on energy efficiency, which will include low-emission zones. As part of this process, the Istanbul Metropolitan Municipality has studied several options such as congestion pricing at peak hours and restrictions for heavy duty vehicles. Other measures, such as more restrictive cordon pricing and increased parking fees, may also be needed to encourage alternative forms of transport and address air pollution.

3.3.3. Feed-in tariff for renewable energy

In 2010, Turkey adopted a Renewable Energy Law to help meet its 30% renewable power target by 2023 (Chapters 1 and 4). The law adjusted and increased Turkish feed-in tariffs. Renewable producers that bid on government tenders are guaranteed the tariffs for ten years and receive an 85% discount on transmission costs. Rates are higher for solar and biomass (0.13 USD/kWh) than for geothermal (0.105 USD/kWh) and hydro and wind (0.073 USD/kWh) energy. The law also includes bonus payments for hardware components made in Turkey to support domestic manufacturing (IEA, 2015). Local content premiums also help make projects more attractive to investors (IEA, 2016a).

While the feed-in tariff provides an important incentive to develop renewable energy projects, high contribution fees required as part of the bidding process decreased profitability for investors. This has delayed or stalled some licensed solar projects. For example, Turkey's first tender for 600 MW of solar PV in 2013 was over-subscribed, but only 82 MW had been installed by September 2018. Small, unlicensed solar PV projects built outside of the tender process have, however, been flourishing. Around 4 800 MW of such projects were installed as of September 2018. Tenders for wind power projects have also been successful, with a licensed wind capacity of 6 800 MW as of September 2018. Future tenders of 3 000 MW of renewables are planned, split evenly across offshore wind, onshore wind and solar. Growth may slow down in the future as unlicensed projects are expected to be required to pay power distribution companies higher fees to transport the electricity generated (Tsagas, 2018).

3.4. Eliminating environmentally harmful subsidies

Turkey continues to provide environmentally harmful subsidies. They encourage fossil fuel production and use through both direct expenditure and tax exemptions. However, there have been some improvements in agriculture, such as the elimination of subsidies for water use and the introduction of payments for soil conservation and organic farming.

3.4.1. Support for fossil fuel production and consumption

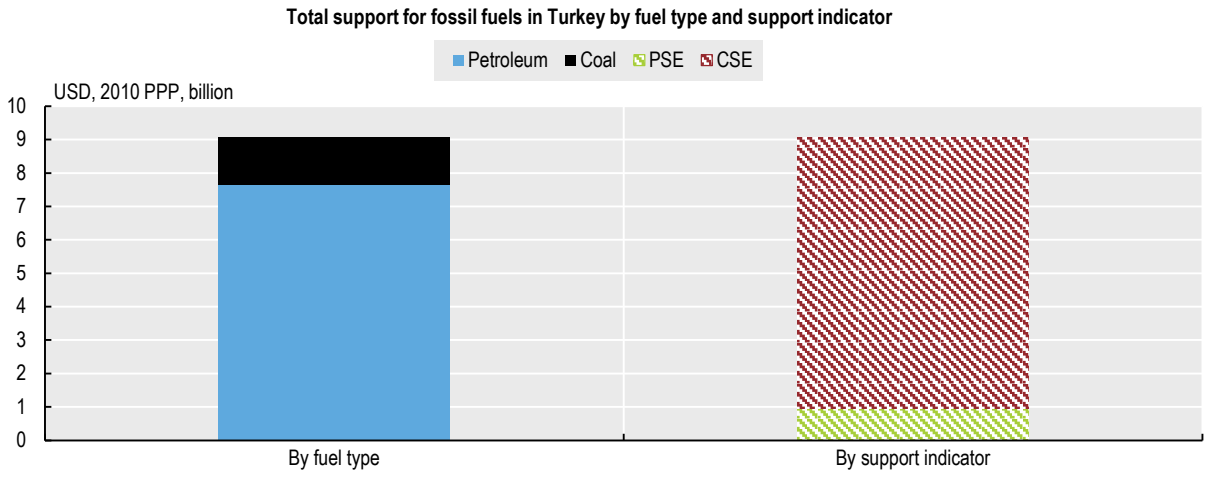
Previous OECD estimates of fossil fuel support showed relatively low levels for Turkey, but recent updates to include new data and measures resulted in estimates over nine times higher in 2016 than in 2008 (TRY 13 billion compared to TRY 1.4 billion) (OECD, 2018f) (Figure 3.5). Most measures provide consumer support for fossil fuel use, though producer support remains significant. The support is likely to increase further, given a new regulation introduced in 2018 to stabilise fuel prices in the face of fluctuations in international oil prices and exchange rates. The regulation essentially caps taxes on fuel products where prices are increasing (AA, 2018a).

Over the past decade, the most significant fossil fuel support has come from a range of fuel tax exemptions, with significant tax expenditures related to high-emission bitumen and petroleum coke fuels that are used as inputs in many industry sectors. In terms of direct

budgetary transfers, coal aid to poor families for heating represents the most significant form of support. Expenditure for the programme more than doubled from TRY 433 million in 2008 to over TRY 1 billion in 2016 (OECD, 2018f). Providing coal to poor families encourages its use for residential heating and contributes to health impacts, local air pollution and GHG emissions. Turkey is working to transition communities to natural gas heating and gradually phase out coal subsidies. All provinces will be supplied with natural gas by the end of 2018. Greater use of incentives for alternatives such as expanded geothermal heating could also be explored. There are already 120 000 households and greenhouses heated by geothermal and solar energy.

In addition to supporting fossil fuel use, the government also provides support for coal production. For example, production costs for hard coal of the state-owned Turkish Hard Coal Enterprises averaged TRY 619 per tonne in 2013, while the average selling price was only roughly one-third of that amount at TRY 194. The government financed the difference. The government has also supported oil, natural gas and coal exploration since 2010 to help reduce dependence on foreign fuel sources (OECD, 2016a). If Turkey removed incentives for coal, it could reduce projected GHG levels by an estimated 5.4% by 2030 (IPC, 2016).

Figure 3.5. Turkey provides significant support for fossil fuel use and production



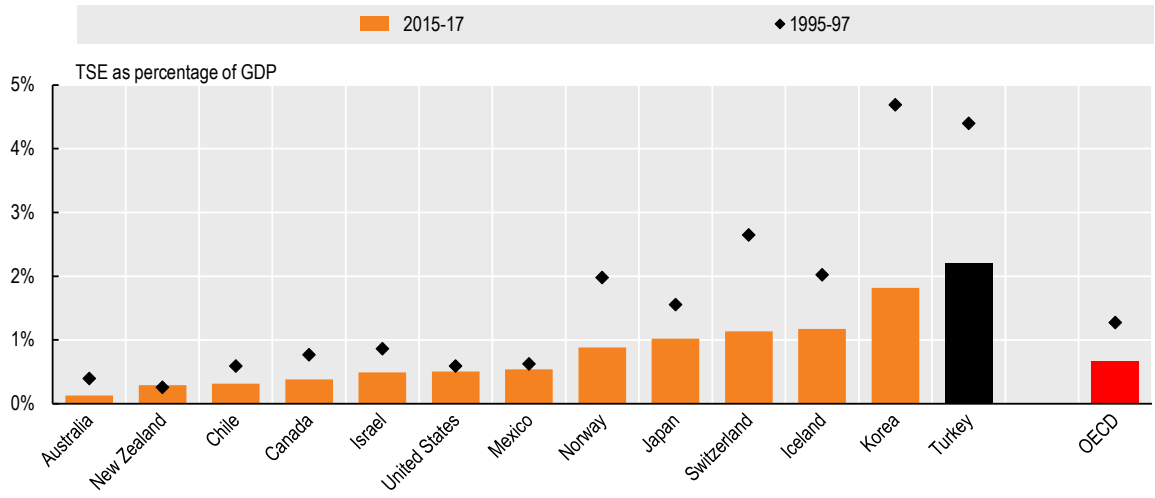
Note: CSE=Consumer Support Estimate; PSE=Producer Support Estimate. Data refer to 2016: the 2016 GDP deflator and the 2010 PPP have been used to convert into USD at constant 2010 prices.
Source: OECD (2018), "OECD Analysis of Budgetary Support and Tax Expenditures, Turkey", *OECD-IEA Fossil Fuel Support and Other Analysis*.

StatLink http://dx.doi.org/10.1787/888933892687

3.4.2. Agricultural subsidies

The level of support for agricultural production in Turkey has declined significantly over the past two decades, but remains higher than in most OECD member countries as a percentage of GDP (Figure 3.6). Input subsidies are considered one of the most distorting forms of support for production and trade. An estimated 91% of Turkey's support is considered distorting, which is significantly higher than the OECD average of 51% (OECD, 2017b). Turkey provides subsidies for diesel and fertiliser use, but they are provided by area to encourage farmers to be more efficient (OECD, 2017c).

Figure 3.6. Turkey provides relatively high levels of distortionary agricultural support



Note: TSE = total support estimate (as percentage of GDP).
Source: OECD (2018), "Agricultural Support Estimates" (Edition 2018), *OECD Agriculture Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892706

Turkey reformed its agricultural subsidies in 2016 to rationalise crop and livestock production by region based on the most suitable conditions (OECD, 2017b). The policy divides Turkey into 941 agricultural basins based on climate and soil, and only provides subsidies to strategic crops in each basin. Livestock subsidies were increased, and producers of breeding animals are able to lease grassland for grazing (FAS, 2016). The environmental impacts of the changes are mixed. Encouraging certain types of crops in areas most suitable to them could reduce pressures in areas of water scarcity. Conversely, encouraging livestock production is likely to increase pressures on land-use and species habitat loss, as well as aquatic ecosystems vulnerable to agricultural run-off.

Turkey ended its subsidy for water use in 2007. However, agricultural water pricing is still not tied to consumption volume, except when pumping systems are used. The price of irrigation water is based on overall operation and maintenance costs. It is charged on a per hectare basis, differentiated according to the crop. Consequently, there is limited incentive for investment in water-use efficiency.

Turkey introduced payments for soil conservation in 2006 and concessional loans for adoption of organic agriculture and good agricultural practices in 2009 (OECD, 2017c). However, these transfers represent a very small share of total support (OECD, 2016b). Organic farming increased from 0.5% to 2.2% of total agricultural land over 2005-15 (MEU, 2015). The Turkish government aims to increase this share to 3% by 2023 (Chapter 1).

3.5. Investing in the environment to promote green growth

Given the rapid pace of growth and urbanisation, transitioning towards green growth will require significant investment in a relatively short time. Foundational policies such as carbon pricing are needed to drive investment towards more environmentally friendly forms of infrastructure. However, innovative approaches that maximise leveraging of

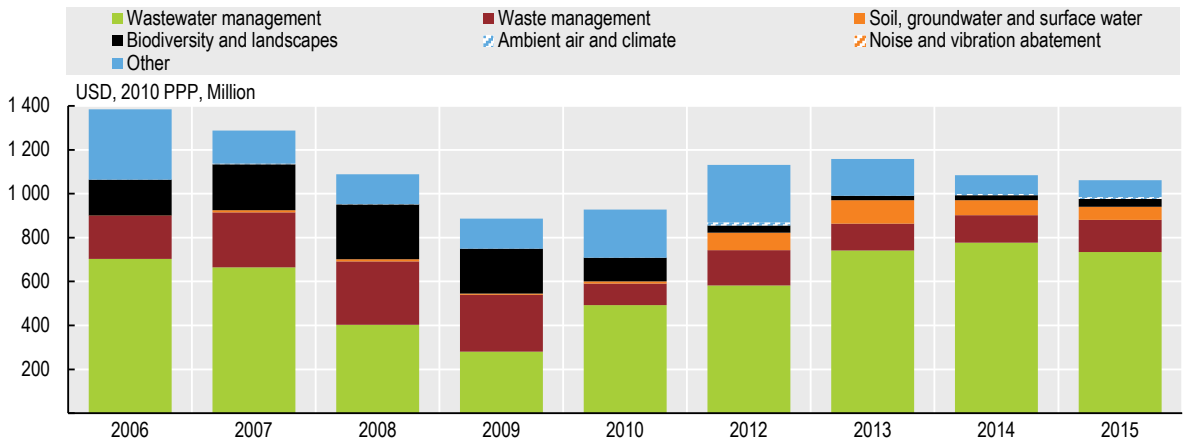
private sector financing from both domestic and international sources will also be essential. Instruments such as public-private partnerships and green bonds are beginning to emerge in Turkey, with support from multilateral development banks and other institutions.

3.5.1. Environmental expenditures

Government expenditures

Public environmental protection investments were lower in 2015 in real terms than in 2006 (Figure 3.7). Most spending focuses on wastewater and waste management services (83% in 2015), more than the EU average of 67% the same year (EuroStat, 2018). Municipalities account for around 86% of public sector environmental expenditures, which is consistent with their mandate for wastewater and waste management. Local administration unions only account for around 2% of expenditures (MEU, 2015).

Figure 3.7. Public investment on environmental protection has declined



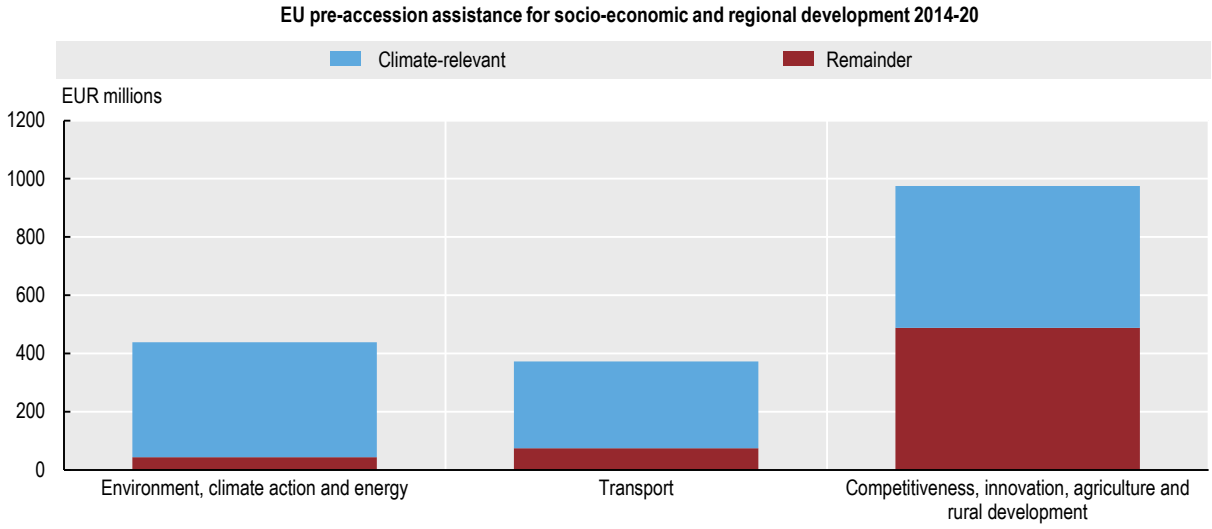
Note: Gross fixed capital formation and acquisition less disposals of non-produced non-financial assets. Data are expressed in million USD, 2010 prices, purchasing power parities.
Source: Eurostat (2018), *Environmental Protection Expenditure* (database); OECD (2018), "OECD Economic Outlook No. 102 (Edition 2017/2)", *OECD Economic Outlook: Statistics and Projections* (database); OECD (2018), "PPPs and Exchange Rates", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892725

EU funding

EU funding contributes to environmental expenditure in Turkey. The EU's Pre-Accession Assistance (IPA) aims to enhance institutional capacity, and the quality of both legislation and implementation. The second IPA for Turkey covers 2014-20 and uses a sectoral approach to allocate funds. Environment-related funds, amounting to over EUR 1.1 billion over 2014-20, are allocated for environment, climate action and energy; transport; and competitiveness, innovation and agricultural and rural development (Figure 3.8). In total, around 33% of EU funds were allocated to environment-relevant areas over 2014-20.

Figure 3.8. European Union provides significant environment-related financial assistance



Source: European Commission (2018), Annex to the commission implementing decision amending Commission Decision C(2014) 5998 of 26 August 2014 adopting the Indicative Strategy Paper for Turkey for the period 2014-2020 .

StatLink http://dx.doi.org/10.1787/888933892744

The Environment and Climate Action portion of the IPA 2014-20 identifies priorities related to water, waste and environmental management. The water priority includes technical assistance to develop river basin management plans, drought and flood risk management plans, and water-related climate adaptation, as well as financing for water-related infrastructure. The waste priority includes technical assistance for collection, reuse and recovery, as well as support for waste reduction, recycling and environmentally friendly disposal. The environmental management priority focuses on technical assistance for sustainable development in a variety of areas. These include preventing industrial pollution, adopting market-based instruments, protecting nature and ecosystem services, promoting climate change adaptation and mitigation, and improving the Disaster and Emergency Management System (MEUA, 2017).

Private expenditures

While business expenditures on environmental protection have grown since 2008, spending in 2015 remains below 2007 levels once inflation is considered (Figure 3.9). Most spending remains focused on wastewater management (Chapter 5). Business spending in other areas, including air and climate, is very low.

Figure 3.9. Environmental business expenditure focused on wastewater management

Note: Gross fixed capital formation and acquisition less disposals of non-produced non-financial assets. Data are expressed in million USD, 2010 prices, purchasing power parities.
Source: Eurostat (2018), *Environmental Protection Expenditure* (database); OECD (2018), "OECD Economic Outlook No. 102 (Edition 2017/2)", *OECD Economic Outlook: Statistics and Projections* (database); OECD (2018), "PPPs and Exchange Rates", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892763

A significant barrier to increasing environmental requirements for businesses, and industry in particular, is the concern that it will impact the competitiveness of the sector or company. Several studies have shown, however, that such policies do not affect trade patterns or productivity significantly (OECD, 2017d, 2016e). Even without more stringent requirements, businesses could improve both environmental performance and long-term competitiveness. Energy efficiency, for example, can lower energy costs and improve energy security while reducing air pollution and GHG emissions. Turkey's industry has large potential for investment in energy efficiency (MidSEFF, 2018b). However, it could be better promoted through financial incentives and energy reporting requirements (Box 3.2. Enhancing incentives for industrial energy efficiency).

Box 3.2. Enhancing incentives for industrial energy efficiency

Turkey requires industrial establishments consuming more than 1 000 toe to be certified to the ISO 50001 energy management system standard. Energy management systems (EnMS) provide a structure to monitor energy consumption and identify opportunities to save money on energy costs while improving environmental performance. EnMS are particularly valuable in energy-intensive industrial sectors, where energy is a significant input cost. The use of EnMS is growing around the world, driven by policy and financial incentives.

The number of global certifications for the ISO 50001 standard for energy management grew to nearly 12 000 in 2015, with 85% of certifications in Europe. In 2016, Turkey was estimated to have only around 100 of 1 200 (8%) large energy-intensive industrial installations applying the ISO 50001 standard. A UNDP/UNIDO project is promoting greater use of energy management systems in Turkey through targeted training and information. Several European countries provide significant tax exemptions for EnMS certification (e.g. electricity tax exemptions in Germany).

Companies in Turkey can also enter into a voluntary agreement to reduce their energy intensity by an average of 10% over three years in exchange for having 20% of their energy costs subsidised during the first year. To date, only seven voluntary agreements have been completed, while another eight are within the three-year monitoring period. Additional incentives may be needed to increase the involvement of industrial installations in energy efficiency programming.

Sources: Siciliano (2014); ACEEE (2016); Janssen (2016); IEA (2017); MidSEFF (2018b).

3.5.2. Investment in environment-related infrastructure

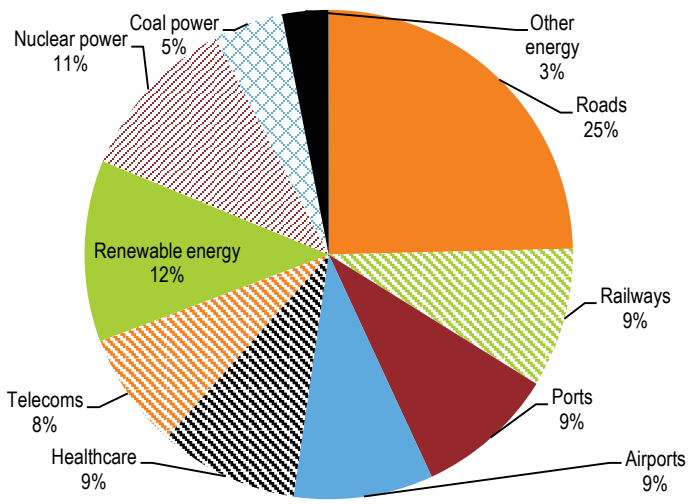
Between 2012 and 2017, Turkey invested more than USD 100 billion in capital projects and infrastructure. The Turkish government has planned an ambitious infrastructure investment programme in advance of the centenary of the Turkish Republic in 2023 that will triple that amount of investment. However, Turkey's ability to borrow in foreign markets and attract foreign investment may be affected by the significant drop in value of the Turkish lira in 2018 (OECD, 2018g). New investment, estimated in 2016 at USD 325 billion, is slated to be spent on transportation, healthcare, telecom and energy capital projects and infrastructure between 2017 and 2023, with a large proportion of private sector financing (Garanti and PwC, 2017). Over half of the investment is expected to be spent on transport-related projects such as roads, railways, ports and airports. About one-third of the investment is likely to go towards energy projects, including renewable, nuclear and coal power generation (Figure 3.10). These long-lived investments will significantly influence Turkey's environmental performance for decades to come.

Turkey should improve cost-benefit analysis (CBA) for all large infrastructure investments, considering environmental externalities such as air pollution and GHG emissions. Such an approach would likely favour renewable energy over coal power, and public transit over roads. OECD countries are increasingly considering elements such as GHG emissions in CBA of large investments, particularly in the transport and energy sectors. However,

thresholds for conducting CBA, and values used to incorporate environmental externalities, vary (OECD, 2018h).

Figure 3.10. Roads and power generation will dominate infrastructure spending to 2023

Projected breakdown of capital project and infrastructure spending across selected sectors, 2017-23



Source: Garanti and PwC (2017).

StatLink http://dx.doi.org/10.1787/888933892782

Transportation

Turkey has significantly increased spending on transportation infrastructure. For example, it has expanded its high-speed rail network, investing TRY 8.9 billion in 2017. It plans TRY 14.2 billion in investments in 2018 (Simsek, 2017). Between 2017 and 2023, it expects to invest double that amount in railways. Over 2014-23, the government aims to increase the share of passengers using railways from 1% to 10% and the share of cargo by rail from 4.4% to 15% (Garanti and PwC, 2017). Turkey's railway networks are less dense than the EU average, the dominant mode of transport being road (Chapter 1).

Road transport will also increase substantially, accounting for around 25% of capital investment expected over 2017-23. The majority will be spent on new toll motorways. Other large investments include Kanal Istanbul, which will connect the Black Sea to the Sea of Marmara. A three-level Grand Istanbul Tunnel under the Bosporus Strait will provide two levels for road traffic and one level for rail (Simsek, 2017). Additional roads, tunnels and bridges may relieve congestion in the short term, as well as alleviate local pollution hotspots. In the long term, however, these additions are likely to lead to more congestion and pollution by inducing greater demand. Complementary policies such as congestion pricing and incentives for low emission vehicles will be important to limit impacts on air pollution (Section 3.2).

Istanbul's new airport is one of the largest infrastructure investments in the world. In 2009, the Directorate General for Civil Aviation launched a "green certificate" programme to improve the environmental performance of airports. "Green Airport" certificates halve the

cost of permits and licences. To be eligible, all organisations and establishments at the airport must achieve the ISO 14064 standard for GHG reporting and the ISO 14001 standard for environmental management. In addition, the programme offers "Green Company" certificates to any company operating at the airport that meets some of the ISO requirements; in this case, they are eligible for a 20% fee reduction. As of 2017, 157 companies held a Green Company certificate, while 3 airports received a Green Airport certificate (Uşak, Adana and Tokat). A similar programme is also available for ports.

Renewable energy

Renewable energy as a share of total primary energy supply has remained stable at around 12% over 2005-17 (Chapter 1). Growth was slowed by a decline in biofuel and waste energy, as well as perceived risks for renewable investors (IEA, 2016a). In 2017, however, Turkey ranked in the top five countries in the world for net capacity additions of geothermal power, geothermal heat, hydropower, solar photovoltaic and solar water heating (REN21, 2018).

Turkey's 2005 Law on the utilisation of Renewable Energy in Electricity Generation enables renewable energy generators to sell their electricity directly to market or to use the feed-in tariff (Section 3.3.3). Laws in 2011 and 2013 further provided investment incentives. First, they exempted renewable energy generation below 1 MW from licensing. Second, they provided a discount for land acquisition for projects commissioned before 2020. The 2012 New Investment Incentives Programme builds on these laws. It provides value-added tax and custom duty exemptions for renewable sources; regional investment incentives that encourage investment in under-developed areas; and strategic and large-scale investment incentives (IEA, 2016a). Turkey also has significant capacity for renewable heat, in terms of geothermal and waste heat, and is developing new heat supply legislation aimed at establishing a well-functioning domestic heat market.

Renewable electricity is to receive more than double the investment in coal-fired power generation by 2023 (Garanti and PwC, 2017). The Turkish government has said it will issue tenders for 10 000 MW of solar and 10 000 MW of wind over the next ten years. In 2017, they held tenders for 1 000 MW of solar and 1 000 MW of wind. A similar amount is expected in 2018, with a focus on offshore wind. The 2017 wind tender was won by a consortium that included German company Siemens and Turkish companies Türkerler and Kalyon Enerji holdings for USD 1 billion (AA, 2018b). For the 2018 tenders, a Chinese company expressed interest in investing USD 1 billion in Turkish renewable energy (Hurriyet, 2018a). Licensed solar installations have been slower to progress, but unlicensed installations under 1 MW have grown rapidly (Section 3.3.3). In 2016, the Turkish government announced plans to commission 101 new hydropower plants (IEA, 2016a).

A 2018 report demonstrated that Turkey could go further on renewables, with the potential to supply more than 50% of electricity output by 2026, with as much as 30% from wind and solar (SHURA, 2018). In its 2016 review of Turkey, the International Energy Agency highlighted several challenges to renewable energy investment. These included high licence and connection fees, delays in grid connection and expansion, regulatory uncertainty for distributed generation and exchange rate risks (IEA, 2016a). Addressing these concerns will be important to further expanding renewable energy investment.

Water, wastewater and waste

By 2023, USD 9.8 billion in investment is estimated to be needed in the water and wastewater sector (MEU, 2016). Turkey also plans to increase use of desalination plants

and reuse of water to address water shortages that are expected to reach critical levels by 2030.

Agriculture is the primary consumer of water in Turkey, representing almost 90% of freshwater withdrawals. Consequently, investment in irrigation efficiency will be critical to reducing water use and building resilience to water shortages (Chapters 1 and 4). Turkey has significantly increased investment in irrigation. Annual investments were over three times higher in 2015 than they were in 2008 (OECD, 2016b). New projects are being designed with drip and sprinkler irrigation systems and open canals are being turned into closed canal systems.

To meet the goals of Turkey's Waste Management Action Plan, about USD 7 billion is estimated to be needed by 2023. This will include developing regional solid waste processing and recycling facilities, new sanitary landfills, and upgrading and remediating unsanitary landfills.

3.5.3. Financing green growth

Turkey's ambitious infrastructure plans and efforts to meet its own targets for improved environmental performance will require significant investment. Non-government financing is coming from the domestic private sector, the international private sector and international institutions. Private sector financing can be leveraged through public-private partnerships, domestic green banks, green bonds and other tools. Multilateral development banks also play an important role in providing and leveraging financing.

Public-private partnerships

Turkey has successfully used public-private partnership financial models for infrastructure, airports, highways, energy and health infrastructure. A few water and rail projects have also used this model. This is consistent with OECD recommendations in the 2008 Environmental Performance Review of Turkey. Between 1986 and 2016, almost half of transport, energy and hospital projects included some aspect of public-private partnership (Simsek, 2017). If structured appropriately, with sufficient revenue streams, public-private partnerships can attract both domestic and international investors for most types of projects, including rail, public transit, water and wastewater infrastructure (PPIRC, 2016).

Domestic financial sector

Local commercial banks and investors have been the main driver behind financing of infrastructure projects in Turkey to date. In 2016, the government's Privatisation Administration established a new Turkish Wealth Fund. It will support infrastructure projects deemed strategic, but details on which projects will be financed have not yet been made public (Garanti and PwC, 2017). İLBANK, a bank that provides credit support to municipalities, generally provides national funding for municipal infrastructure. These banks could be an important source of financing for public transit, renewable energy, wastewater, waste and clean technology projects. Green banks in Australia, Japan, several US states and Malaysia have been used to concentrate expertise and fill a gap in financing from risk-averse traditional institutions. Green banks can use credit guarantees and other instruments to help protect investor capital and reduce real or perceived risk that is keeping traditional investors out of a particular market (GBN, 2016).

The Industrial Development Bank of Turkey (IDBT) and the Turkish Development Bank are also important sources of financing. They use loans from the European Investment Bank

(EIB) to fund mainly renewable energy and energy efficiency projects. Since 2008, environment-related projects funded by the EIB in Turkey have totalled 2.6 USD billion (2010 prices). The IDBT issued the first-ever Turkish Green Sustainable Bond in May 2016, worth USD 300 million. It attracted 13 times more demand than the issue size, from 317 institutional investors in international markets. The funds will be used for renewable energy, energy efficiency, climate change adaptation and GHG reduction projects, as well as healthcare, electricity transmission and ports.

The Banks' Association of Turkey issued voluntary sustainability guidelines for the banking sector in 2014. The government is also developing a template for banks to report their sustainability activities. The template is intended to increase awareness, encourage best practices and enable the Banking Regulation and Supervision Agency to measure and assess progress of the Turkish banking sector. The guidelines are an initial step that partly responds to recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures. To that end, the guidelines encourage reporting of sustainability measures and plans, but do not yet put sufficient emphasis on disclosing risks related to global and domestic environmental policy, and climate change impacts (Chapter 4).

Multilateral development banks

Multilateral development banks (MDBs) can also play a role in providing and leveraging financing (Chapter 4). MidSEFF provides loans through seven Turkish banks to support financing of mid-size investments in renewable energy, waste-to-energy and industrial energy efficiency. The World Bank has provided Turkey with hundreds of millions of dollars for sustainable cities projects, including public transport, energy services and water, sanitation and waste management. It has also provided loans to Turkish public banks to improve access to energy efficiency finance for small and medium-sized enterprises, support geothermal investment and alleviate energy infrastructure capacity constraints. In addition, since 2009 Turkey has received over USD 300 million from the Clean Technology Fund, channelled through MDBs.

3.6. Promoting eco-innovation

Eco-innovation will be an essential component of achieving green growth in Turkey. Companies in Turkey have significant potential to expand in the areas of electric vehicles, solar thermal energy, geothermal energy, and wind and solar power. With a young work force and high proportion of engineering and mathematics graduates, a supportive set of policies could catalyse a wave of eco-entrepreneurship that could support economic growth and lower the costs of achieving environmental goals.

3.6.1. Overall innovation performance and policy

Turkey's environment for innovation remains challenging, but has improved significantly since 2008. Turkey's gross expenditure on research and development (GERD) remains low relative to the OECD average (0.9% of GDP vs. the OECD average of 2.4% in 2015). However, it grew by 119% over 2008-15, mainly as a result of increased defence and space research. Business expenditures on research and development (R&D) are also low (0.44% of GDP vs. the OECD average of 1.63%), but growing (OECD, 2016c). The Supreme Council for Science and Technology has set targets for GERD at 3% and for business expenditure on research and development at 2% by 2023 (IPP, 2016).

The tenth Development Plan and the National Science, Technology and Innovation Strategy (2011-16) guide Turkey's science, technology and innovation policy. The Turkish Scientific and Technological Research Council promotes, conducts and co-ordinates research and development in line with national targets and priorities. It has several grant programmes that can support companies' R&D projects, including those related to energy or the environment.

Turkey has implemented several measures to encourage business innovation and entrepreneurship, including the International Incubation Centre (2015); the R&D Centres of International Enterprises (2014); and investment support, promotion and marketing for technological products (2013-14) (IPP, 2016). Turkey has also introduced cluster support programmes to promote the internationalisation of key clusters of interconnected businesses and improve capabilities to engage in international markets and global supply chains (OECD, 2016d). In 2016, Turkey was among the top 20 economies in terms of cited scientific publications related to machine learning and has a number of start-ups in the information and communication technology sector (OECD, 2017e). Entrepreneurs continue to face challenges in attracting international financing and expanding to international markets, however (Farrell, 2016).

A 2016 law greatly improved intellectual property right protections in Turkey, merging and modernising a series of decrees used previously. The law included improved patent office capacity, and a better framework for commercialisation and technology transfer. Enforcement, however, remains a challenge with counterfeit goods and software piracy continuing to flourish. A 2012 law on title-deed registration also removed requirements for foreign purchasers of real estate to partner with Turkish individuals or companies, though investors continue to be cautious (SDOIA, 2017).

3.6.2. Eco-innovation performance and policy

Turkey has historically performed poorly on most indicators of eco-innovation, but has recently shown some signs of improvement. A fundamental element of such performance is strong domestic demand, which is a function of the coverage and stringency of environmental policies. Turkey is falling short in both areas relative to other OECD member countries (OECD, 2018i). Eco-innovations also need a level playing field with existing technologies. Fossil fuel subsidies and other policies favouring incumbents can restrict new entrants (Section 3.4).

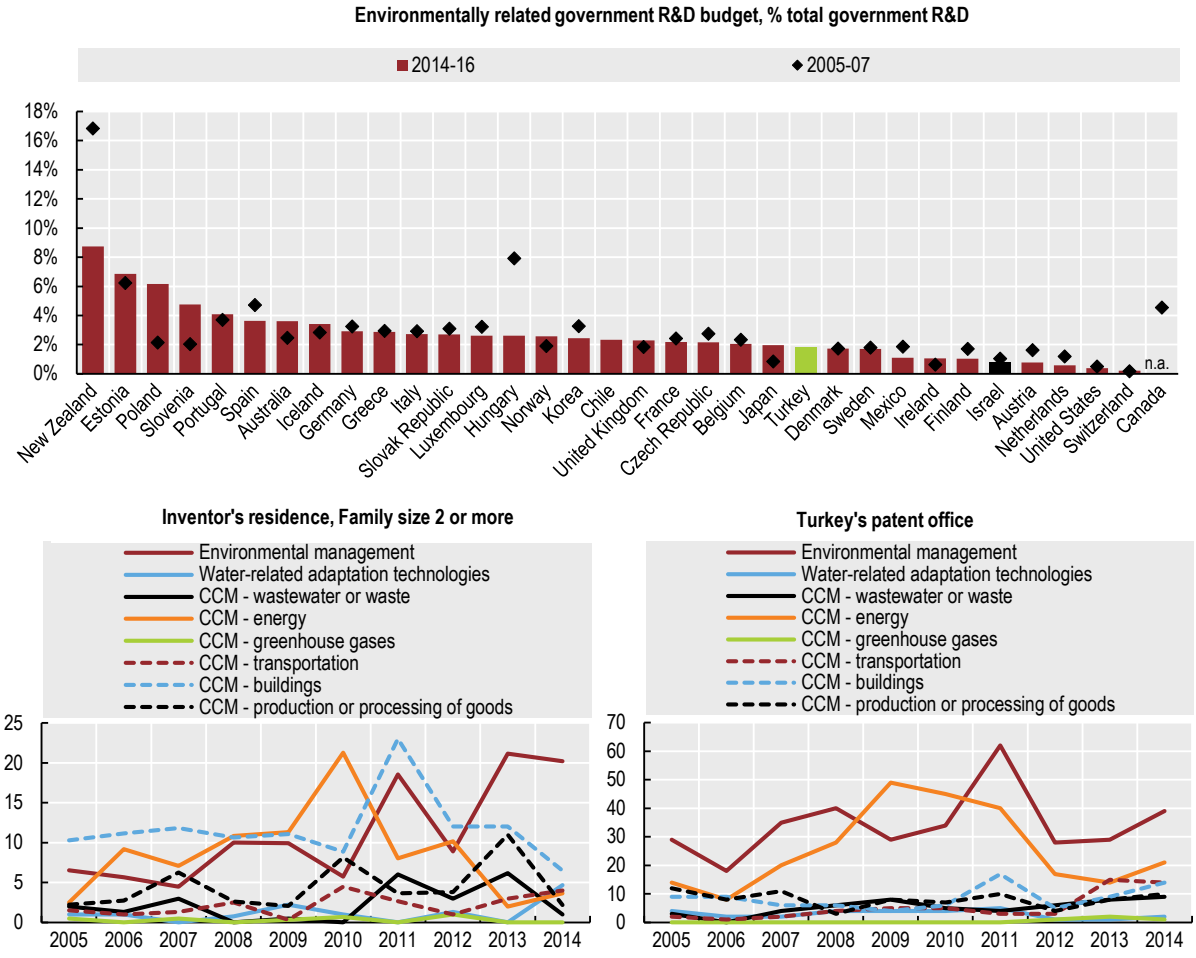
In addition, policy frameworks that support idea creation linked to environmental solutions are critical. Turkey has several programmes, but does not have an integrated approach to support clean technology development from early-stage R&D through to commercialisation and exportation. General innovation support will benefit clean technology entrepreneurs, but targeted policies are often needed to overcome barriers. These barriers can include demand and technology uncertainty; lack of clean technology knowledge and capacity across investors; and large capital requirements with long pay-back periods. Environment-related government R&D spending in Turkey as a percentage of total R&D spending remains low relative to other OECD member countries (Figure 3.11). Patent applications in environment-related technologies represent a relatively small percentage of total patent applications (6% compared to the OECD average of 10.9% for 2012-14). However, there are some recent signs of growth (Figure 3.11).

New supportive policies are also emerging in Turkey. For example, Turkey encourages demand for energy efficiency technologies through public procurement policies. These policies promote the purchase of services and commodities that comply with minimum

energy efficiency criteria. In 2018, Turkey introduced ecolabel legislation in line with the EU Ecolabel regulation. Its implementation initially covers textile, ceramic and paper products, and will later expand into other sectors. Ecolabelling is one way to highlight the environmental credentials of products to consumers.

In addition, the Scientific and Technological Research Council of Turkey and the Global Environment Facility – which brings together UN agencies, MDBs and international NGOs – have partnered to develop a USD 3 million fund to support clean innovation. The programme targets small and medium-sized enterprises (SMEs) and start-ups that work on energy and water efficiency, renewable energy, waste management, green buildings and transportation (Hurriyet, 2018b). Turkey's Environment and Cleaner Production Institute also contributes to national R&D activities in line with SDGs, with a focus on best available techniques.

Figure 3.11. Environmental R&D is relatively low, but green patents are growing



Note: In panel 2, data refer to inventions filed for protection from inventors residing in Turkey, family size two or more (i.e. filed in two or more jurisdictions); in panel 3, data refer to inventions filed for protection in Turkey. CCM = climate change mitigation.
Source: OECD (2018), "Patents in Environment-related Technologies: Technology Diffusion and Patent Protection", *OECD Environment Statistics* (database); OECD (2018), "Patents in Environment-related Technologies: Technology Development by Inventor Country", *OECD Environment Statistics* (database); OECD (2018), "Green Growth Indicators", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892801

3.6.3. Markets for environmentally related products

Turkish companies have the potential to capture a share of growing domestic and global EGS markets in a number of areas. For example, Turkey's automotive sector is the fifth largest in Europe. An industrial consortium of five companies and the Union of Chambers and Commodity Exchanges was formed in 2018 to launch a Turkish electric car. The Ministry of Industry and Technology, the Union of Chambers and Commodity Exchanges, and members of the Joint Venture Group of companies are working to establish a domestic company that will own the intellectual and industrial property rights to the car. Turkey's Automobile Sector Strategy Document and Action Plan (2016-19) commits to new legislation and physical infrastructure to support widespread use of electric, hybrid, hydrogen and compressed natural gas vehicles. Policies such as carbon pricing, vehicle emission standards and phasing out gasoline and diesel tax exemptions would help to further increase demand for cleaner vehicles.

Another Turkish EGS industry that has not received a lot of attention is solar thermal. Turkey has two solar thermal companies (Solimpeks and Eraslanlar) that rank in the top 12 of global flat plate collector manufacturers, the dominant technology in Europe (Epp, 2018). Turkey is the second largest solar thermal market after the People's Republic of China (hereafter "China"). Most of its applications target water heating in multi-family houses. Solar thermal energy has also been used for space cooling in hotels and shopping malls, for drying agricultural products and for heating greenhouses. A solar "combi set" that combines solar water and space heating, and works alongside gas boilers, is also becoming popular for villas and hotels. The Turkish government has installed solar water heaters in social housing, hospitals and prisons, but has not yet provided specific support for the sector (IEA, 2016b). Turkey has the potential to expand district heating systems using solar thermal, geothermal or waste heat energy to reduce the need for coal and natural gas heating. New heat supply legislation should help to realise some of this potential, though details on specific measures to be included were not yet available at the time of writing. Phasing out subsidies for coal heating and increasing incentives for renewable and district heating would further help to expand Turkey's domestic market.

A broader set of policy reforms will be required to continue expanding Turkey's domestic EGS market. This market was valued at USD 7.3 billion in 2016, more than double the USD 2.9 billion estimated in 2004 (DoC, 2017). Turkey's exports of environment-related products grew between 2002 and 2015 from 4.8% to 6.4% of total exports, but Turkey remains below the OECD average (OECD, 2017f). Anticipated investment growth in renewable energy, public transportation, irrigation, water reuse, water and wastewater treatment, and waste management infrastructure will support growth. However, more stringent regulations for reductions in air pollution and GHGs, carbon pricing, vehicle emissions standards, elimination of fossil fuel subsidies and expanded procurement policies will be needed to fully realise Turkey's market potential (DoC, 2017).

3.7. Contributing to the global environmental agenda

Turkey can make a significant contribution to the global environmental agenda in the coming decade. It can do this both through efforts to improve domestic environmental performance and through international trade, investment and development co-operation. International sources of financing already play an important role in shaping environmental characteristics of Turkey's rapid growth. They support cleaner energy, transportation and urban development solutions. Foreign investors and governments can also encourage best

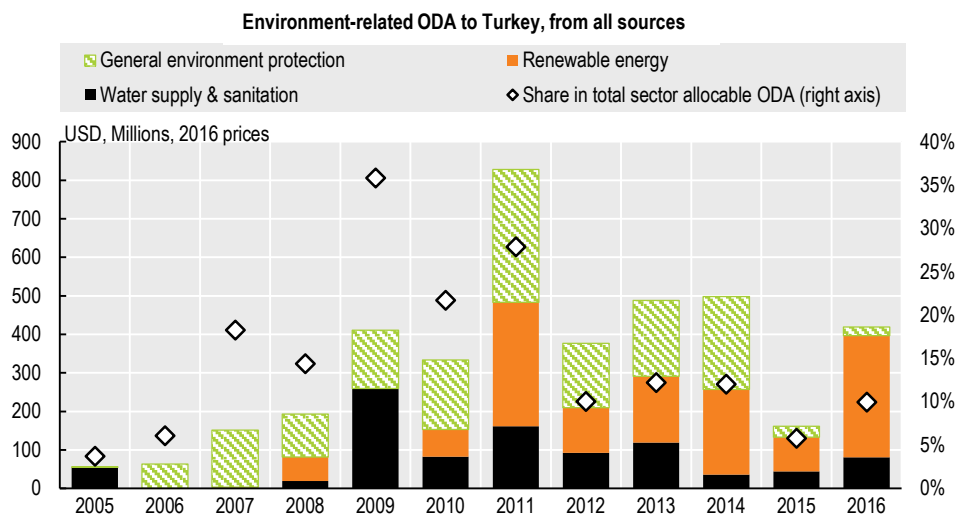
practices in sustainability and corporate social responsibility. However, domestic policy will continue to be the driving force behind environmental performance.

3.7.1. Development co-operation

Turkey is considered an upper-middle income country, and is both a provider and recipient of development co-operation. Since 2011, Turkey's total receipts of official development assistance (ODA) and disbursements have increased. Turkey remains the third largest recipient of net ODA in the world, receiving almost USD 5 billion in 2016. Per capita ODA commitments also increased in real terms, rising from USD 24.4 to USD 65.3 over 2005-16 in 2016 prices (OECD, 2018j). Environment-related ODA has fluctuated since 2008, but renewable energy ODA has increased (Figure 3.12).

Turkey's net ODA disbursements increased from USD 604 million in 2005 to USD 9.1 billion in 2017 (2016 prices). This represents 0.95% of gross national income, above the 0.7% UN target (OECD, 2018k). Turkey undertakes development co-operation activities with African, Central Asian and neighbouring countries. Turkey does not have a strong environmental focus in its development co-operation. However, it does provide aid for water, sanitation and hygiene, as well as a training programme for industrial energy efficiency (MFA, 2018).

Figure 3.12. Renewable energy ODA has grown significantly recently



Note: ODA commitments. Right axis: share of general environment protection, renewable energy and water supply and sanitation in total sector allocable ODA.
Source: OECD (2018), "Creditor Reporting System: Aid Activities", *OECD International Development Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892820

3.7.2. Trade and the environment

Trade agreements

Turkey is linked to the European Union by a Customs Union agreement that came into force in 1995. Turkey is also a member of the Euro-Mediterranean partnership, and has signed free trade agreements (FTAs) with several countries (EC, 2018).

The European Union is Turkey's largest import and export partner. Secondary export markets include Iraq, the United States, Switzerland, the United Arab Emirates and Iran (EC, 2018). Consumer goods represent almost half of Turkey's exports, while intermediate and capital goods each represent around one-third of imports (World Bank, 2016a).

The European Council is discussing a 2016 proposal to modernise the Customs Union with the European Union and extend bilateral trade relations to services, public procurement and sustainable development. Preparatory work for the proposal considered the environmental impacts of the EU's Bilateral Preferential Trade Framework with Turkey, including the Customs Union. Overall, it determined that the influence was negligible. For example, increased economic activity, and the composition of that activity, has increased GHGs and air pollutants, but reduced emissions from energy and steel production largely offset the increase (BKP/Panteia/ALSA, 2016). The report concluded that Turkey's own environmental policies are of greater relevance to environmental performance than trade-related agreements with the European Union.

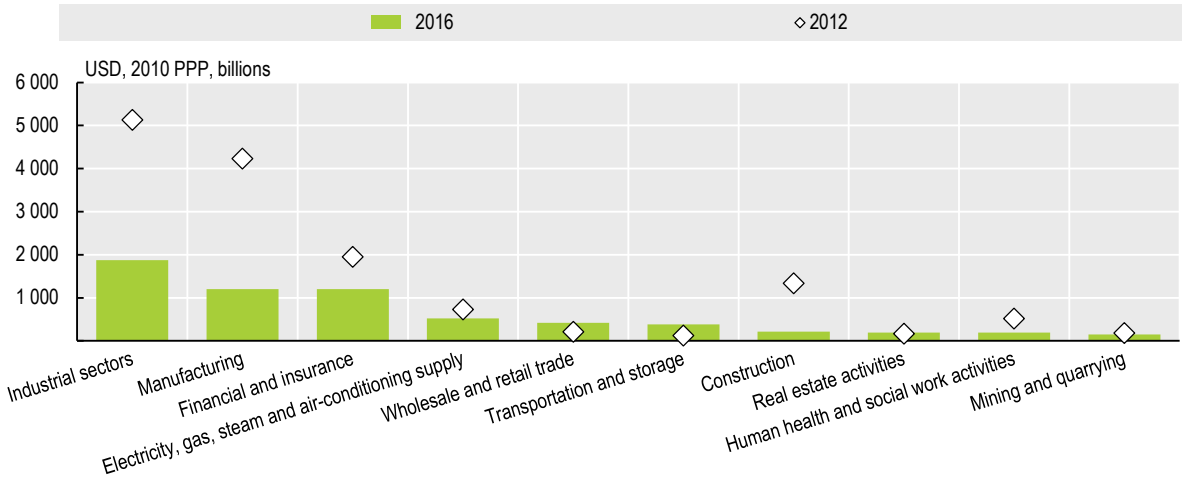
Environmental provisions are also included in Turkey's FTAs with Chile, Korea, Lebanon and Malaysia. The FTA with Chile includes a provision on environmental co-operation. FTAs with Malaysia and Lebanon include several provisions on environmental collaboration, while the FTA with Korea contains a full chapter dedicated to trade and sustainable development.

Foreign direct investment

The Turkish government has introduced investment incentives such as customs duty and VAT exemptions to encourage foreign direct investment (FDI). All investment incentives are provided equally to foreign and domestic investment sources, although some specify local content requirements. The value of FDI inflows dropped from USD 19.9 billion in 2008 to USD 12.3 billion in 2016. However, the number of companies with international capital has continued to grow steadily, with 53 200 companies with foreign capital operating in Turkey as of December 2016 (Government of Turkey, 2017). The main sectors that attract FDI are industry, manufacturing, and finance and insurance, as well as electricity production (Figure 3.13).

Europe continues to be the largest source of FDI, but Asian investors are growing in importance. To decrease dependence on energy imports, Turkey has sought international investors in domestic renewables and coal power projects. Turkey's 2016 Centres of Attraction programme, which provides interest-free credit and low-interest working capital loans for certain investments, had attracted 53 Chinese companies as of September 2017. There have also been major Turkey-China deals relating to coal and nuclear plants, as well as wind projects (Gündoğan and Turhan, 2017). The Russian Federation's role in nuclear expansion in Turkey may also increase beyond the plant under construction if additional plants are approved (DS, 2018). Investment from Japan in areas such as automotive, consumer electronics, energy and food is also increasing, as work to finalise an FTA with Turkey continues. International investors may influence the environmental performance of projects in the future. China, for example, has committed to greater consideration of environmental risk in overseas investment (GFCC, 2017).

Figure 3.13. FDI inflows have declined since 2012, but remain important for several sectors



Source: Country submission.

StatLink http://dx.doi.org/10.1787/888933892839

Corporate social responsibility

Pressure from international investors and consumers is starting to impact private sector interest in demonstrating sustainability. Borsa Istanbul (Turkey's stock exchange) established a Sustainability Index in 2014 to help institutional investors find companies that have high environmental, social and governance performance. This provides an incentive for Turkish companies to meet requirements (Borsa Istanbul, 2017). Several large private entities are already taking action beyond what is required by the Turkish government (Box 3.3).

The Turkish government could do more to support corporate social responsibility related to the environment. For example, it could highlight best practice examples and provide guidelines and financial incentives for continual improvement. Many such actions will not only benefit the environment, but also reduce costs and increase the attractiveness of companies to foreign consumers and investors. At the time, they could improve resiliency to climate change, resource constraints, and future domestic and international environmental policy changes.

Box 3.3. Private sustainability initiatives illustrate potential for progress

Turkish company Arçelik A.Ş., which manufactures household appliances, air conditioners and televisions, is listed on the Borsa Istanbul Sustainability Index. It has achieved "A list" ranking on CDP's Climate Performance Leadership Index, and was rated "AAA" on the MSCI Global Sustainability Index. It reduced CO_2 emissions from its Turkish operations by 56% between 2010 and 2016, and reduced water withdrawal per product by 31% between 2012 and 2016. The company's annual Sustainability Report provides detailed accounting of GHGs, energy consumption, water withdrawal, use of raw materials and waste. With 10 R&D centres in Turkey and more than 1 300 R&D staff, the company has significant potential for eco-innovation. A Supplier Sustainability Index planned by Arçelik A.Ş. will also help drive improved environmental performance across suppliers and increase demand for environmental goods and services.

OYAK Group is one of Turkey's largest conglomerates, with operations in mining, metallurgy, cement, concrete, energy (coal), chemicals, financial services, automotive and logistics. It developed a sustainability strategy in 2011. With 2016 revenues of USD 8.5 billion and exports of USD 3.5 billion, OYAK Group action on sustainability can have significant influence on demand for environmental goods and services in Turkey. OYAK Group companies report increased environmental investments of 36.6% between 2015 and 2016, but long-term trends are not provided. They are making progress in substituting waste materials for raw inputs, reusing water and improving energy efficiency. However, further work is needed to provide a detailed annual account of performance on a range of environmental indicators, including GHGs, air pollutants and resource use.

Sources: Arçelik, 2016; OYAK, 2016.

Recommendations on green growth

Framework for sustainable development and green growth

- Continue prioritising sustainability and green growth in public policies, better align fiscal policies and budget allocations with environmental commitments, leveraging all available domestic and international sources of financing.
- Continue to integrate SDGs into NDPs and action plans across institutions and sectors; enhance implementation efforts; finance data collection needed to monitor progress and programme effectiveness.

Greening the system of taxes and charges

- Reform the system of vehicle and fuel taxation to remove exemptions and integrate emissions criteria; introduce congestion pricing in Istanbul to limit traffic and air pollution.
- Closely monitor the uptake of incentives for renewable energy to ensure that fees, project size requirements and approval processes do not deter investment.

Eliminating environmentally harmful subsidies

- Phase out tax exemptions for fossil fuel consumption; gradually replace coal aid to poor families with support for transition to cleaner alternatives.
- Tie water pricing in agriculture to the volume of water used and increase financial incentives for organic and other environmentally friendly practices.

Investing in the environment to promote green growth

- Improve consideration of environmental externalities in evaluation of major investments by using tools such as comprehensive cost-benefit analysis.
- Expand the use of instruments that leverage private sector investment in environmental projects, including public-private partnerships for rail and public transit, green banks to reduce risk for traditional investors, and green bonds.

Promoting eco-innovation

- Evaluate strategic opportunities identified in domestic and global EGS markets; develop an integrated approach to support clean technology entrepreneurs from early stage R&D through to commercialisation and export.
- Strengthen the policy framework for eco-innovation by increasing spending on environmental R&D, supporting technology demonstration and commercialisation with an expanded number of clean technology incubators, and integrating greater awareness of EGS market opportunities into education and skills programming.

Contributing to the global environmental agenda

- Promote corporate social responsibility initiatives such as sustainability reporting, certification, internal environmental performance targets and investment in environmental projects.

References

AA (2018a), "Turkey to stabilize consumer fuel tax with new rule", 17 May 2018, Anadolu Agency, www.aa.com.tr/en/energy/transportation-fuel-oil/turkey-to-stabilize-consumer-fuel-tax-with-new-rule/20091.

AA (2018b), "Turkey to hold 20,000- megawatt wind and solar tenders", 17 April 2018, Anadolu Agency, www.aa.com.tr/en/energy/regulation-renewable/turkey-to-hold-20-000-megawatt-wind-and-solar-tenders/19687.

ACEA (2018), "Average Vehicle Age", webpage, European Automobile Manufacturers Association, www.acea.be/statistics/tag/category/average-vehicle-age (accessed 6 June 2018).

ACEEE (2016), "Turkey", webpage, American Council for an Energy Efficient Economy, https://aceee.org/sites/default/files/pdf/country/2016/turkey.pdf (accessed 26 February 2018).

Arçelik A.Ş. (2016), *Sustainability Report 2016*, Arçelik A.Ş., Istanbul, www.arcelikas.com/page/204/Sustainability_Report.

Bauza, V. (2017), "A new market for infrastructure financing helps Izmir thrive", *Creating Markets #IFC Markets*, June 2017, International Finance Corporation, Washington, DC, www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/cm-stories/a-new-market-for-infrastructure-financing-helps-izmir-thrive.

Börjesson, M. (2017), "Long-term effects of the Swedish congestion charges", presentation at the ITF roundtable on social impacts of time and space-based road pricing, Auckland, 1 December 2017, www.itf-oecd.org/road-pricing-roundtable.

Borsa Istanbul (2017), BIST Sustainability Index website, www.borsaistanbul.com/en/indices/bist-stock-indices/bist-sustainability-index (accessed 25 February 2018).

BKP/Panteia/ALSA (2016), "Study of the EU-Turkey bilateral preferential trade framework, including the Customs Union, and an assessment of its possible enhancement", report commissioned by the European Commission, October 2016, http://trade.ec.europa.eu/doclib/docs/2017/january/tradoc_155240.pdf.

BS and SDSN (2017), *SDG Index and Dashboards: 2017*, report commissioned by the SDSN Secretariat, www.sdgindex.org/.

C40 (2015), "Milan's Area C reduces traffic pollution and transforms the city center", *C40 Cities*, 24 March 2015, www.c40.org/case_studies/milan-s-area-c-reduces-traffic-pollution-and-transforms-the-city-center.

Croci, E. and A. Ravazzi (2014), *Urban Road Pricing: The Experience of Milan*, http://ic-sd.org/wp-content/uploads/sites/4/2016/06/Milan-Urban-Road-Pricing_07.08.15.pdf.

DoC (2017), *2017 ITA Environmental Technologies Top Markets Report: Turkey Case Study*, U.S. Department of Commerce International Trade Administration, Washington, DC, www.trade.gov/topmarkets.

DS (2018), "Russia willing to build more nuclear plants in Turkey", *Daily Sabah*, 6 April 2018, Istanbul, www.dailysabah.com/energy/2018/04/07/russia-willing-to-build-more-nuclear-plants-in-turkey.

EAFO (2018), *Turkey: Summary*, European Alternative Fuels Observatory, Brussels, www.eafo.eu/content/turkey.

EC (2018), *Countries and Regions: Turkey*, European Commission Directorate-General for Trade, Brussels, http://ec.europa.eu/trade/policy/countries-and-regions/countries/turkey/.

Ecofys (2016), "Roadmap for the consideration of establishment and operation of a greenhouse gas emissions trading system in Turkey", report commissioned by the Ministry of Environment and Urbanization, Ankara, www.ecofys.com/en/publications/roadmap-for-an-emissions-trading-system-in-turkey/.

ED (2006), *Singapore: A Pioneer in Taming Traffic*, Environmental Defense, New York, www.edf.org/sites/default/files/6116_SingaporeTraffic_Factsheet.pdf.

Epp, B. (19 March 2018), "World's largest flat plate collector manufacturers in 2017", Solar Thermal World blog, http://solarthermalworld.org/taxonomy/term/44061.

Eurostat (2018), Environmental Protection Expenditure (database), http://ec.europa.eu/eurostat/web/environment/environmental-protection-expenditure/database (accessed 7 June 2018).

Farrel, R. (2016), "What is holding back Turkey's startups?", 3 January 2016, *Wamba*, www.wamda.com/2016/01/what-is-holding-back-turkeys-startups.

FAS (2016), "New Turkish agricultural policy and projected impacts", *GAIN Report,* No. TR6053, 14 November 2016, USDA Foreign Agricultural Service, Washington, DC, https://gain.fas.usda.gov/Recent%20GAIN%20Publications/New%20Turkish%20Agricultural%20Policy%20and%20Projected%20Impacts_Ankara_Turkey_11-14-2016.pdf.

Garanti and PwC (2017), *Capital Projects and Infrastructure Spending in Turkey: Outlook to 2023*, January 2017, Garanti BBVA Group and PwC Turkey, www.pwc.com.tr/en/hizmetlerimiz/danismanlik/sirket-birlesme-ve-satin-almalari/yayinlar/turkiye-altyapi-yatirim-harcamalari-raporu.html.

GBN (2016), "Green Bank Network Members", webpage, http://greenbanknetwork.org/members/ (accessed 26 February 2018).

GFCC (2017), Environmental Risk Management Initiative for China's Overseas Investment, Green Finance Committee (GFC) of China Society for Finance and Banking, 5 September 2017, http://unepinquiry.org/wp-content/uploads/2017/09/Environmental-Risk-Management-Initiative-for-China---s-Overseas-Investment.pdf.

GlobalFleet (24 May 2017), "Taxation drives Turks towards leasing", Features blog, www.fleeteurope.com/en/features/taxation-drives-turks-towards-leasing-0.

Government of Turkey (2017), *FDI in Turkey*, Invest in Turkey, Ankara, www.invest.gov.tr/en-US/investmentguide/investorsguide/Pages/FDIinTurkey.aspx.

Gündoğan, A.C. and E. Turhan (2017), "China's role in Turkey's energy future", 26 September 2017, *China Dialogue*, www.chinadialogue.net/article/show/single/en/10047-China-s-role-in-Turkey-s-energy-future.

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.

Hayim, L. (2017), "Turkey's solar growth continues despite challenging requirements on recent tender", 26 January 2017, *PV Europe*, www.pveurope.eu/News/Markets-Money/Turkey-s-solar-growth-continues-despite-challenging-requirements-on-recent-tender.

Hurriyet (2018a), "Chinese company plans to invest $1 billion in Turkey's green energy market", 5 April 2018, *Hurriyet Daily News*, www.hurriyetdailynews.com/chinese-company-plans-to-invest-1-billion-in-turkeys-green-energy-market-129862.

Hurriyet (2018b), "Turkey's TUBİTAK to support entrepreneurs in clean technology", 4 February 2018, *Hurriyet Daily News*, www.hurriyetdailynews.com/turkeys-tubitak-to-support-entrepreneurs-in-clean-technology-126752.

IEA (2018), *IEA CO_2 Emissions from Fuel Combustion Statistics* (database, 2018 preliminary), https://doi.org/10.1787/co2-data-en (accessed 7 June 2018).

IEA (2017), *Energy Efficiency 2017*, International Energy Agency, Paris, www.iea.org/efficiency/.

IEA (2016a), *Energy Policies of IEA Countries: Turkey 2016 Review*, International Energy Agency, Paris, www.iea.org/publications/freepublications/publication/EnergyPoliciesofIEACountriesTurkey.pdf.

IEA (2016b), *Country Report – Turkey*, Solar Heating and Cooling Programme, International Energy Agency, Paris, www.iea-shc.org/country-report-turkey.

IEA (2015), *Renewable Energy Law 2010: Turkey*, International Energy Agency, Paris, www.iea.org/policiesandmeasures/pams/turkey/name-24961-en.php.

IPC (2016), *Coal Report: Turkey's Coal Policies Related to Climate Change, Economy and Health,* April 2016, Istanbul Policy Centre, Istanbul, http://ipc.sabanciuniv.edu/wp-content/uploads/2016/01/Coal-Report-Turkeys-Coal-Policies-Related-to-Climate-Change-Economy-and-Health.pdf.

IPP (2016), *STI Outlook 2016 Country Profile: Turkey*, Innovation Policy Platform, Washington, DC, www.innovationpolicyplatform.org/content/turkey.

Janssen, R. (2016), "Turkey: Industrial energy efficiency strategy", 17 October 2016, Energy Efficiency in Industrial Processes, Brussels, www.ee-ip.org/articles/detailed/7cc969ab93f80c76a54ecc339c544ae9/turkey-industrial-energy-efficiency-strategy/.

KGM (2013), *Otoyol ve Köprü Gelirleri (2001-12)*, Highway and Bridge Income, KGM, www.kgm.gov.tr/SiteCollectionDocuments/KGMdocuments/Istatistikler/OtoyolMaliBilgileri/OtoyolveKopruGelirleri(2001-2012).pdf.

KPMG (2017), *Turkey – Income Tax*, 28 February 2017, https://home.kpmg.com/xx/en/home/insights/2011/12/turkey-income-tax.html.

MEU (2018), *Turkey's Third Biennial Report under the United Nations Framework Convention on Climate Change*, January 2018, Ministry of Environment and Urbanization, Ankara, http://unfccc.int/national_reports/biennial_reports_and_iar/biennial_reports_data_interface/items/10132.php.

MEU (2016), *EU Integrated Environmental Approximation Strategy 2016-2023*, Ministry of Environment and Urbanization, Ankara.

MEU (2015), *Environmental Indicators 2015*, Ministry of Environment and Urbanization, Ankara.

MEUA (2017), *IPA I and IPA II Programming*, 2 November 2017, Ministry for EU Affairs, Ankara, www.ab.gov.tr/45627_en.html.

MFA (2018), *The Development Assistance Report 2015*, Ministry of Foreign Affairs, Ankara, www.tika.gov.tr/upload/2017/YAYINLAR/TKYR%202015%20ENG/KALKINMA%20.pdf.

MidSEFF (2018a), "Carbon Markets", webpage, http://turkishcarbonmarket.com/carbon-markets (accessed 26 February 2018).

MidSEFF (2018b), "Energy Efficiency Projects", webpage, www.midseff.com/energy_efficiency_projects.php.

MoD (2016), *Report on Turkey's Initial Steps Towards the Implementation of the 2030 Agenda for Sustainable Development*, July 2016, Ministry of Development, Ankara, https://sustainabledevelopment.un.org/content/documents/107102030%20Agenda%20Turkey%20Report.pdf.

MoF (2018), *Public Accounts: Central Government,* Ministry of Finance, Ankara, www.muhasebat.gov.tr/content/public-accounts-bulletin/central-government.

OECD (2018a), *Effective Carbon Rates 2018: Pricing Carbon Emissions through Taxes and Emissions Trading*, OECD Publishing, Paris, https://doi.org/10.1787/9789264305304-en.

OECD (2018b), "Environmental Policy: Environmental Policy Instruments", *OECD Environment Statistics* (database), http://dx.doi.org/10.1787/data-00696-en (accessed 6 June 2018).

OECD (2018c), *Taxing Energy Use 2018 – Turkey*, OECD Publishing, Paris, www.oecd.org/tax/tax-policy/taxing-energy-use-2018-turkey.pdf.

OECD (2018d), *Taxing Energy Use 2018: Companion to the Taxing Energy Use Database*, OECD Publishing, Paris, https://doi.org/10.1787/9789264289635-en.

OECD (2018e), *Taxing Vehicles, Fuel and Road Use: What Mix for Road Transport?* OECD Publishing, Paris (forthcoming).

OECD (2018f), "OECD analysis of budgetary support and tax expenditures, Turkey", *OECD-IEA Fossil Fuel Support and Other Analysis*, OECD Publishing, Paris, www.oecd.org/site/tadffss/data/ (accessed 26 February 2018).

OECD (2018g), *OECD Economic Surveys: Turkey 2018*, OECD Publishing, Paris, https://doi.org/10.1787/eco_surveys-tur-2018-en.

OECD (2018h), *Cost-benefit Analysis and the Environment: Further Developments and Policy Use*, OECD Publishing, Paris, https://doi.org/10.1787/9789264085169-en.

OECD (2018i), *OECD Environment Statistics* (database), http://dx.doi.org/10.1787/5jxrjnc45gvg-en (accessed 26 February 2018).

OECD (2018j), "Creditor Reporting System: Aid Activities", *OECD International Development Statistics* (database), http://dx.doi.org/10.1787/data-00061-en (accessed 7 June 2018).

OECD (2018k), *Geographical Distribution of Financial Flows to Developing Countries Disbursements, Commitments, Country Indicators,* OECD Publishing, Paris, http://dx.doi.org/10.1787/fin_flows_dev-2018-en-fr.

OECD (2017a), *Revenue Statistics 2017 – Turkey*, OECD Publishing, Paris, www.oecd.org/tax/revenue-statistics-turkey.pdf.

OECD (2017b), *Agricultural Policy Monitoring and Evaluation 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/agr_pol-2017-en.

OECD (2017c), *Producer and Consumer Support Estimates* (database)*: Turkey,* www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm#country (accessed 11 July 2018).

OECD (2017d), "Do Environmental Policies Matter for Productivity Growth?", webpage, www.oecd.org/environment/do-environmental-policies-matter-for-productivity-growth.htm (accessed 14 April 2018).

OECD (2017e), Highlights from the OECD Science, Technology and Industry Scoreboard 2017 – *The Digital Transformation: Turkey*, OECD Publishing, Paris, www.oecd.org/turkey/sti-scoreboard-2017-turkey.pdf.

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

OECD (2016a), *Fossil Fuel Support Country Note: Turkey*, OECD Publishing, Paris, www.oecd.org/site/tadffss/data/.

OECD (2016b), "Innovation, agricultural productivity and sustainability in Turkey", *OECD Food and Agricultural Reviews*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264261198-en.

OECD (2016c), *OECD Economic Surveys: Turkey 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-tur-2016-en.

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

Özgenel, M. and G. Günay (2017), "Congestion pricing implementation in Taksim Zone: A stated preference study", *Transportation Research Procedia,* No. 27 (2017), Elsevier, Amsterdam, pp. 905-912, https://doi.org/10.1016/j.trpro.2017.12.065.

OYAK (2016), *2016 Annual Report,* OYAK, Istanbul, http://content.oyak.com.tr/oyakdosyalar/media/editor/files/OYAK_FR2016EN_s.pdf.

PPIRC (2016), *Public-Private Partnerships for Transport*, Public-Private-Partnership in Infrastructure Resource Center, World Bank Group, Washington, DC, https://ppp.worldbank.org/public-private-partnership/

REN21 (2018), *Renewables 2018. Global Status Report,* Renewable Energy Policy Network for the 21st Century, Paris, www.ren21.net/wp-content/uploads/2018/06/17-8652_GSR2018_FullReport_web_final_.pdf.

SDOIA (2017), "Turkey 5 Protection of Property Rights", webpage, 27 September 2017, www.export.gov/article?id=Turkey-Protection-of-Property-Rights (accessed 7 June 2018).

SHURA (2018), *Increasing the Share of Renewables in Turkey's Power System: Options for Transmission Expansion and Flexibility*, SHURA Energy Transition Center, Istanbul, www.shura.org.tr/wp-content/uploads/2018/05/Grid-Study-eng.pdf.

Siciliano, G. (2014), "Energy management policies and programs from around the globe", presentation at UNIDO expert working group meeting, Vienna, 8-10 April 2014, www.unido.org/sites/default/files/2014-04/7.Energy_policies_related_to_energy_management__Sicilliano__0.pdf.

Simsek, B. (2017), "2018 will see launch of major infrastructure projects in Turkey", 29 December 2017, *Daily Sabah,* www.dailysabah.com/economy/2017/12/30/2018-will-see-launch-of-major-infrastructure-projects-turkey.

TomTom (2018), "TomTom Traffic Index: Measuring Congestion Worldwide" website, www.tomtom.com/en_gb/trafficindex/list?citySize=LARGE&continent=ALL&country=ALL (accessed 26 February 2018).

Tsagas, I. (2018), "Turkey adds 1.7 GW of solar PV in 2017", 10 January 2018, *PV Magazine,* www.pv-magazine.com/2018/01/10/turkey-adds-1-7-gw-of-solar-pv-in-2017/.

TSTC (2017), *Road Pricing in London, Stockholm and Singapore: A Way Forward for New York City*, Tri-State Transportation Campaign, www.tstc.org/reports/A-WAY-FORWARD-FOR-NEW-YORK-CITY-2017.pdf.

TurkStat (2018a), *Sustainable Development Indicators* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreTablo.do?alt_id=1097 (accessed 25 February 2018).

TurkStat (2018b), *Transportation Statistics: Number of Road Motor Vehicles by Kind of Fuel Used* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreTablo.do?alt_id=1051 (accessed 25 February 2018).

TurkStat (2018c), *Transportation Statistics: Number of Road Motor Vehicles by Aim of Use* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=355 (accessed 26 February 2018).

TurkStat (2018d), *Transportation Statistics: Road Lengths* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreTablo.do?alt_id=1051 (accessed 25 February 2018).

World Bank (2016a), "Turkey's cities to become socially, environmentally, and financially sustainable with World Bank support", Press Release, 20 December 2016, World Bank, Washington, DC, www.worldbank.org/en/news/press-release/2016/12/20/turkeys-cities-to-become-socially-environmentally-and-financially-sustainable-with-world-bank-support.

World Bank (2016b), *Turkey Trade Summary 2016*, World Bank World Integrated Trade Solution (WITS), Washington, DC, https://wits.worldbank.org/CountryProfile/en/Country/TUR/Year/LTST/Summarytext.

Part II. Progress towards selected environmental objectives

Chapter 4. Climate change

This chapter reviews Turkey's progress in the areas of climate change mitigation and adaptation. It highlights efforts and challenges in decarbonising the growing economy with rapid renewable energy development, in the context of strong reliance on fossil fuels. It examines the institutional and policy framework for climate change policies and points to key measures in the energy, agriculture and forestry sectors to curb the continuous increase in greenhouse gas emissions. This chapter also presents challenges raised by current and future climate conditions and related impacts and vulnerability. Efforts in implementing adaptation policy, including setting up monitoring and evaluation, improving governance and mainstreaming adaptation across sectors.

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.

4.1. Introduction

Driven by strong economic and population growth, rising income levels and continued reliance on a carbon-intensive fuel mix, Turkey's greenhouse gas (GHG) emissions have increased substantially over the past decade. Nonetheless, it remains the only OECD member country without a climate mitigation pledge for 2020. Furthermore, it has not yet ratified the Paris Agreement. In 2015, Turkey announced its first commitment to reduce economy-wide GHG emissions to a maximum of 21% from the business-as-usual (BAU) level by 2030. Turkey aims to achieve this by increasing the use of renewable energy, enhancing energy efficiency and improving public transport. It also has a stated objective to reduce its reliance on energy imports, which account for three- quarters of its energy supply, by exploiting its domestic coal resources.

Turkey already faces challenges related to water shortages, sea-level rise, drought and floods. Annual mean temperatures in the Mediterranean region are likely to increase more than the global mean. Temperature increase and change in precipitation patterns are likely to exacerbate these challenges. Climate change impacts are expected to increase the vulnerability of certain socio-economic sectors, especially those that are climate-sensitive such as agriculture. With a changing climate, better preparing the country's population and their economic activities for adaptation is becoming necessary.

4.2. State and trends

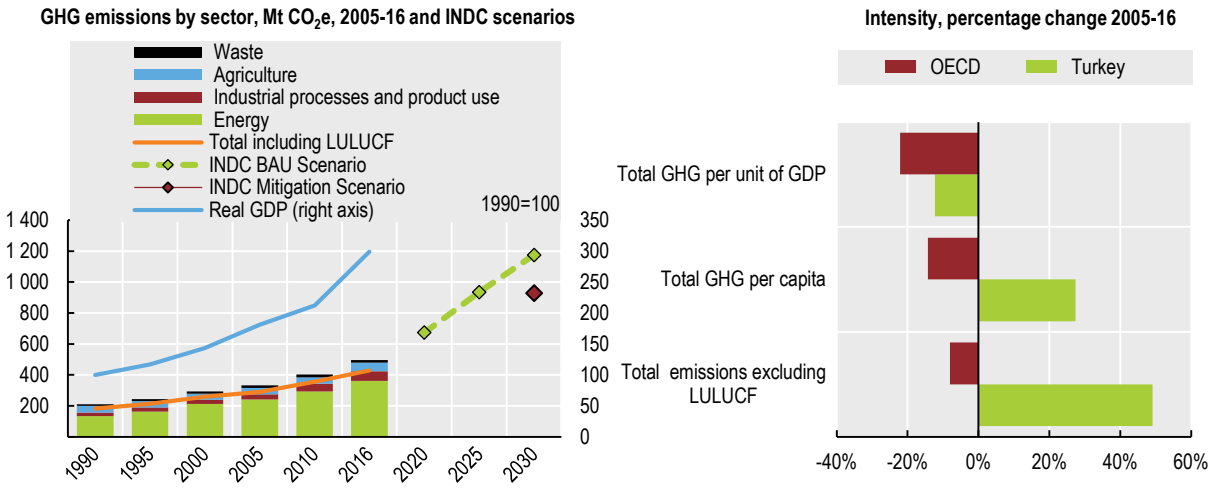
4.2.1. Greenhouse gas emissions profile

GHG emissions have increased substantially over the past decade[1]: they reached close to 500 $MtCO_2e$ in 2016, increasing by 49% since 2005 and by 135% since 1990. This growth was largely driven by strong economic and population growth, and continued reliance on a carbon-intensive fuel mix. Over the same period, emissions per capita have increased, although still below the OECD average. However, emissions intensity has declined with accelerated renewable energy development and improvements in energy efficiency (Figure 4.1).

Emissions from most sectors have increased over the past decade – most notably from transport (+95%), industrial processes (+80%) and energy industries (+60%). Net removals from land use, land-use change and forestry (LULUCF) have also increased over the past decade to 68 $MtCO_2e$ in 2016. Carbon dioxide accounts for most GHG emissions (81%), mainly generated in fuel combustion, followed by methane (11%) mainly from agriculture (Chapter 1).

Official projections, developed as part of Turkey's Intended Nationally Determined Contribution (INDC), expect accelerated growth in GHG emissions compared to previous trends in both BAU and mitigation scenarios (Figure 4.1). Turkey is yet to clarify which measures are included in the BAU and the mitigation scenarios. GHG emissions from all sectors except LULUCF are expected to increase (UNFCCC, 2016). At this stage, Turkey does not plan a peak in its emissions. Turkey's INDC is ranked as "critically insufficient" (i.e. it is not consistent with holding warming to below 2°C) (Climate Action Tracker, 2018).

Figure 4.1. Emissions are expected to continue growing rapidly



Note: Projections include emissions/removals from land use, land-use change and forestry (LULUCF). GDP is expressed in 2010 USD prices, purchasing power parities.

Source: MEU (2016), *Turkey's Sixth National Communication under the UNFCCC*, Ministry of Environment and Urbanization, Ankara; OECD (2018), "Air and Climate: Greenhouse Gas Emissions by Source", *OECD Environment Statistics* (database); OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892858

4.2.2. International context

Turkey became a party to the 1992 UN Framework Convention on Climate Change (UNFCCC) in 2004. It joined the Kyoto Protocol in 2009, 12 years after its adoption, as recommended in the last OECD Environmental Performance Review (OECD, 2008). Under the UNFCCC, Turkey was initially categorised both as an Annex I and an Annex II country (alongside all OECD member countries – 24 countries – at the time of adoption of the UNFCCC).[2] However, Turkey's "special circumstances" were recognised to distinguish it from other Annex I countries (UNFCCC, 2010, 2002). These decisions mean that as Turkey has been removed from the list of Annex II countries – unlike other OECD24 countries – it does not have to provide financial assistance to developing countries. Turkey requested to be deleted from the Annex I list in 2018.

Turkey has not submitted a GHG emission reduction target under the Kyoto Protocol. It remains the only OECD member country without a national or international emissions reduction target for 2020. In 2015, Turkey announced its INDC to reduce GHG emissions to up to 21% from the BAU level by 2030. This goal allows Turkey to more than double its emissions in 15 years: from 411 $MtCO_2e$ in 2015 (including LULUCF) to 928 $MtCO_2e$ in 2030, instead of 1 175 $MtCO_2e$ in a BAU scenario (Republic of Turkey, 2015). In addition to its INDC, Turkey has established both national renewable energy and energy efficiency targets (Section 4.4).

Although Turkey has signed the Paris Agreement, it has yet to ratify it (unlike over 180 other countries) and publish a long-term strategy. Turkey has already benefited from considerable levels of climate finance under a variety of bilateral and multilateral channels (Section 4.3.3). The eligibility of Turkey for finance and technology support, notably through the Green Climate Fund, after 2020 is a key negotiation point for Turkey in the context of ratification of the Paris Agreement.

4.3. Institutional and policy framework for climate change mitigation

4.3.1. Institutional framework

The Ministry of Environment and Urbanization (MEU) co-ordinates domestic and international activities related to climate change mitigation, adaptation and means of implementation (finance, technology development and transfer, capacity building). It chairs the Co-ordination Board on Climate Change and Air Management (CBCCAM), which meets on an ad hoc basis to identify policies and strategies for climate change. The CBCCAM gathers public and private institutions and organisations, as well as observers from non-member public/private institutions, academia, non-governmental organisations (NGOs) and professional associations. The CBCCAM relies on seven technical working groups to develop policies related to climate change. Among other activities, the CBCCAM ensures compliance with international obligations in terms of GHG monitoring and report submission. It is the main board related to climate change, but others are also relevant, such as the Economy co-ordination board.

At the local level, municipalities and provincial administrations are responsible for transportation and certain infrastructure services that relate to climate change mitigation (MEU, 2016). International funding and citizen campaigns have pushed local authorities to initiate climate action (Turhan et al., 2016). However, by 2018, only 11 of 1 397 municipalities, accounting for about 16% of the population, had submitted climate change action plans and GHG targets to the Covenant of Mayors for Climate and Energy. Gaziantep was the first metropolitan municipality to develop a climate change action plan in 2011. Only one of these action plans touches upon adaptation. Istanbul Metropolitan Municipality, the only Turkish city part of the C40 Cities Climate Leadership Group, is developing its climate change mitigation and adaptation plan. This plan will be a major step for climate action at the local level, increasing the share of population covered by a plan to 35%. Seven municipalities are members of ICLEI (Covenant of Mayors for Climate and Energy, 2018).

4.3.2. Policy framework

Turkey has several policies relevant to climate change. The last three National Development Plans (NDPs) – eighth (2001-05), ninth (2007-13), tenth (2014-18) – called for improving the sustainability of the economy with general objectives and measures. The National Climate Change Strategy (NCCS) covering 2010-20 guides climate policy (MEU, 2010). It sets a range of short-, medium- and long-term sectoral targets for mitigation, as well as objectives for adaptation, finance and technology development. The NCCS, approved by the Higher Planning Council in 2010, was developed under co-ordination of the MEU, in consultation with public institutions, private sector establishments, NGOs and universities. The CBCCAM oversees its implementation. As a follow-up to the ninth NDP and the NCCS, the National Climate Change Action Plan (2011-23) (NCCAP) sets out measures and activities across different institutions (MEU, 2011b). This addresses the 2008 EPR recommendation to prepare a comprehensive national climate change plan.

Although the NCCAP sets out milestones and responsibilities for climate actions, activities were not monitored or updated accordingly (e.g. many actions have a 2011-15 implementation timeframe). In addition, the action plan lacks GHG emissions reduction targets across sectors, as well as information on the expected mitigation impact and cost of the policies and measures. Turkey needs to assess how different policies and measures are modifying trends in GHG emissions and quantify these impacts (UNFCCC, 2016). Doing

so would help Turkey identify the main mitigation policies in place, prioritise action and assess the effectiveness of policies to date.

Turkey's reporting has improved, but information in national reports does not fully conform to UNFCCC guidelines. For example, National Communications should better explain how policies and measures are modifying long-term GHG trends. Turkey missed the deadlines for submitting its sixth and seventh National Communications (Mazlum, 2017; UNFCCC, 2018, 2016), although it submitted its third Biennial Report on time.

Turkey cannot participate in carbon markets under the Kyoto Protocol because it did not take on an emissions reduction target for 2020. However, Turkey expressed interest over the past decade in using market-based mechanisms to address GHG emissions (Chapter 3). Turkey participates actively in voluntary markets by supplying offset credits known as Voluntary Emission Reductions. Turkey intends to use carbon credits from international market mechanisms to achieve its 2030 mitigation target (Republic of Turkey, 2015).

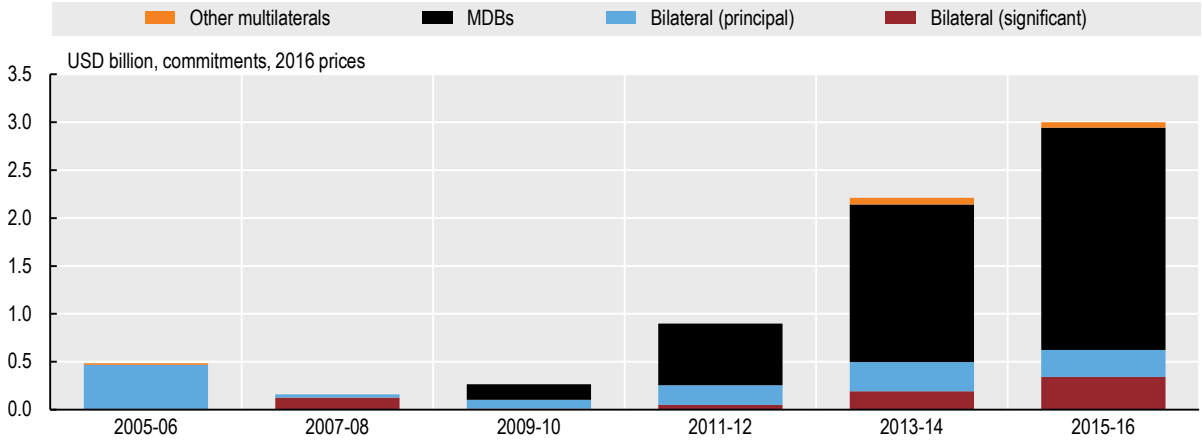
Turkey has been laying the ground for a national emissions trading system that could be compatible with the EU Emissions Trading System (ETS), but has not set a starting date (Chapter 3). Harmonisation with the EU ETS Directive drove the development of Turkey's monitoring, reporting and verification (MRV) system, covering half of Turkey's emissions. The MRV Regulation (2012) requires energy (over 20 MW combustion capacity) and industrial installations above a certain threshold to report on their GHG emissions and have them verified by third parties. Several donor initiatives have supported development of the MRV system (World Bank, 2018).

4.3.3. Climate-related development finance

Turkey benefits from a considerable level of climate-related development finance from bilateral and multilateral donors outside the financial mechanism of the UNFCCC (Figure 4.2). An average of USD 3 billion per year in climate finance was committed to Turkey in 2015-16, primarily in loans provided by multilateral banks (Figure 4.2). This level is significantly higher than countries with similar levels of gross domestic product (GDP) per capita. Thus, average per capita climate finance was USD 36.8 in Turkey, USD 21.9 in Chile and USD 5.7 in Mexico (2014-15).

Multilateral sources provide most of this climate finance (an average of USD 2.32 billion per year in 2015-16). The two largest contributors are the European Bank of Reconstruction and Development and the European Investment Bank. Bilateral finance channels are also an important source of climate-related development finance, bringing an average of USD 0.62 billion per year in 2015-16. Nearly all multilateral and a majority of bilateral climate funding is allocated to mitigation-related activities. Support for adaptation activities, which corresponds to a small share of climate finance, is largely delivered through grants.

Figure 4.2. Climate-related development finance to Turkey has increased



Note: The increase after 2012 is largely explained by enhanced reporting of multilateral finance to the OECD Creditor Reporting System. A "principal" objective score is given to an activity specifically promoting the objectives of the UNFCCC as one of the principal reasons for undertaking the activity. Activities marked "significant" have other prime objectives, but have been formulated or adjusted to help meet climate concerns.
Source: OECD (2018), "Creditor Reporting System: Aid Activities", *OECD International Development Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892877

Shifting to a low-carbon and climate-resilient economy requires a significant amount of mobilised funding across sectors. As for most countries, much of the finance will need to come from domestic sources and, with the right domestic enabling conditions, international private investment (OECD, 2015a). Turkey, as many other countries, does not tag its domestic public climate expenditure. This makes it difficult to grasp the level of public spending and whether expenditure is in line with the country's priorities.

4.4. Key mitigation measures

4.4.1. Reducing GHG emissions from energy use

As in other OECD member countries, energy use accounts for most of Turkey's domestic GHG emissions. It is therefore important to ensure that there are no misalignments in policies driving the transition to a low-carbon economy. Energy use is continuously growing; its supply is highly carbon-intensive and largely dependent on imports. Domestic production meets only a quarter of energy supply, split between fossil fuels and renewable energy sources (Chapter 1).

Turkey's main priority is to reduce reliance on energy imports by promoting its domestic resources (lignite, wind, geothermal, solar and hydro) and reducing energy demand (MoD, 2014; MENR, 2017). This priority, as well as the purchase guarantee to coal investors, has led to significant growth in the coal sector (in terms of exploration, number of power plants and share of electricity generation). This, in turn, raises questions about Turkey's political commitment to the global effort of mitigating climate change.

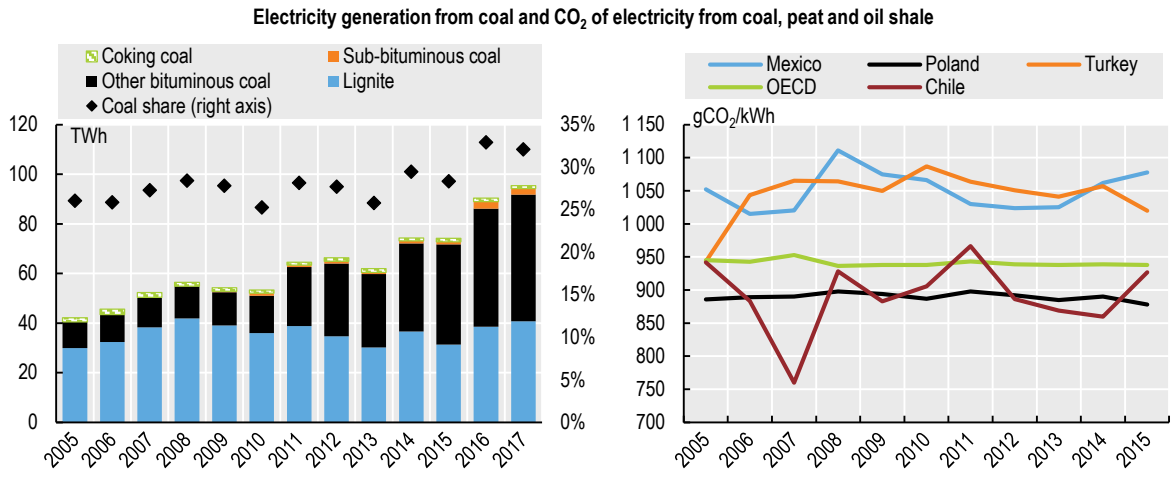
Besides renewables, domestic energy production mainly consists of lignite (35% of energy production in 2016), along with small amounts of steam coal and coking coal. Domestic lignite, which is of low quality, has high production costs and requires upfront investment (IEA, 2016). Domestic coal supply has been complemented by increasing imports of bituminous coal (+143% between 2005 and 2016). These imports, mostly from Colombia

and the Russian Federation, make Turkey the second largest coal importer in OECD Europe (IEA, 2018, 2017).

In addition to several old coal-fired power plants, Turkey also has the largest coal power plant development programme in the OECD (IEA, 2016). New domestic coal-based power plants are constructed in line with the Ministry of Energy and Natural Resources (MENR) target of reaching 60 TWh/year of electricity generation from domestic coal-fired power plants by 2019 – a target the government expects to meet (MENR, 2014a). Construction of supercritical (higher-efficiency) coal plants relying on imported coal is also planned (Coalswarm, 2018).

The carbon-intensity of coal-fired electricity in Turkey has increased by 8% since 2005 and stands at 9% above the OECD average (2015) (Figure 4.3). More use of subcritical technologies means that Turkey is moving away from its domestic objective in the 2011 NCCAP to "increase the average cycle efficiencies of existing coal-fired thermal power plants until 2023". Progress has been made in reducing electricity transmission and distribution losses with the privatisation of the distribution sector. This is a mitigation measure listed in the INDC (IEA, 2016).

Figure 4.3. Electricity generation from carbon-intensive coal is increasing



Note: Panel 2 shows CO_2 per kWh of electricity from coal, peat and oil shale (in gCO_2 per kWh) in selected OECD countries (Poland, Chile and Mexico are used for comparison).
Source: IEA (2018) "OECD - Electricity and Heat Generation", *IEA Electricity Information Statistics* (database); IEA (2018), "Emissions per kWh of Electricity and Heat Output", *IEA CO_2 Emissions from Fuel Combustion Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892896

With 37% of electricity from natural gas (2017), Turkey surpassed the objective of the MENR Strategic Plan (2015-19) to decrease the share of natural gas to 38% of electricity generation by 2019. Although this helps address the reliance on imports of natural gas (MENR, 2014a), it limits the possibility of using gas as a transition fuel. However, these strategic considerations are different for the residential sector, where natural gas is expected to gradually replace coal for heating.

Renewable energy sources have grown rapidly over the past decade in absolute, although not relative terms, to meet a growing electricity demand (Chapter 1). There remains a large untapped potential. Annual insolation time has been estimated to be around 2 750 hours,

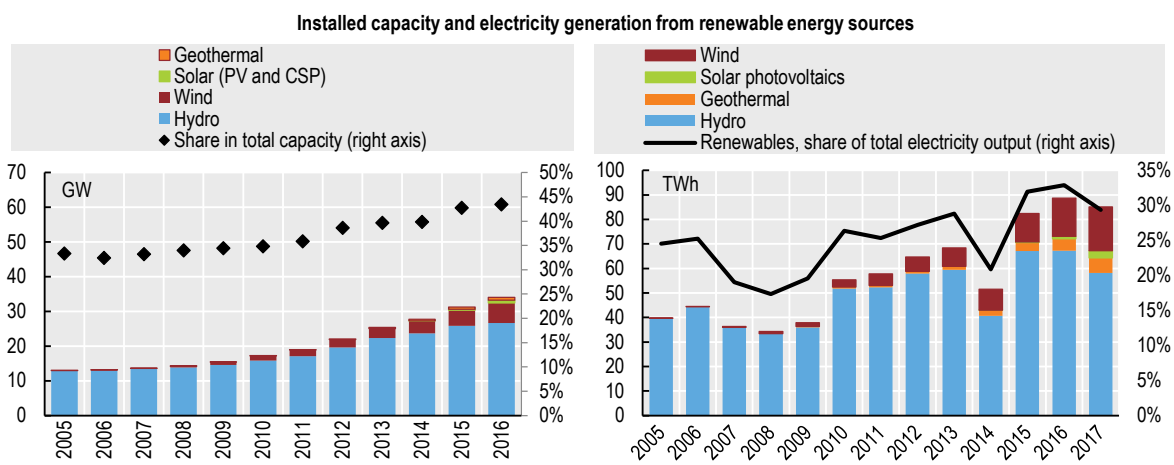
with a total potential solar energy derived per year of 1 527 kWh/m^2. Turkey has an estimated wind energy potential of 48 GW (while installed capacity was close to 7 GW in 2018) and a technically feasible hydroelectric potential of 36 GW. Biomass potential, estimated at about 8.6 Mtoe, is expected to increase to 700 MW in 2019 (Erdil and Erbıyık, 2015; MENR, 2018a, 2014a).

The National Renewable Energy Action Plan (NREAP) forecasts 61 GW of renewable energy (hydro, wind, geothermal, solar and biomass) to be installed by 2023 to generate about 159 TWh (MENR, 2014b). With respect to uptake of solar and wind, an ambitious scenario projected reaching 60 GW in 2026 with additional investments in the grid. This scenario is considered feasible provided grid integration is planned (SHURA, 2018).

Turkey is well aware of the importance of tapping its renewable energy potential. In so doing, it can tackle its reliance on imported fuels, mitigate GHG emissions and meet future demand. These objectives were presented in the NCCAP 2011-23, the Energy Efficiency Strategy 2012-23 and the MENR Strategic Plans for 2010-14 and 2015-19. Implementation of the NREAP should be monitored to ensure that the country is seizing all opportunities from renewable energy development (MENR, 2014b). Almost a third of electricity generation comes from renewable energy sources (mostly hydro) (Chapter 1). Consequently, Turkey has almost reached its 2023 target of 30% electricity from renewables (Chapter 1). This target was announced in the 2009 Electricity Energy Market and Supply Strategy Paper and reiterated in the NCCS.

It will be important to continue to meet, or exceed, this target as total electricity generation increases. Similarly, a target for renewable energy sources beyond 2023 should be defined to send a clear signal to investors. The targets need to be consistent across different policy documents. For example, the indicative target in Turkey's INDC for increasing wind capacity is less ambitious than the one in the NREAP.[3] In parallel, mechanisms that put a price on emissions can send a clear signal to investors to further encourage uptake of renewables (Chapter 3).

Figure 4.4. Renewable energy sources are growing



Note: Data in panel 1 exclude biomass.
Source: IEA (2018), "World Energy Balances", *IEA World Energy Statistics and Balances* (database); IEA (2018), "OECD - Net Electrical Capacity", *IEA Electricity Information Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892915

The 2005 Law on using renewable energy sources for electricity generation laid the ground for a feed-in tariff (FIT), supplier obligations to purchase renewable electricity and exemptions from licence obligations for small generators (Chapter 3). In 2010, after the law was amended to set technology-specific rates rather than a single one, and introduced longer-term support, investments began to pick up (Figure 4.4).

The FIT (known as the Renewable Energy Resources Support Mechanism) applies to hydro, wind, geothermal, biomass, waste and solar PV. Rates vary from 0.073 USD/kWh for hydro and wind to 0.133 USD/kWh for solar and biomass for ten years. Generators receive a bonus if they produce certain components domestically – a measure contested by the European Union within the World Trade Organization (IEA, 2016). Large-scale capacity of wind or solar on public land is also promoted through tenders, as defined by the 2017 Regulation on Renewable Energy Designated Areas (SHURA, 2018).

Legal provisions (e.g. related to licensing) for renewable energy use for power generation are also included in three pieces of legislation. These are the 2007 Energy Efficiency Law, the 2007 Geothermal Law and the 2013 Electricity Market Law (MENR, 2014b; IEA, 2016). Such incentives and guarantees for project developers and lending institutions have resulted in a rapidly growing installed capacity. However, addressing some concerns related to licence and connection fees and grid connection will be important to further expand renewable energy investment (Chapter 3).

Nuclear power is absent from Turkey's energy mix, but its development is one of the strategic objectives of the MENR (MENR, 2014a) and is part of its mitigation efforts for 2030 (Republic of Turkey, 2015). Turkey has already ratified agreements with the Russian Federation and Japan to construct two nuclear power plants. These are, together, expected to add 9.2 GW of baseload capacity from nuclear energy (IEA, 2016; Chapter 1).

4.4.2. Reducing energy demand

Economic and population growth has led to a steady rise in final energy consumption across sectors, except when the economic crisis hit the country. The industry sector is, together with transport, the largest energy consumer, followed by the residential sector. Turkey's economic structure and energy efficiency efforts will determine its success in reducing overall energy consumption. Turkey's energy intensity (total primary energy supply per unit of GDP) has been slowly declining, but not at a steady pace (Chapter 1). It is important that energy efficiency policies receive high priority across ministries (IEA, 2016).

Turkey needs to accelerate efforts to reduce energy intensity by at least 20% from 2011 levels by 2023. This target, set out in the Energy Efficiency Strategy Paper, left space for energy use to continue growing in absolute terms (MENR, 2012). It was updated in the NEEAP (2017-23), which aims to decrease primary energy consumption by 14% compared to BAU in 2023 through 55 actions that should save 24 Mtoe cumulatively (MENR, 2018b). The monitoring and evaluation commissions play an important role to ensure these actions are on track and transparently reported via the ENVER portal. Essential to achieving long-term climate goals, energy efficiency is also part of the NCCS and NCCAP.

Industry

Since the 2008 EPR, Turkey has taken positive steps to strengthen the policy and legal framework for energy efficiency. The Energy Efficiency Law enacted in 2007 and related regulations govern this topic. Two regulations on labelling several energy products and on eco-design (covering mostly household appliances) transpose the EU Eco-design and

Labelling Directives. Implementation monitoring of the Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC) and the EU Energy Efficiency Directive (2012/27/EC) remains to be completed. The adoption of the ISO 50001 Energy Management Standard is a welcome step to enhance energy efficiency in the industry sector (100 of 1 200 large industrial installations have applied for certification). The National Eco-Efficiency Programme (2014-18) has promoted awareness in the industry sector (IEA, 2016).

Financial mechanisms such as grants support energy efficiency measures. Industrial users can benefit from the Efficiency Improvement Project, which funds up to 30% of selected energy efficiency project costs under TRY 1 million. Since 2009, TRY 15.3 million supported 154 projects, saving an estimated 53 ktoe in total. Under the Voluntary Agreements Support Programme, grants are provided to industrial plants if they managed to reduce the energy intensity of industrial production. Seven agreements worth TRY 0.7 million have been supported since 2009, saving 4.6 ktoe in total.

Energy efficiency activities are also financed through bilateral and multilateral funds. For example, Turkey receives support from the Japan International Co-operation Agency's Country Training Programme and from the Global Environment Facility for projects related to small and medium-sized enterprises, building and industry.

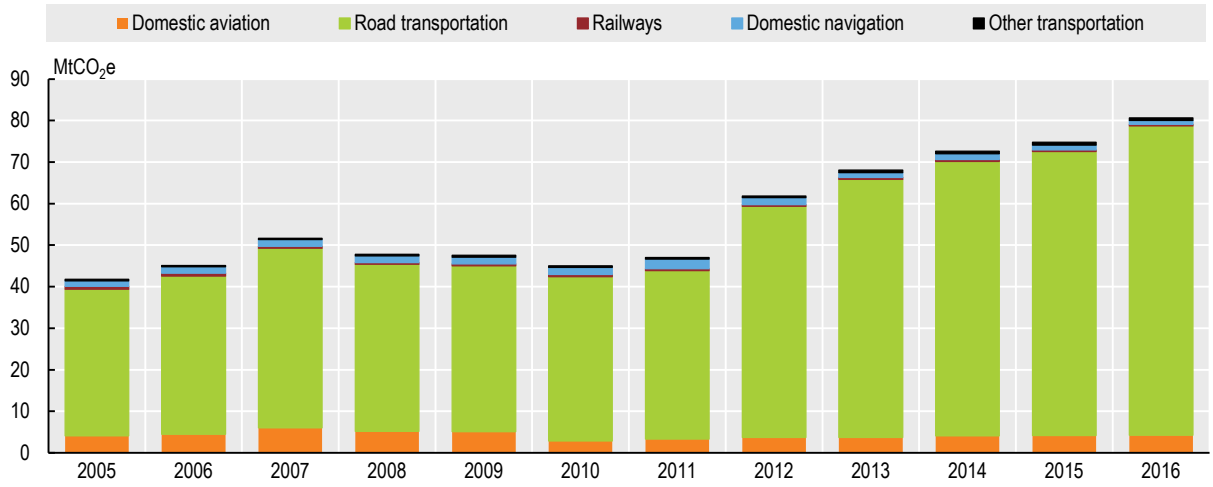
Transport

GHG emissions from transport have increased by 95% since 2005 and by 203% since 1990. They represented 16% of Turkey's total GHG emissions in 2016. Nearly all transport-related GHG emissions (91%) came from road transport (Figure 4.5). Growing car use, especially diesel cars, has been increasing emissions (TurkStat, 2017) of both GHG and local air pollutants, which is a growing concern in large cities (Chapter 1).

The road vehicle stock is much lower than the OECD average on a per capita basis, but is expected to grow. Despite this, there are limited measures to address emissions from road transport. With a large number of production plants, the Turkish automotive industry plays a key role in developing clean technologies – from local manufacturing of electric vehicles to less reliance on imported oil (Mock, 2016; Chapter 3). While rail transport remains largely underdeveloped and shows declining emissions, air transport emissions are rapidly growing.

There have been limited signs of the planned shift from road transport to rail, as sought by the NCCAP, the overarching policy for mitigating transport emissions. The NCCAP aims to increase the use of railways for freight and passenger transportation, and decrease the use of highways. However, the opposite has happened since the action plan was released (TurkStat, 2017). The introduction of low emission zones is under consideration (Chapter 3). The NCCAP partially reflected the 2008 OECD recommendation to strengthen efforts to integrate air quality concerns into transport policy. The recommendation included a modal shift from road to public transport, with appropriate cost-benefit analysis of investments, and more use of cleaner motor vehicles (OECD, 2008). This recommendation is still valid (Chapter 1).

Figure 4.5. Road transportation emissions are rapidly increasing



Note: GHG emissions from road increased between 2011-12 due to accounting methods for diesel fuel used in agriculture.
Source: TurkStat (2017), *National Greenhouse Gas Inventory Report 1990-2015*, Turkish Statistical Institute, Ankara.

StatLink http://dx.doi.org/10.1787/888933892934

Turkey has put in place some economic and regulatory instruments to curb rapidly growing emissions from road transport. In order to increase efficiency in the transport sector, an objective of the NCCAP, some measures to remove inefficient vehicles from the road have been put in place, but their cost-effectiveness is yet to be confirmed (MEU, 2016; Chapter 1). Measures to incentivise uptake of low-emissions vehicles do not appear to be working as anticipated (Chapter 3). Indeed, although the consumption tax is lower on electric vehicles purchased since 2011, sale of electric vehicles has remained low (77 per year on average since 2012).

Turkey has not yet developed a specific CO_2 emission or efficiency standard for new vehicles, unlike many other OECD member countries. The regulation on road transport (amended in 2016) sets a cap on the age of commercial motor vehicles. A 2003 regulation mandated providing information to consumers on fuel economy and CO_2 emissions of new passenger cars in line with the related EU Directive. This has raised awareness of environmental impacts. In terms of biofuels, fuel distribution and refinery licence holders are obliged to blend 3% of domestically produced bioethanol in gasoline and 0.5% of domestically produced biodiesel in diesel. The percentage is too low to encourage development of this industry in Turkey. Biofuels produced domestically can benefit from excise duty exemptions (IEA, 2016).

Turkey has nearly fully transposed the EU Directive on the quality of petrol and diesel fuels (98/70/EC). To that end, the country has introduced a range of regulations, including one restricting harmful effects of gasoline and diesel used in motor vehicles. It is also updating the 2008 Regulation on the Procedures and Principles for the Promotion of Energy Efficiency in Transport (covering fuel consumption, efficiency standards and public transport). These actions are in line with the 2008 EPR recommendation to continue promoting the use of cleaner fuels for motor vehicles.

Residential and commercial sectors

Emissions growth from the combustion of fuels in the commercial/institutional and residential sectors has been driven by the rapidly growing population, income levels, living standards and urbanisation rate (MEU, 2016). The Regulation on Energy Performance on Building (adopted in 2008, amended in 2011) covers norms and standards, data collection and control procedures on design, heating, cooling, insulation, hot water, electrical systems and lighting to be used in existing and new buildings. It was developed in line with the 2002 EU Directive on Energy Performance of Buildings. However, it does not reflect all the changes made to the directive in 2010, notably on minimum energy performance requirements, on financial support for energy efficiency and the target for all new buildings to be nearly zero-energy by 2020. Accelerated efforts are still needed for all buildings to have energy performance certificates by 2020, as only about 8% of the 9 million buildings have them (Chapter 1).

4.4.3. Mitigation in agriculture and forestry

The NCCS includes a range of short-, mid- and long-term objectives for addressing emissions from land use, agriculture and forestry. However, the NCCAP does not provide quantitative mitigation targets for these sectors (MEU, 2011a).

Agriculture

Agricultural emissions, mostly due to enteric fermentation, accounted for 11% (56 Mt CO_2e) of Turkey's total GHG emissions in 2016, up from 41 Mt CO_2e in 2005. Emissions from agriculture have increased less dramatically than in other sectors. However, their share has grown since 2008 because the Ministry of Agriculture and Forestry (MAF)[4] promoted increasing the number of livestock, which generate a large amount of methane (MEU, 2016). Agricultural activities represent the largest national sources of methane (CH_4) and nitrous oxide (N_2O) emissions (TurkStat, 2017). Agriculture, vulnerable to climate change, is a key sector for adaptation (Sections 4.5).

The agricultural sector is also subject to a range of strategies and action plans, including the tenth Development Plan, the Strategic Plan of the former Ministry of Food, Agriculture and Livestock, the NCCS and NCCAP. Concessional loans, as defined in the 2010 Regulation on Good Agricultural Practices, support specific measures for improving agricultural practices. Training programmes improve awareness around fertiliser use according to soil conditions. However, financial support to farmers for environmental sustainability represents a marginal share of total support to agricultural producers (OECD, 2016) (Chapter 3).

Land use, land-use change and forestry

Turkey's LULUCF sector, which has been acting as a GHG sink, sequesters about 14% of total emissions. The increasing sink capacity (+60% since 2005) is a result of reforestation and increased use of harvested wood products. Indeed, forest area increased from 13.9% to 15.4% as a share of land area over 2005-16 (Chapter 1). However, dam constructions, fires and droughts put this sink capacity at risk (TurkStat, 2017). It is important to continue to increase sink areas, prevent land degradation and implement the Action Plan on Forestry Rehabilitation and National Afforestation Campaign (Republic of Turkey, 2015; UNFCCC, 2016). Turkey aims to do so by limiting forest fires (e.g. through training), addressing threats from pests and diseases, and accelerating the afforestation and rehabilitation of the degraded forest areas.

The overarching policy for the forestry sector is the National Forest Programme (2004-23). This programme calls for sustainable management of forests, but does not have any direct specific measures on climate change mitigation and adaptation. The Strategic Plan of the MAF General Directorate of Forestry (2017-21) acknowledges the need for mitigation. As a party to the UN Convention to Combat Desertification, Turkey has established a range of targets in its National Report 2016-30 related to land degradation neutrality. Efforts in this area will also contribute to adaptation efforts and to reaching Sustainable Development Goal (SDG) 15.3 related to desertification, degraded land and soil (MFWA, 2016a).

4.5. Climate change impacts and vulnerability

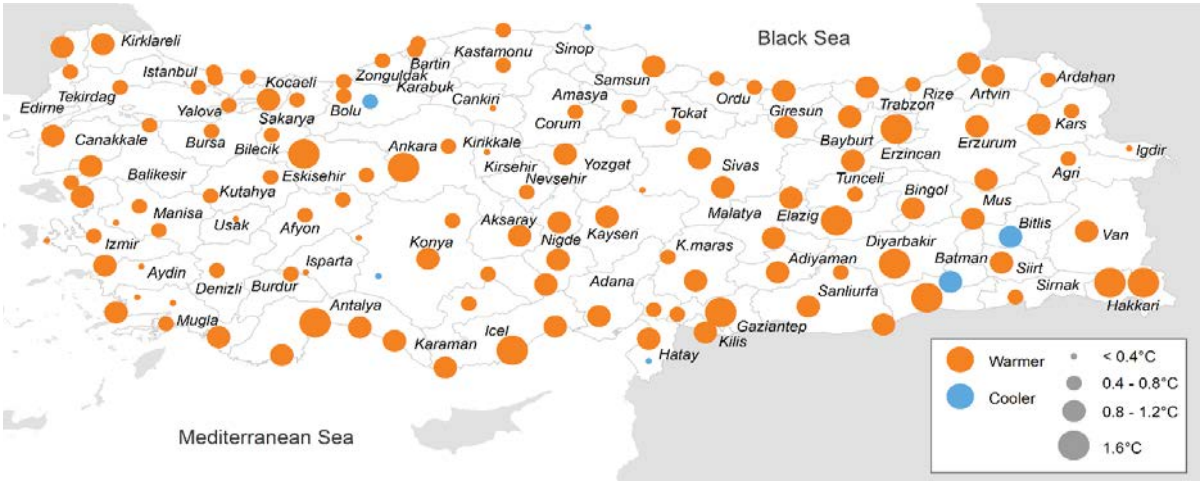
4.5.1. Current and projected climate change impacts

Turkey is situated within the Mediterranean climate zone, with hot and dry summers, and warm and wet winters. It also experiences contrasts in weather between the central and coastal regions, with coasts and mountains shaping its climate. Annual precipitation has been 574 mm (1981-2010 average), with the Black Sea region receiving most rainfall and Central Anatolia the least (MEU, 2016; TSMS, 2018).

Climate change impacts can already be observed in Turkey. The main impacts are an increase in average temperature and a general decrease in precipitation. The number of hot days and nights has been increasing (MEU, 2016), while the number of cool days dropped between 1960 and 2010. Most of the stations of the Turkish State Meteorological Service (TSMS) recorded an increasing number of days with heavy precipitation between 1960 and 2010 (Şensoy et al., 2013). Turkey's annual mean temperature in 2016 and 2017 was above 14°C, close to 1°C more than the 1981-2010 average (Figure 4.6). Precipitation patterns are changing across the country and the seasons, with above-normal precipitation levels in the north, but below normal in the south in 2016 (TSMS, 2018, 2017). Over the last century, the sea level rose by around 12 cm in the Mediterranean and Black Sea regions (OECD, 2013a).

Figure 4.6. Temperature is generally increasing, but unevenly

Difference between 1981-2010 average and 2017 mean temperature

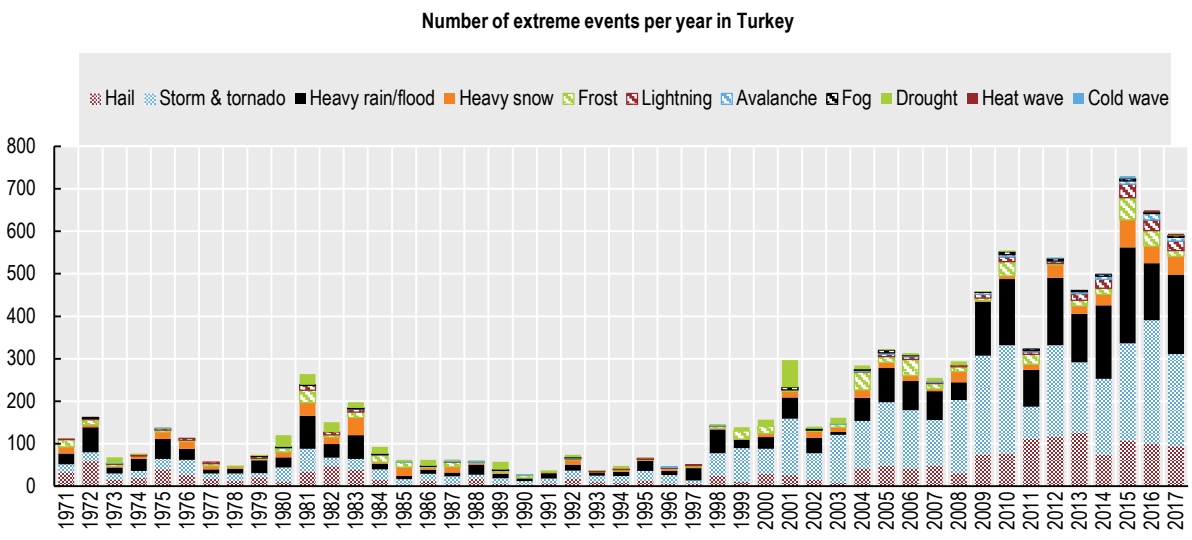


Note: A bubble corresponds to a weather station.
Source: FAO (2015), The Global Administrative Unit Layers (GAUL) 2014 dataset, implemented by FAO within the CountrySTAT and Agricultural Market Information System (AMIS) projects.

StatLink http://dx.doi.org/10.1787/888933892953

Turkey is frequently impacted by climate-related hazards such as heat waves, floods, landslides, storms and forest fires. Over the past decade, the TSMS recorded an increasing number of extreme events, mostly wind storms and heavy rain (Figure 4.7). Natural hazards such as storm or hail are likely to increase with climate change (Demircan et al., 2017).

Figure 4.7. Extreme meteorological events are more frequent



Note: This figure shows observed heat and cold waves and not calculated ones (cf. TSMS (2018) for calculated heat and cold waves).
Source: TSMS (2018), *State of the Climate in Turkey in 2017*, Turkish State Meteorological Service, Ankara.

StatLink http://dx.doi.org/10.1787/888933892972

The average rise in annual temperature in Turkey is expected to range between 1°C and 2°C between 2016 and 2040, relative to 1971-2000. This rise is projected to further increase between 1.5°C and 4°C for 2041-70; and to between 1.5°C and 5°C for 2071-99, with some differences between scenarios (Demircan et al., 2017). Average temperature is projected to increase by 3°C in winter and 6°C in summer by the end of the 21st century (IEA, 2016). The global average surface temperature change ranges between 1°C and 4°C up to 2099 according to different scenarios. Precipitation in Turkey is also expected to increase in most regions during winter, but decrease during the summer (Demircan et al., 2017). Previous simulations came to the same conclusion of further temperature increase (MEU, 2013).

Since the 2008 EPR, Turkey has made progress on modelling future climate, but needs to further refine results and address uncertainty. The TSMS created climate projections for Turkey based on two scenarios (RCP4.5 and RCP8.5). It used three global climate models (HadGEM2-ES, MPI-ESM-MR, GFDL-ESM2M) downscaled by using a regional climate model at 20 km for Turkey (TSMS, 2015; Demircan et al., 2017). Despite improvements, this spatial resolution is still of high level compared to other countries. It will be important to clarify the treatment of uncertainty in the projections because adaptation costs can vary according to the degree of probability.

With respect to water resources, scenarios developed up to the end of the 21st century show increasing temperature throughout Turkey and uneven change in precipitation levels. Specifically, this means more rain in the north and less rain in the centre and south of Turkey. The scenarios also anticipate the snow-covered areas to diminish (MFWA, 2016b, 2014a). Other projected impacts include loss of surface waters, more frequent arid seasons, degradation of soil, erosion in coastal regions and floods. The increase in frequency, intensity and duration of droughts in the south, southeast and west, and floods – especially in the Western Black Sea region – will alter water regimes. Eutrophication and salinization can also threaten water use for drinking or irrigation (OECD, 2013a).

The change in both quantity and quality of water, combined with an expected growing demand for water, make the water sector highly vulnerable (OECD, 2013a; MFWA, 2016b). In addition to implications related to exacerbating water stress, more days with heavy precipitation can put pressure on storm water management, especially in urban areas (Chapters 1 and 5). Uneven impacts can either exacerbate or ameliorate pressures on water resources according to the location. All features of the water cycle are affected by climate change. Several policy areas will have to adapt to these changes to avoid jeopardising water, food and energy security.

Turkey, with various climatic zones, is a biodiversity hotspot, but its diverse biodiversity and ecosystems services are vulnerable to climate change. The increase in water temperature affects ecological processes and geographic distribution of aquatic species. This can lead to the extinction of species. Loss of area and volume of water bodies can deteriorate biodiversity and habitats (MEU, 2016).

4.5.2. Socio-economic implications of climate change

Turkey has not yet comprehensively assessed the potential costs of climate change for the country. More information on sectoral costs, benefits and finance needs is planned as part of the revision of the National Adaptation Strategy and Action Plan (NASAP) (Section 4.6.1). Estimating the costs of climate change is complex due to uncertainty about climate impacts and their valuation, assumptions on economic growth, demographics and the response of the climate system to increasing GHG concentrations (OECD, 2015b).

Response to natural disasters has largely been driven in reaction to earthquakes, which have caused over two-thirds of the total losses from natural disasters over the past century. Climate-related hazards (e.g. heat waves, floods, landslides, storms and forest fires) have significant direct and indirect effects on the population and economic activity (OECD, 2013a). The cost of damages from natural disasters (excluding earthquakes) occurring between 2000 and 2009 reached an estimated USD 1 billion (about 0.1% of GDP in 2010 prices), with many affected by these events (death, injury, homelessness or otherwise affected). Over 1 million people have been directly affected by floods, landslides, storms or wildfire (1990-2015) (UCL-CRED, 2018).

Some groups, depending on age, gender, education or wealth, are more vulnerable than others to the impacts of climate change. Some groups can be more exposed to climate risks because of poor-quality housing, while others can be more exposed because their livelihood relies on climate-sensitive activities (IPCC, 2014). Turkey needs to identify how the impacts of climate change can affect vulnerable people and communities and adopt appropriate adaptation policies. This is also important for reaching several SDGs such as 1 (poverty), 2 (hunger), 3 (health) and 13 (climate change).

Vulnerability can also be exacerbated in places with high population density. Heat waves, flooding and storm surges can impact both population and infrastructure in urban areas. Future challenges arising from Turkey's rapid urbanisation and population growth and climate change will require a sustainable and integrated urban planning and water management system.

4.6. Climate change adaptation policy and institutional frameworks

4.6.1. Climate change policy framework

Adaptation policy

The NASAP, building on the NCCS and NCCAP, provides an overarching view of adaptation challenges and actions to address them (MEU, 2011b). It calls for further awareness raising about the impacts of climate change, improving knowledge about possible risks and integrating climate change into several policy areas such as water and disaster risk management (Section 4.7). Before the NASAP, adaptation actions were spread across sectoral policies (e.g. disaster risk management, biodiversity conservation, and water and food security).

The NASAP is based on a scientific analysis of vulnerable areas and impacts of climate change. Various stakeholders, from provincial and regional directorates, research institutes and municipalities to NGOs, helped define needs in terms of awareness and capacity to adapt to climate change (MEU, 2011c). With finance from UN organisations, the MEU supervised preparation of the NASAP in co-operation with the Joint Programme on Enhancing the Capacity of Turkey to adapt to Climate Change. It is planned to be revised, with the latest science, as part of the Instrument for Pre-Accession (IPA II) project on Enhancing Adaptation Action in Turkey (2018-21).

The NASAP, which does not have legal status, provides a range of qualitative objectives for key focus areas (water resources management, agricultural sector and food security, ecosystem services, biodiversity and forestry, natural disaster risk management and public health) (MEU, 2011b). Each objective details specific actions, but without prioritising them. Moreover, responsibilities are broadly defined and do not have estimated cost and identified funding sources for implementation. Turkey has not yet assessed whether

adaptation actions in the NASAP were implemented as planned before 2015 (these are most of NASAP actions).

Adaptation is integrated into complementary documents to the NASAP such as the Biodiversity Strategy and Action Plan (2007-17), the Strategy to Combat Desertification (2013-23), the Drought Management Strategy and Action Plan (2017-23), the River Basin Protection Action Plans for the 25 water basins, the Flood Management Plans and the National Programme and Action Plan for Reducing the Adverse Impacts of Climate Change on Public Health (Section 4.7). The tenth NDP (2014-18) aims to mainstream disaster risks in macroeconomic, sectoral and spatial planning processes (MoD, 2014).

Government operations

Systematically integrating climate change impacts into decision-making processes enhances the resilience of policies and projects (Agrawala et al., 2011). Entry points for integrating adaptation are policy design (via strategic environmental assessment), budgetary allocation, procurement and project implementation (via environmental impact assessment, or EIA) (Chapter 2) (OECD, 2015c). Climate change adaptation could be better mainstreamed into government operations if policy makers received guidance on how to incorporate climate impacts into policies and projects appraisal, and made use of this guidance.

The NASAP flagged that EIA is an entry point for adequately mainstreaming adaptation and called for screening projects against their vulnerability to climate change (MEU, 2011b). EIA legislation in Turkey does include a climate change mitigation component. However, it does not require projects to anticipate future impacts of climate change (e.g. determine possible climate impacts, identify risks to the project and adaptive management plan) (Agrawala et al., 2011).

Monitoring and evaluation

Turkey has not tracked progress in implementing its adaptation policy. Monitoring and evaluation is an important part of climate policy, as it enables countries to assess whether policies have the desired effect and outcome. In so doing, they can improve the effectiveness of their climate mitigation and adaptation policies (OECD, 2015d). This is recognised by Turkey, whose NCCS (2010) indicated that "a co-ordination and monitoring system shall be established by the Ministry of Environment and Urbanization to closely track the progress and intervene as needed in a timely manner".

Turkey put an online monitoring system for the NCCAP in place in 2011. However, it was not used to ensure that actions were underway and had the desired outcome. Not all targets in the NCCAP and NASAP are measurable, have a baseline or have a performance indicator to track progress. Turkey needs to ensure that objectives in the NASAP are still adequate, and clarify and use suitable performance indicators for each action. Further developing the monitoring tool that was set up to collect information in a user-friendly manner, along with clear roles and responsibilities for implementation and monitoring, could help track progress and assess adaptation actions. This is valid for mitigation actions as well.

4.6.2. Governance for adaptation and disaster risk management

Co-ordination of adaptation actions across institutions

Given that many climate-sensitive sectors, such as forestry, water, agriculture, disaster risk management and tourism, are managed by different entities (e.g. AFAD, MEU, MAF), significant horizontal co-ordination is needed to ensure integrated policy development. Horizontal co-ordination takes place at the technical level through one of the seven working groups of the CBCCAM that focuses on effects of climate change and adaptation. This working group, including representatives of relevant public and private institutions, meets several times a year.

The cross-ministerial adaptation working group can bring adaptation to the attention of the CBCCAM. However, political support for adaptation is seen as a longer-term issue and often not given priority over short-term issues. It is important for Turkey to lock in resources to address adaptation (IPCC, 2014).

Adaptation at the local level

Public institutions have regional or provincial directorates to implement actions at the local level. The MEU's provincial directorates' divisions of environmental management and inspection implement national policies, including the NASAP. Divisions for the protection of natural assets contribute to adaptation efforts through research and monitoring of biodiversity and habitats. The MAF also carries out adaptation activities at the local level in the areas of water management, biodiversity and food security through its regional and provincial directorates as well as through research institutes (on plant breeding, agro-technology, apiculture, aquaculture, etc.). Co-ordination between the central and provincial and regional directorates is also ensured through the Disaster and Emergency Management Authority (AFAD) (Box 4.1). Local environmental boards, which make decisions related to the environment at the local level, do not address adaptation except as a broad cross-cutting issue.

Box 4.1. AFAD is helping Turkey better manage risks related to natural hazards

The Marmara Earthquake in 1999 shed light on Turkey's challenges to manage its risks related to natural hazards. With the establishment of the Disaster and Emergency Management Authority (AFAD) in 2009, Turkey shifted its disaster management approach from crisis management to risk management. AFAD is in charge of preventing disasters and reducing disaster-related damages in Turkey. It plans and co-ordinates post-disaster response and promotes co-operation among various government agencies. It operates through a central agency and its 81 provincial branches, which manage local emergency action. AFAD also has 11 regional special search and rescue brigades and 23 regional logistics warehouses. AFAD's budget comes from the central government and special international emergency and humanitarian funds.

AFAD's Strategic Plan acknowledges the growing risks posed by climate change. Disaster risk management and climate change adaptation have complementary aspects. Therefore, it would be beneficial to integrate them into different levels of governance and across sectors. As part of building capacity for managing climate-related natural hazards, AFAD is identifying best practices around the world and working to understand lessons learned from recent floods in Turkey.

Source: AFAD (2012).

Due to the local dimension of climate change impacts, local authorities are well placed to contribute to both policy making and implementation of adaptation measures. They can address some climate impacts by ensuring that building codes are enforced and that planning decisions consider climate change. They can also raise awareness and provide adequate emergency services. Municipalities do not have a specific role with regard to climate under the 2004 Law on Metropolitan Municipalities and the 2005 Law on Municipality. However, their remit covers infrastructure, transport, environmental health, waste and wastewater management, and afforestation – which are important for both mitigation and adaptation to climate change.

Implementation processes for adaptation actions appear to follow a top-down approach rather than bottom-up. There are no systematic co-operation mechanisms to enable local levels of administration to influence adaptation policy making. The establishment of a local adaptation division in the MEU Department of Adaptation to Climate Change is a welcome step to overcome this. The government needs to provide guidance for local authorities on how to act at the local level because the NASAP does not appear to do so sufficiently. Clarifying the role of local authorities, supported by sufficient resources, would also help make progress on adaptation at the local level (Box 4.2).

Box 4.2. Overcoming barriers to climate action at the local level

Based on a survey of the 30 metropolitan municipalities (equivalent to about 65% of the Turkish population), climate action at the municipal level appears to be driven mainly by awareness and political will. Some municipalities also cite air quality, national regulations (e.g. the 2011 regulation for efficient use of energy and energy resources defining responsibilities of various authorities, including municipalities) or EU grants as other drivers.

Barriers to effective adaptation at the local level include financial constraints, weak co-ordination among departments and insufficient awareness of staff and politicians to act. Mainly relying on central funding, municipalities face budgetary challenges to act on climate (notwithstanding that some actions may already occur but are not tagged as adaptation). Although they can access additional funds from international donors, these are not regularly available. Continuity is also a problem when new local administrations change policy priorities, which creates instability.

Source: Gedikli and Balaban (2018).

The private sector can contribute to climate adaptation by assessing companies' own risks, but there is limited evidence of this in Turkey. Involving private enterprise in climate responses helps build consensus around climate action and empowers businesses to act themselves. Working with the public sector, the private sector can also seize business opportunities for building resilience to climate change arising in different realms. These could include health care, waste and water management, sanitation, housing or energy sectors (e.g. to ensure that waste management systems are robust to increased intensity of precipitation, Chapter 5).

Co-operation with neighbouring countries

The risks of insufficient water, of excess water, of inadequate quality and of disruption of freshwater systems need to be adequately managed to achieve water security (OECD, 2013b). The management of these risks, which can be exacerbated by climate change and transcend jurisdictions, can benefit from common initiatives with neighbouring countries.

The Euphrates-Tigris basin is projected to experience lower annual surface run-off, creating challenges for operation of dam reservoirs and hydropower plants (Bozkurt and Sen, 2013). In March 2017, the relevant ministries of Turkey and Iraq established working groups on desertification, sand and dust storms, dams and water quality, backed by ministerial-level consultations. Technical co-operation is also ongoing with Armenia and Georgia. The Eastern Mediterranean Climate Centre has been enabling climate communities to study climate impacts on the region, sharing knowledge and promoting capacity building (EMCC, 2009).

The European Union funded the Capacity Improvement for Flood Forecasting and Flood Control project in the Turkish-Bulgarian border region (2007-11). It led to setting up a flood forecasting and early warning system for cross-border rivers and installation of hydro-meteorological stations. These actions helped reduce economic losses from floods (Sumer, 2016). High-level co-operation councils on issues related to transboundary rivers were established with Greece in 2010 and with Bulgaria in 2012. In building on these efforts, the 2008 EPR recommendation to maintain an open and active dialogue with its

neighbouring countries to ensure sound management of water quality and quantity remains important.

Improving and sharing knowledge

Complex decision making on adaptation needs to be further informed by sound knowledge about current and future impacts of climate change (see Box 4.3 for the Korean experience). A wide variety of stakeholders will need this knowledge (e.g. national and subnational governments, business, industry and farmers). However, the NASAP flagged that R&D did not sufficiently support adaptation; and the fifth National Communication under the UNFCCC indicated that the state of climate impact assessments was largely under development (MEU, 2013). The NCCAP calls for building the information infrastructure to meet the needs of key sectors such as agriculture and water management.

Limited availability and access to sound information are key challenges for decision making. Despite efforts to make climate information more available, IFC/EBRD (2013) found that two-thirds of Turkish SME survey respondents were not aware of climate change and its impacts. Furthermore, three-quarters felt that they did not have sufficient information. This information gap can have a significant impact on people's ability to adapt to climate change. Turkey could address the gap by setting up a website dedicated to climate change adaptation to enhance knowledge-sharing as part of its revision of the NASAP. The website could house information on climate projections, vulnerability assessments and public awareness materials.

Some knowledge gaps remain on vulnerability and adaptation measures in industry, forestry and fisheries (MEU, 2016). Efforts to fill knowledge gaps are undertaken by different institutions, often supported by international donor projects. Water, agriculture, forestry and natural disaster risk management are subject to various research studies. However, there are no observation systems to monitor climate change and its economy-wide impact.

The TSMS provides all meteorological information in Turkey and prepares observations and forecasts. Dedicated websites publish projections by the TSMS, as well as vulnerability and risk assessments. The MAF's Climate Change Impacts on Water Resources Project includes projections for all 25 basins until 2100, assessing change in surface water and groundwater levels with dynamically downscaled climate projections. It also analyses sectoral impacts of climate change in three pilot basins. For each basin, it examines drinking water, agriculture, industry and ecosystems, as well as a specific sector (tourism, textile manufacturing and energy). This project will inform river basin management plans (RBMPs), flood management plans and drought management plans (Section 4.7). The General Command of Mapping operates tide gauges to monitor sea-level change with information gathered in the Turkish National Sea-Level Monitoring System.

The MAF has also been carrying out some monitoring to improve the information base in the agriculture sector. Using remote sensing satellites and ground observation stations, Turkey is gathering information on agriculture and livestock in a single database, the Agricultural Information System. It aims to anticipate problems arising from excessive use of pesticides, fertilisers, antibiotics and water. The MAF undertakes a range of adaptation-related research studies. These aim to identify and monitor drought and its impact on soil quality and water resources, as well as to better understand the impact of climate change on yield.

Early warning and information systems reduce or avoid the impacts of natural disaster risks. Through its Strategic Plan 2015-19, the General Directorate of State Hydraulic Works (GDSHW) addresses risks from floods by preparing flood hazard maps and early warning systems. AFAD is preparing an Integrated Disaster Hazard Map, covering all types of disasters (earthquakes, landslides, rock falls, floods and avalanches). This will be the basis for risk reduction studies. Since 2013, AFAD has been developing the Turkish Disaster Data Bank to gather information on a single online platform (tabb.afad.gov.tr). It is looking at the cost of disasters in accordance with the Sendai Framework. It does not report on the environmental, social and economic impact of disasters, however. There is scope for it to be more user-friendly, namely for policy makers (e.g. possibility of aggregating information about water-related disasters per year).

Box 4.3. Supporting adaptation through knowledge development and sharing

Given the wide-ranging implications of climate change, establishing an organisation with comprehensive functions to oversee adaptation efforts can prove beneficial for expediting effective implementation of adaptation strategies and enhancing national adaptation capacity.

This is what Korea did with the establishment of the Korea Adaptation Center for Climate Change in 2009, as required by the Comprehensive Plan for National Climate Change Adaptation. Funded by the Ministry of Environment and hosted in the Korea Environment Institute, the Center leads and co-ordinates national strategies for climate change adaptation.

It provides support to the central and local governments in developing and implementing adaptation policies and during domestic, regional and global adaptation negotiations. The Center also helps to build an information base by conducting adaptation research on risks, impacts and vulnerability; raise awareness among businesses and other stakeholders to improve their overall adaptive capacity; and enhance the knowledge network via domestic and international co-operation.

In other OECD member countries, institutions performing these functions include the UK Climate Impacts Programme since 1997, Germany's Competence Centre on Climate Impacts and Adaptation since 2006 and Australia's National Climate Change Adaptation Research Facility since 2008. These institutions conduct multidisciplinary research and co-operate with one another to share knowledge and experiences.

Source: Korea Adaptation Center for Climate Change (2018) website, http://ccas.kei.re.kr/ (accessed 15 July 2018); UKCIP (2011), Making progress: UKCIP & adaptation in the UK, UK Climate Impacts Programme, Oxford, UK.

4.7. Mainstreaming adaptation into sectoral policies

Strengthening adaptation requires integration of adaptation issues into decision making across a range of policy areas. This can fall under the responsibility of different institutions. Mainstreaming adaptation can lead to synergies between policy areas and result in efficient use of resources.

4.7.1. Cross-cutting issues

Water

Water management comes under the responsibility of the MAF and its General Directorate for Water Management, and the GDSHW. The GDSHW oversees work on water resources for energy use, drinking and irrigation and flood management. Metropolitan municipalities or local authorities also take action to prevent flooding. A project by the former Ministry of Forestry and Water Affairs (MFWA) recommended integrating the results of scenarios for Turkey and its 25 river basins into Water Management Master Plans and Water Resources and Drought Management Plans, which Turkey is gradually doing (MFWA, 2016b).

By 2014, each of the 25 river basins in Turkey had a River Basin Protection Action Plan that identified pressures and precautionary measures. They are being transformed into RBMPs; all 25 plans are expected to be completed by 2023 (Chapter 5). Sectoral water allocation action plans are under preparation, starting with the Ceyhan, Akarçay and Konya basins. Information-based instruments, such as flood-risk maps, appear to be used frequently by policy makers to lay the ground for action (Section 4.6). Water-related extreme events such as floods and droughts have been identified as a concern for future water management. The GDSHW Strategic Plan (2015-19) calls for building flood protection facilities and strengthening and modernising the use of machinery and equipment against floods.

By 2021, all 25 river basins will need flood risk management plans, but only five have been completed to date. Turkey has prepared flood risk management plans for the basins of Yeşilırmak, Antalya, Ceyhan, Susurluk and Sakarya. These are in line with the EU Directive on Flood Risks Assessment and Management (2007/60/EC). Each basin's flood management plan requires the preparation of a report on climate change impacts. The plans are regulated by the 2016 Regulation on Preparation, Implementation and Monitoring of Flood Management Plan. The EU Flood Directive provides valuable guidance as regards vulnerability to flood risks.

Drought is a key risk for agricultural production and the livelihood of farmers. The Drought Management Strategy Document and Action Plan (2017-23) calls for finalising 2 drought management plans before 2019, 13 before 2021 and 10 before 2024; drought management plans for Akarçay, Konya, Küçük Menderes, Doğu Akdeniz, Kuzey Ege, Van, Batı Akdeniz, Antalya and Burdur basins have been completed. These plans consider past and possible future drought events, using climate change scenarios, as well as sectoral vulnerabilities (municipal water, agriculture, industry and other key sectors). The Konya basin drought plan was built on climate studies to assess future conditions of the basin, complemented by sectoral vulnerability assessments to prepare for further difficulties related to droughts (Duygu and Kirmencioğlu, 2017).

Buildings and infrastructure

Turkey needs to ensure that existing and new infrastructure is resilient to climate change. Policy makers can minimise risks from extreme weather events by ensuring that building and construction codes adequately consider climate change impacts. To that end, they need to better share and use information about climate projections, accounting for climate risks in public sector investments (OECD, 2015c; Vallejo and Mullan, 2017).

Turkey will need to anticipate and evaluate the potential impacts of climate change on its energy supply. Extreme weather events, increasing temperatures and stress on water

resources impact the vulnerability of the energy sector. For example, changing precipitation may affect hydropower generation and reduce cooling water for thermal power plants. Extreme weather events can damage energy infrastructure such as power transmission and distribution lines. Climate change impacts (such as increased numbers of cooling-degree days) will also alter energy demand patterns across time and regions. Turkey should assess the vulnerability of its energy sector to climate change[5] and identify the impacts that can disrupt supply, alter demand patterns and damage infrastructure.

Urban settlements with growing building stock are vulnerable to climate change because of their low adaptive capacity and high population density. Transport infrastructure will need to be adapted to temperature increases and be resistant to extreme weather events (e.g. damages from floods). Damage to transport infrastructure indirectly impacts other economic sectors by disrupting the movement of people and goods.

Coastal zone planning

Coasts are vulnerable to climate change because of the risks of sea-level rise, erosion and saltwater intrusion in freshwater systems, which can further endanger coastal ecosystems. Most of Turkey's population and economic activity is concentrated on the coasts, where continued urbanisation and tourist development increase exposure to climate change (Karaca and Nicholls, 2008). One NASAP objective was to integrate adaptation into the marine and coastal zone management framework.

With varying degrees of thoroughness, the MEU has prepared integrated coastal zone plans (ICZPs), a legal tool integrating different sectoral plans.[6] The first wave of ICZPs (Samsun, Antalya, Izmit, İskenderun and Bursa) integrates general environmental provisions. However, the Antalya and İskenderun ICZPs showed limited additional research on climate change (Özügül, Yerliyurt and Seçilmişler, 2017; Yalciner Ercoskun, 2017). Second-wave ICZPs (Balıkesir-Çanakkale and Aydın-Muğla), which are yet to be adopted, are more comprehensive. They are built on expert reports on a range of topics (coastal structure, oceanography, marine ecosystems) that help determine climate-sensitive areas and inform infrastructure decisions. These plans, which need to consistently integrate adaptation, are a step towards implementing the 2008 EPR recommendation to improve coastal management and protect sensitive parts of the coasts.

Preparedness for natural hazards

Turkey needs to monitor the effectiveness of disaster risk management in relation to climate change. The tenth NDP (2014-18) aims to mainstream disaster risks into macroeconomic, sectoral and spatial planning processes; to raise awareness and resilience against disasters (e.g. with a disaster information system); and to build disaster-resilient and safe settlements (e.g. retrofitting public buildings) (MoD, 2014). AFAD's Technological Disasters Roadmap (2014-23) focuses on better anticipating emergency situations related to accidents, fires and threats to infrastructures, including those resulting from climate change. Half-way through its implementation, it is important to monitor the effectiveness of the actions related to climate change and revise them accordingly.

In line with Priority 2 of the Sendai Framework for Disaster Risk Reduction, Turkey is developing disaster risk reduction plans at both the national and provincial levels. These plans will assess risks, including those arising from climate change, and identify actions and responsible institutions to manage those risks. The national plan consolidates risk management of present and future disaster risks and ensures co-ordination between institutions to avoid overlaps between investments.

Health

The Ministry of Health developed a National Programme and Action Plan on Reducing the Adverse Impacts of Climate Change on Public Health (2015-19). Its implementation is ongoing, but no follow-up is planned. The ministry set up a commission to study diseases linked to climate change; results will be integrated into its early warning system. For example, the increasing frequency and intensity of heat waves is expected to negatively affect the population, especially the young and elderly, and people with cardiovascular diseases. The plan identifies measures for reducing impacts of climate change and extreme weather events on human health by improving public awareness, as some extreme weather events such as floods can further spread certain diseases (MEU, 2011b). To strengthen institutional capacity to monitor diseases incidence, the ministry trained close to 3 000 laboratory staff between 2015-17 (Ministry of Health, 2015).

4.7.2. Ecosystems

Turkey published its National Biological Diversity Strategy and Action Plan in 2007, in line with Article 6 of the Convention on Biological Diversity (Chapter 1). One of its strategic objectives is to monitor impacts of climate change and to protect most affected ecosystems and species. It identifies climate change as one of the key threats to forest and mountain biodiversity (Ministry of Environment and Forestry, 2007). In co-operation with the former MFWA, the United Nations Development Programme published the Protected Areas and Climate Change National Strategy in 2011, but there was no follow-up. The MAF regularly monitors both the species and ecosystem levels for protected areas, and monitors activities with potential adverse environmental impacts through EIA. A study on synergies between climate change and biodiversity announced in 2014 (MFWA, 2014b) could not be implemented due to lack of funding.

More frequent forest fires threaten the role of forests in offsetting some of Turkey's GHG emissions. Indeed, more than half of Turkey's forest is in fire-prone areas. Furthermore, forest fire season in the Mediterranean region is already getting longer (NASAP). In revising the National Forestry Programme, it will be important to understand how this will impact the feasibility of achieving the INDC. Forests are not sufficiently integrated when planning adaptation policies. Information is limited on whether the forest management plans adequately consider climate change adaptation.

4.7.3. Key economic sectors

Agriculture

The current and projected impacts of climate change on water and land are expected to heavily affect the agricultural sector and food security through changing agricultural productivity. An analysis of water requirements for 35 crops in 81 regions suggests that economic effects of climate change will be mild until the mid-2030s, but then become more severe. Impacts will be unevenly spread across regions based on irrigation requirements: regions less reliant on irrigation will not be as affected. Reduced irrigated production and declining yields are expected to lead to higher agricultural prices and more food imports (Dudu and Çakmak, 2017). Wheat and sunflower exports are expected to decrease, while corn and cotton imports are expected to increase (MEU, 2016). The projected increase of competing water abstraction for urban and industrial use combined with the expected adverse effects of droughts on yields are serious concerns. This calls for better

understanding the impacts of climate change on yields and on the sustainability of resources already over-used, e.g. groundwater resources (OECD, 2016).

Agriculture's sensitivity to climate makes it a key sector for adaptation measures by the MAF and MEU. Since 2006, the Environmentally Based Agricultural Land Protection Scheme (ÇATAK) has been providing economic incentives to farmers in 58 provinces (payments of 30-135 TRY/thousand m2 according to the technique used) for protecting the quality of soil and water, and preventing erosion. Since 2016, water use has been capped in some water-scarce regions. In order to better manage water, water pricing should be tied to volumetric water use (Chapter 3). The Programme for Efficient Use of Water Resources in Agriculture covers modernisation of irrigation equipment, capacity building for farmers and targeted agricultural support for crops that need less water. In so doing, it contributes to both adaptation and mitigation. However, water-use efficiency remains a challenge: a third of the irrigation network is more than 40 years-old (Chapter 3). An agricultural insurance system has also been set up to help farmers respond to extreme weather events (Box 4.4) (OECD, 2016).

In line with the NASAP objective to integrate adaptation into agriculture and food security policies, climate adaptation was integrated into the Rural Development Strategy (2014-20). It is also aligned with the Agricultural Drought Management Strategy and Action Plan, which covers activities such as developing studies and awareness raising. Turkey is highly vulnerable to land degradation, desertification and drought due to its various climate and soil characteristics. Its National Strategy to Combat Desertification (2015-23) summarises actions for combating desertification and land degradation until 2023, aligned with its participation in the UN Convention on Combating Desertification (MFWA, 2015).

Box 4.4. The Agricultural Insurance System covers a growing share of farmers

The Agricultural Insurance System (TARSIM), as defined by the 2005 Agricultural Insurances Law, was devised to compensate farmers for losses in their agricultural activities arising from natural hazards. These included risks from hail, floods, storms, tornadoes, fires, earthquakes, landslides and frost. The system works as a public-private partnership, with the government covering part of the insurance premium to be paid by producers. Before TARSIM, agricultural producers could be compensated from the impacts of disasters through a government aid programme or private insurance. However, limited access to finance resulted in coverage for only a small share of farmers.

TARSIM activities have been growing significantly. Over 2006-16, the number of producers covered by agricultural insurance increased dramatically from about 3 700 to 400 000. A range of insurance products is already in place for crop, greenhouse production, cattle, sheep and goats, aquaculture and apiculture. Continued government support and diversification in insurance are expected to lead to a growing number of insurance applications.

This risk-sharing mechanism at the national level has contributed to increased resilience to climate extremes. It now serves as a model for Azerbaijan. The system will have to ensure its sustainability in a context of increased transaction and implementation costs and uncertain climate change impacts.

Source: Bora (2010); OECD (2016); TARSIM (2017).

Tourism

Increasing temperatures in the Mediterranean region, along with risks of water shortage and forest fires, are likely to affect the attractiveness of Turkey for tourism – which accounts for 4% of Turkey's GDP. Antalya, the city receiving the highest number of foreign visitors, is already experiencing a rise in temperature (+1.5ºC between the 1990-99 and 2000-09 averages) (MEU, 2011b). The city is expected to see a growing number of days with extreme temperature above 40ºC; this could trigger a shift in the seasonal pattern of seaside tourism. The increase in sea level and in the frequency and intensity of extreme weather events could damage historical and cultural sites (IFC/EBRD, 2013). Winter tourism depending on snowfall may also suffer from adverse effects of climate change (MEU, 2016).

Although the NASAP anticipates climate change will negatively impact tourism, this issue has not been adequately mainstreamed into the Tourism Strategy 2023 (Ministry of Culture and Tourism, 2007). Tourism, which accounts for 9% of employment, is the main source of foreign exchange. It appears from Turkey's sixth National Communication that efforts to adapt in this sector – as well as to mitigate emissions – have largely been lacking. Turkey has not yet assessed the vulnerability of tourism to climate change, although such assessment is planned as part of future revisions of the NASAP.

Recommendations on climate change

Policy framework and international commitments

- Ratify the Paris Agreement and strengthen the INDC; establish a long-term (2050) low-emission and resilient development strategy that integrates climate and energy objectives.
- Formulate a sector-by-sector action plan to 2030 with emissions reduction goals for mitigation and updated adaptation objectives, prioritised short-term actions aligned with 2050 goals; identify resource requirements and financing for implementation.

Monitoring and evaluation

- Establish a comprehensive monitoring and evaluation system with clear roles and responsibilities overseen by the Co-ordination Board on Climate Change and Air Management; identify and use suitable performance indicators for each action; prepare regular reports and make them available to the public; regularly monitor and evaluate the implementation of all other climate-related policy documents (e.g. Drought Management Plans, the NREAP and the NEEAP).

Mitigation

- Reduce carbon intensity of power and heat generation by increasing energy efficiency and renewable energy use (e.g. through co-firing of biomass) and by closing or renovating old coal-fired power plants; ensure that new coal plants are efficient, equipped with carbon capture and storage or can be retrofitted with it.
- Promote clean transport by encouraging a modal shift to public transportation, cleaner freight and passenger vehicles (e.g. with taxes and regulatory instruments).
- Set priority actions and quantitative energy efficiency targets by sector, support measures across sectors and regularly monitor and evaluate their cost-effectiveness as part of the implementation of the NEEAP.
- Increase the short-term renewable energy target and set longer-term targets; clarify subsector targets and ensure consistency across targets and objectives; encourage the use of renewable energy sources in transport.

Adaptation

- Strengthen mainstreaming of adaptation into relevant policy areas (e.g. key economic sectors, ecosystems, infrastructure) and in policy and project appraisal.
- Further improve scientific knowledge on climate change vulnerability and impacts, including social aspects, to make an economic case for action; continue to develop early warning systems for extreme weather events; design an online platform for climate data that is user-friendly for policy makers and other stakeholders.
- Support local authorities in preparing their climate change adaptation plans by building technical capacity and improving access to geographically disaggregated data at the local level; ensure that adaptation plans are supported by robust and realistic financing strategies.

Notes

[1] All numbers presented in this section exclude emissions from LULUCF unless otherwise specified.

[2] Annex II countries need to provide financial support.

[3] 16 GW by 2030 in the INDC compared to 20 GW by 2023 in the NREAP.

[4] The Ministry of Forestry and Water Affairs and the Ministry of Food, Agriculture and Livestock were merged into the Ministry of Agriculture and Forestry in 2018.

[5] A study of the impacts and vulnerability in five priority sectors (including the energy and tourism sectors) is planned within the scope of the revision of the NASAP.

[6] The ICZPs and information about integrated coastal zone planning in Turkey are available on the MEU website (https://mpgm.csb.gov.tr/).

References

AFAD (2012), *2013-17 Strategic Plan for Disaster and Emergency Management Presidency*, Disaster and Emergency Management Presidency, Ankara, www.afad.gov.tr/upload/Node/2584/files/Afad_Strtjk_web_en_son.pdf.

Agrawala, S. et al. (2011), "Incorporating climate change impacts and adaptation in environmental impact assessments: Opportunities and challenges", *OECD Environment Working Papers*, No. 24, OECD Publishing, Paris, http://dx.doi.org/10.1787/5km959r3jcmw-en.

Bora, B. (2010), "Subsidised Agricultural Insurance in Turkey (TARSIM)" (brochure), www.mapfre.com/ccm/content/documentos/mapfrere/fichero/en/subsidised-agricultural-insurance-in-Turkey.pdf.

Bozkurt, D. and O. Sen (2013), "Climate change impacts in the Euphrates–Tigris basin based on different model and scenario simulations", *Journal of Hydrology*, Vol. 480, Elsevier, Amsterdam, pp. 149-161, http://dx.doi.org/10.1016/J.JHYDROL.2012.12.021.

Climate Action Tracker (2018), "Rating Countries", webpage, http://climateactiontracker.org/countries.html (accessed 26 April 2018).

Coalswarm (2018), "Global Coal Plant Tracker", webpage, https://endcoal.org/tracker/ (accessed 26 February 2018).

Covenant of Mayors for Climate and Energy (2018), *Action Plans*, www.covenantofmayors.eu (accessed 1 February 2018).

Demircan, M. et al. (2017), "Climate change projections for Turkey: Three models and two scenarios", *Turkish Journal of Water Science and Management*, Vol. 1/1, Ministry of Forestry and Water Affairs, Ankara, www.mgm.gov.tr/FILES/genel/makale/44_Climate%20Change%20Projections%20for%20Turkey.pdf.

Dudu, H. and E. Çakmak (2017), "Climate change and agriculture: An integrated approach to evaluate economy-wide effects for Turkey", *Climate and Development*, Taylor & Francis Online, pp. 1-14, http://dx.doi.org/10.1080/17565529.2017.1372259.

Duygu, M.B. and A.B. Kirmencioğlu (2017), "Essential tools to establish a comprehensive drought management plan – Konya Basin case study", *Turkish Journal of Water Science and Management*,

Vol. 1/1, Ministry of Forestry and Water Affairs, Ankara, http://dergipark.gov.tr/download/article-file/282358.

EMCC (2009), Eastern Mediterranean Climate Center website, www.emcc.mgm.gov.tr/climate-change.aspx (accessed 20 February 2018).

Erdil, A. and H. Erbıyık (2015), "Renewable energy sources of Turkey and assessment of sustainability", *Procedia – Social and Behavioral Sciences*, Vol. 207, Elsevier, Amsterdam, pp. 669-679, http://dx.doi.org/10.1016/J.SBSPRO.2015.10.137.

Gedikli, B. and O. Balaban (2018), "An evaluation of local policies and actions that address climate change in Turkish metropolitan cities", *European Planning Studies*, Vol. 26/3, Taylor & Francis Online, pp. 458-479, http://dx.doi.org/10.1080/09654313.2017.1397107.

IEA (2018), "World energy balances", *IEA World Energy Statistics and Balances* (database), International Energy Agency, http://dx.doi.org/10.1787/data-00512-en (accessed 2 September 2018).

IEA (2017), *Coal 2017*, International Energy Agency, Paris, https://doi.org/10.1787/coal_mar-2017-en.

IEA (2016), *Energy Policies of IEA Countries: Turkey 2016*, Energy Policies of IEA Countries, International Energy Agency, Paris, https://doi.org/10.1787/9789264266698-en.

IFC/EBRD (2013), *Climate Risk Case Study – Pilot Climate Change Adaptation Market Study: Turkey*, International Finance Corporation and European Bank for Reconstruction and Development, Washington, DC, www.ebrd.com/downloads/sector/sei/turkey-adaptation-study.pdf.

IPCC (2014), *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Pachauri, R.K. and L.A. Meyer (eds.), www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf.

Karaca, M. and R. Nicholls (2008), "Potential implications of accelerated sea-level rise for Turkey", *Journal of Coastal Research West Palm Beach*, Vol. 24/2, Coastal Education and Research Foundation, Fletcher, US, pp. 288-298, http://dx.doi.org/10.2112/07A-0003.1.

Korea Adaptation Center for Climate Change (2018) website, http://ccas.kei.re.kr/english2014/eng2014_index.do (accessed 15 July 2018).

Mazlum, S. (2017), "Turkey and post-Paris climate change politics: Still playing alone", *New Perspectives on Turkey,* Vol. 56, Cambridge University Press, UK, pp. 145-152, http://dx.doi.org/10.1017/npt.2017.20.

MENR (2018a), Info bank – Energy website, www.enerji.gov.tr/ (accessed 26 April 2018).

MENR (2018b), *National Energy Efficiency Action Plan (2017-23)*, Ministry of Energy and Natural Resources, Ankara, www.yegm.gov.tr/document/20180102M1_2018_eng.pdf.

MENR (2017), *National Energy and Mining Policy*, Ministry of Energy and Natural Resources, Ankara.

MENR (2014a), *Strategic Plan 2015-19*, Ministry of Energy and Natural Resources, Ankara, www.enerji.gov.tr/File/?path=ROOT%2f1%2fDocuments%2fStrategic%20Plan%2fStrategicPlan2015-2019.pdf.

MENR (2014b), *National Renewable Energy Action Plan for Turkey*, Ministry of Energy and Natural Resources, Ankara.

MENR (2012), *Energy Efficiency Strategy Paper 2012-23*, Ministry of Energy and Natural Resources, Ankara, www.eie.gov.tr/verimlilik/document/energy_efficiency_strategy_paper.pdf.

MEU (2016), *Turkey's Sixth National Communication under the UNFCCC*, Ministry of Environment and Urbanization, Ankara.

MEU (2013), *Turkey's Fifth National Communication under the UNFCCC*, Ministry of Environment and Urbanization, Ankara, https://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/nc5_turkey%5B1%5D.pdf.

MEU (2011a), *National Climate Change Action Plan*, Ministry of Environment and Urbanization, Ankara.

MEU (2011b), *Turkey's National Climate Change Adaptation Strategy and Action Plan*, Ministry of Environment and Urbanization, Ankara, www.dsi.gov.tr/docs/iklim-degisikligi/turkeys-national-climate-change-adaptation-strategy-and-action-plan.pdf.

MEU (2011c), *Enhancing the Capacity of Turkey to Adapt to Climate Change: Participatory Vulnerability Analysis*, Ministry of Environment and Urbanization, Ankara.

MEU (2010), *Climate Change Strategy 2010-20*, Ministry of Environment and Urbanization, Ankara, Climate Change Strategy (accessed 14 December 2017).

MFWA (2016a), *Land Degradation Neutrality – National Report 2016-30*, Ministry of Forestry and Water Affairs, Ankara, www.cem.gov.tr/erozyon/Files/yayinlarimiz/brosurler/Turkey%20LDN%20National%20Report.pdf (accessed 5 January 2018).

MFWA (2016b), *Climate Change Impacts on Water Resources Project - Executive Summary*, Ministry of Forestry and Water Affairs, Ankara, http://iklim.ormansu.gov.tr/ckfinder/userfiles/files/Iklim_Nihai%20Rapor_Executive%20Summ_05122016.pdf (accessed 10 January 2018).

MFWA (2015), *National Strategy and Action Plan to Combat Desertification 2015-23*, Ministry of Forestry and Water Affairs, Ankara, www.cem.gov.tr/erozyon/Libraries/cemDocument/National_Strategy_and_Action_Plan_to_Combat_Desertification-TURKEY.sflb.ashx.

MFWA (2014a), *Climahydro – Climate Changes Impact on Water Resources Project*, Ministry of Forestry and Water Affairs, http://iklim.ormansu.gov.tr/eng/Proje.aspx#ProjeAmaci (accessed 10 January 2018).

MFWA (2014b), *Fifth National Report to the UN CBD*, Ministry of Forestry and Water Affairs, Ankara, www.cbd.int/doc/world/tr/tr-nr-05-en.pdf.

Ministry of Culture and Tourism (2007), *Tourism Strategy of Turkey – 2023*, www.kultur.gov.tr/Eklenti/43537,turkeytourismstrategy2023pdf.pdf?0&_tag1=796689BB12A540BE0672E65E48D10C07D6DAE291 (accessed 19 January 2018).

Ministry of Environment and Forestry (2007), *The National Biological Diversity Strategy and Action Plan*, Ministry of Environment and Forestry, Ankara, www.cbd.int/doc/world/tr/tr-nbsap-v2-en.pdf.

Ministry of Health (2015), "İklim Değişikliğinin Sağlık Üzerine Olumsuz Etkilerinin Azaltılması Ulusal Programı ve Eylem Planı" [National Programme and Action Plan on Reducing the Adverse Impacts of Climate Change on Public Health (2015-19)], https://hsgm.saglik.gov.tr/depo/birimler/cevre-sagligi/2-ced/iklim-degisikligi/Iklim_Degisikligi_Eylem_Plani.pdf.

Mock, P. (2016), "The automotive sector in Turkey: A baseline analysis of vehicle fleet structure, fuel consumption and emissions", *White Paper,* International Council on Clean Transportation, Washington, DC, www.theicct.org/sites/default/files/publications/ICCT_Turkish-fleet-baseline_20160318.pdf.

MoD (2014), *The Tenth Development Plan (2014-18)*, Ministry of Development, Ankara, www.mod.gov.tr/Lists/DevelopmentPlans/Attachments/5/The%20Tenth%20Development%20Plan%20(2014-2018).pdf (accessed 8 January 2018).

OECD (2018), "Air and climate: Greenhouse gas emissions by source", *OECD Environment Statistics* (database), http://dx.doi.org/10.1787/data-00594-en (accessed 26 February 2018).

OECD (2016), *Innovation, Agricultural Productivity and Sustainability in Turkey*, OECD Food and Agricultural Reviews, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264261198-en.

OECD (2015a), *Aligning Policies for a Low-carbon Economy*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264233294-en.

OECD (2015b), *The Economic Consequences of Climate Change*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264235410-en.

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

OECD (2015d), *National Climate Change Adaptation: Emerging Practices in Monitoring and Evaluation*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229679-en.

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

OECD (2013b), *Water Security for Better Lives,* OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264202405-en.

OECD (2008), *OECD Environmental Performance Reviews of Turkey*, OECD Publishing, Paris, www.oecd.org/env/country-reviews/environmentalperformancereviewsturkey2008.htm.

Özügül, M., B. Yerliyurt and T. Seçilmişler (2017), "Evaluation of integrated coastal zone management plan practices in the Turkish case", *IOP Conf. Series: Materials Science and Engineering*, Vol. 245/062032, IOP Science, Bristol, UK, http://dx.doi.org/:10.1088/1757-899X/245/6/062032.

Republic of Turkey (2015), *Intended Nationally Determined Contribution (INDC)*, www4.unfccc.int/submissions/INDC/Published%20Documents/Turkey/1/The_INDC_of_TURKEY_v.15.19.30.pdf.

Şensoy, S. et al. (2013), "Trends in Turkey climate indices from 1960 to 2010", presentation to sixth atmospheric science symposium, Istanbul, 3-5 June 2013, www.mgm.gov.tr/FILES/genel/makale/19_trendsin-turkey.pdf (accessed 19 February 2018).

SHURA (2018), *Increasing the Share of Renewables in Turkey's Power System: Options for Transmission Expansion and Flexibility*, SHURA Energy Transition Center, Istanbul, www.shura.org.tr/wp-content/uploads/2018/05/Grid-Study-eng.pdf.

Sumer, V. (2016), Water and Politics in Turkey: Structural Change and EU Accession, International Library of Human Geography, 39, I.B. Tauris, London, https://searchworks.stanford.edu/view/11880218.

TARSIM (2017), *2016 Annual Report, TARSIM – Agricultural Insurance System*, İstanbul, https://web.tarsim.gov.tr.

TSMS (2018), *State of the Climate in Turkey in 2017*, Turkish State Meteorological Service, Ankara, www.emcc.mgm.gov.tr/files/State_of_the_Climate_in_Turkey_in_2017.pdf (accessed 1 March 2018).

TSMS (2017), *State of the Climate in Turkey in 2016*, Turkish State Meteorological Service, Ankara, www.mgm.gov.tr/files/en-US/State_of_the_Climate_in_Turkey_in_2016.pdf (accessed 8 January 2018).

TSMS (2015), "Yeni Senaryolar ile Türkiye İklim Projeksiyonları ve İklim Değişikliği" [Climate Projections for Turkey with New Scenarios and Climate Change], Turkish State Meteorological Service, Ankara, www.mgm.gov.tr/FILES/iklim/iklim-degisikligi-projeksiyon2015.pdf.

Turhan, E. et al. (2016), "Beyond special circumstances: Climate change policy in Turkey 1992-2015", WIRES *Climate Change*, Vol. 7/3, Wiley Interdisciplinary Reviews, pp. 448-460, http://dx.doi.org/10.1002/wcc.390.

TurkStat (2017), *National Greenhouse Gas Inventory Report 1990-2015*, Turkish Statistical Institute, Ankara, http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php.

UCL-CRED (2018), *EM-DAT: The Emergency Events Database, Centre for Research on the Epidemiology of Disasters* (database), http://emdat.be/emdat_db/ (accessed 10 January 2018).

UKCIP (2011), *Making progress: UKCIP & adaptation in the UK,* UK Climate Impacts Programme, Oxford, UK, https://www.ukcip.org.uk/wp-content/PDFs/UKCIP-Making-progress-FINAL.pdf.

UNFCCC (2018), *Seventh National Communications (NC7)*, submitted National Communications from Annex I Parties, New York, http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/10138.php.

UNFCCC (2016), *Report of the Technical Review of the Sixth National Communication of Turkey,* UN Framework Convention on Climate Change, New York.

UNFCCC (2010), *The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention*, UN Framework Convention on Climate Change, New York, https://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf.

UNFCCC (2002), *Report of the Conference of the Parties on its Seventh Session. Decision 26/CP.7.*, UN Framework Convention on Climate Change, New York, http://unfccc.int/resource/docs/cop7/13a04.pdf.

Vallejo, L. and M. Mullan (2017), "Climate-resilient infrastructure: Getting the policies right", *OECD Environment Working Papers*, No. 121, OECD Publishing, Paris, http://dx.doi.org/10.1787/02f74d61-en.

World Bank (2018), *PMR Türkiye, Partnership for Market Readiness*, World Bank, Washington, DC, http://pmrturkiye.org/en/.

Yalciner Ercoskun, O. (2017), "Coastal zone protection in the Mediterranean countries and Turkish efforts", *Gazi University Journal of Science*, Vol. 30/2, Gazi University, Ankara, pp, 1-16, www.researchgate.net/publication/318264100_Coastal_zone_protection_in_the_Mediterranean_countries_and_Turkish_efforts.

Chapter 5. Urban wastewater management

Turkey has achieved progress over the last decade by increasing the share of population connected to sewerage and to wastewater treatment infrastructure. It has also invested significantly in river basin planning. This integrated approach to planning needs to be leveraged to help Turkey achieve its ambitious goals for urban wastewater management in the short to medium term. The chapter describes these achievements and barriers to achieving the urban wastewater management goals, and suggests opportunities for improvement.

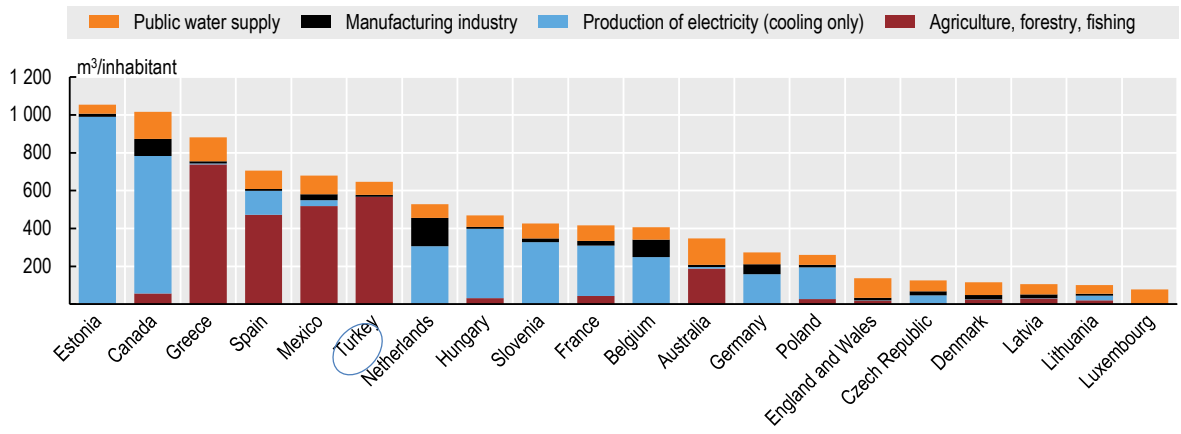
The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

5.1. State of play and trends

5.1.1. Urban wastewater in the context of water management

Based on the annual volume of water available per capita, Turkey is not a water-rich country. With population predicted to reach 100 million in 2030, the annual available amount of water per person will decrease. Population growth and the effects of climate change are expected to reduce water availability from less than 1 400 m^3 per capita today to 1 120 m^3 per capita by 2030. Water stress, defined as the ratio of water abstraction to available resources, is much higher than the average for OECD member countries (Chapter 1). The agricultural sector, especially irrigation (with almost 70% of total water abstraction), dominates water use in Turkey, as it does in several other OECD member countries, such as Greece, Spain and Mexico (Figure 5.1).

Figure 5.1. Irrigation dominates water use in Turkey



Source: OECD (2018), "Water: Freshwater Abstractions", *OECD Environment Statistics* (database); OECD (2018), "Environmental Performance Indicators", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892991

Throughout the country, water resources are unevenly distributed in time and space. Rivers often have irregular flows due to climate conditions and variations in topography. Water resources are considered limited in the highly urbanised and industrialised western part of Turkey.

Recent studies demonstrate that Turkey will soon become hotter, more arid and unstable in terms of precipitation patterns (Chapter 4). These changes, along with population growth, are expected to reduce water availability in many areas. This is of particular concern for basins such as Marmara, K. Menderes and Asi, where water availability is already less than 1 000 m^3/capita. Agriculture and energy production will also increase pressure on water quantity and quality (IPCC, 2014).

Water-use efficiency is likely to play a prominent role in Turkey's future water policy. Conserving the quantity and quality of water resources is essential for the country's long-term growth and sustainability. Untreated wastewater makes water use downstream more expensive. Significant investment is required to provide access to appropriate levels of treatment across the nation, to renew infrastructure and to adapt to a changing climate.

Turkey can do more to target and manage water risks in a changing climate, especially in areas prone to hazards. Studies of current and projected impacts of climate change on urban wastewater systems are at initial stages. Flash floods in urban settlements and combined sewer overflows are issues of mounting significance. The EU-funded project on Enhancing Adaptation Action in Turkey is expected to study the impact on ecological services and vulnerable socio-economic sectors, including urban wastewater. It will focus on four pilot urban areas representing four climate zones (MEU, 2016a).

5.1.2. Pressures

Point and diffuse sources of pollution

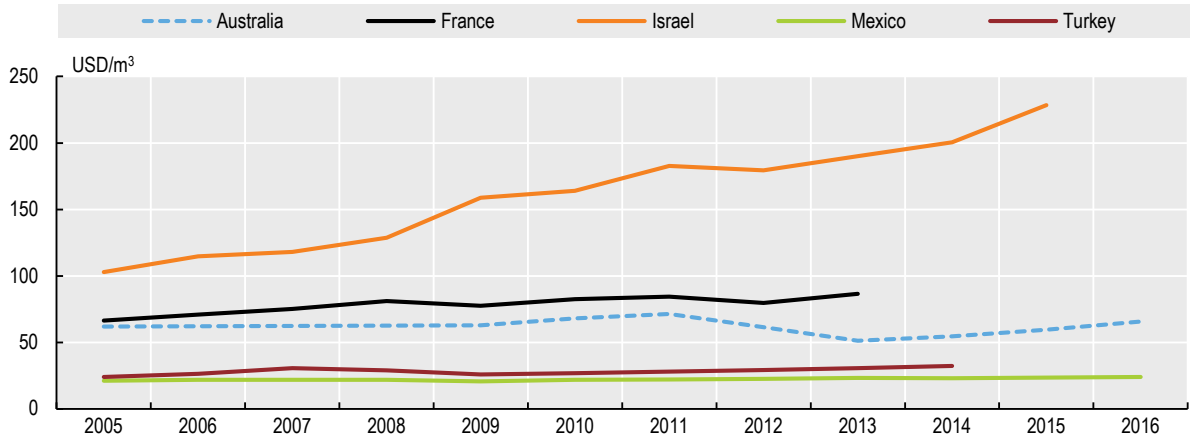
Surface water quality, considered low in many water bodies, is deteriorating due to insufficient pollution control. The impact is reaching alarming levels in some large municipalities. Groundwater quality and levels are also of concern. Groundwater is often contaminated by leakages from wastewater infrastructure and municipal waste dump sites. Yet households and agriculture increasingly use groundwater as a resource.

The problem of discharges of untreated wastewater from urban and industrial areas is exacerbated by the buoyant economy (Gürlük and Ward, 2009). In 2016, about 4.5 billion m^3 of wastewater was discharged from municipal sewerage. Over 14% of the residential wastewater was discharged without treatment, and about 38% of industrial wastewater was not treated before being discharged into water bodies (TurkStat, 2018). There is little documentary evidence that eutrophication is widespread in the country or primarily related to point source discharges (municipal wastewater or industrial wastewater) or agricultural run-off. However, Turkey has recently designated inland and coastal areas as “sensitive areas” or “potentially sensitive areas”.

Economic and social pressures on water abstraction

Water use in Turkey is less efficient than in high-income countries. For example, gross domestic product (GDP) per tonne of water used is only about 35% that of France. The value, which reached 32 USD/m^3 in 2014, has not grown much in recent years (Figure 5.2). The inefficient use of water in agriculture results in over-abstraction of water from both surface water and groundwater in several river basins. Inefficient surface irrigation methods such as flooding, furrow and border are widespread (Chapter 1).

Figure 5.2. GDP per tonne of water used in Turkey trails behind the best performers



Note: GDP at 2010 prices and purchasing power parities.
Source: OECD (2018), "Water: Freshwater Abstractions", *OECD Environment Statistics* (database); OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

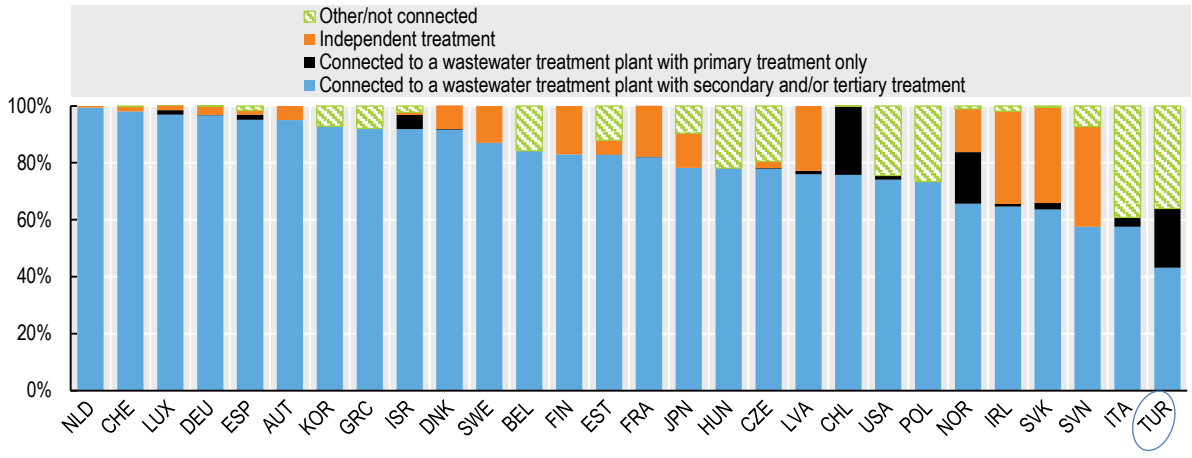
StatLink http://dx.doi.org/10.1787/888933893010

State of urban infrastructure for wastewater collection and treatment

A remarkable effort has been made to increase wastewater collection and treatment for people living in metropolitan areas. Between 2006 and 2014, Turkish water utilities connected an average of 4 800 people to a sewer and provided wastewater treatment to an additional 6 850 people daily. Over the same period, as its population increased by 7 million, Turkey extended sewer access to 14 million people, and access to wastewater treatment to 20 million people. It decreased the ratio of wastewater discharged without treatment from 36% (1 226 million m^3) in 2006 to 14.3% (642 million m^3) in 2016 (Turkstat, 2018). This significant progress was made with technical and financial support from national and international funds.

The share of the population served by wastewater treatment plants increased from 36% to 70% over 2004-16 (Turkstat, 2018). However, the percentage of the population connected to secondary or tertiary wastewater treatment is still one of the lowest among OECD member countries (Figure 5.3).

Figure 5.3. Access to wastewater treatment has increased, but remains among the lowest in the OECD



Note: 2016 or latest available year. Data for Turkey refer to 2014.
Source: OECD (2018), "Water: Wastewater Treatment", *OECD Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933893029

Turkey's Regulation on Urban Wastewater Treatment (2006) reflects the requirements of the Urban Wastewater Treatment Directive (UWWTD), but there are problems with its implementation. For example, Turkey does not yet regulate or monitor water pollutants based on conditions of receiving water bodies at the basin level. Such differences in regulatory requirements may lead to unnecessarily high capital costs. They may also embed higher long-term operation and maintenance (O&M) costs when applied to new infrastructure. Turkey is committed to move towards full alignment with the UWWTD.

The impacts of climate change on resources and energy costs encourage policies that promote treated wastewater reuse and biological digestion of sludge wherever it makes economic sense. These could reduce costs and contribute towards water and energy security, serving both economic and environmental agendas. Turkey could benefit from increasing wastewater reuse, particularly in the water-stressed municipal areas.

Biogas production through digestion (and using it to meet utilities' energy needs), sludge composting or reuse, and treated wastewater effluent reuse are not common practice in Turkey. A small number of pioneering municipalities have piloted these innovative practices. For example, biogas production through sludge digestion, sludge composting and reuse, was trialled in Ankara, while Konya evaluated treated wastewater reuse. Turkey most commonly disposes of sludge in landfills or through incineration. These expensive solutions do not exploit more sustainable reuse opportunities. Similarly, the use of sludge in agriculture is not common in Turkey, as it is in most EU countries (EC, 2016).

Storm water management

Higher intensity of precipitation events (heavy rains) from a changing climate will increase the amount of storm water needing treatment. Storm water in urban environments can be heavily polluted with nutrients, hydrocarbons, heavy metals, pesticides and animal waste. This polluted water is typically discharged untreated. In the case of combined sewers, large storms can result in raw sewage and polluted storm water bypassing the wastewater treatment facility (MEU, 2012).

The average annual rainfall in Turkey is 643 mm, and 7 of 25 basins receive rainfall below this average. Mountainous coastal regions receive abundant precipitation (1 000-2 500 mm/year), while most parts of Central Anatolia and South-eastern Anatolia have precipitation of only 350-500 mm annually. The lowest precipitation level (250-300 mm/year) is in the environs of Lake Tuz (country submission).

Most sewerage systems in Turkey are combined systems, but there are some separate systems in Istanbul, Izmir and Antalya. There are no statistics available on the volume of untreated wastewater discharged through combined sewers or the number of annual overflow episodes.

In the context of future challenges related to climate change, Turkey assigns a high priority to storm water management. It could reduce the polluting effects of storm water overflows through water-wise urban design, use of natural water retention systems and improved management of networks connected with treatment plants. These activities require additional investments (BMI, 2014). In the framework of harmonisation with the UWWTD requirements, Turkey is considering investments to reduce storm water overflows and partially renew/improve infrastructure (e.g. in case of combined sewers).

5.2. Governance framework

5.2.1. Institutional arrangements

Turkey is taking important steps towards re-organising the institutional, policy and legislative framework of its water sector. Improved governance, increased institutional capacity and improved infrastructure for wastewater treatment are among the priorities for the Turkish government in the EU harmonisation process.

Role of national and provincial governments

Water-related roles and responsibilities of different ministries were reshuffled in 2011. At the central level, the Ministry of Agriculture and Forestry (MAF) and the Ministry of Environment and Urbanization (MEU) hold the main responsibilities for the water sector (Chapter 2). The MAF regulates and monitors performance of water supply services; the MEU does the same for sanitation. The Strategy and Budget Office of the Presidency (formerly Ministry of Development) is also involved in decision making.

The MEU determines treatment standards for wastewater treatment plants, issues discharge permits and monitors the performance of wastewater facilities. It also regulates wastewater tariffs and implements an operational programme for related investments.

The MAF develops policies for protection of water resources and their sustainable use, regulates water supply and co-ordinates national water management. The MAF's General Directorate of State Hydraulic Works (GDSHW) and General Directorate for Water Management (GDWM) are key authorities in managing water resources.

The GDWM, established in 2011, develops policies for protecting and sustaining water resources, and co-ordinating and preparing river basin management plans (RBMPs) together with relevant stakeholders. The GDWM also identifies and monitors urban-sensitive areas and nitrate-sensitive areas. The GDSHW oversees investments in the supply of potable and industrial water, and, if required, in municipal wastewater treatment plants.

Development and investment bank

ILBANK, Turkey's development and investment bank, provides credits to municipalities and acts as an agent in the administration of municipalities' external loans. It has a major influence on municipal investments, a large share of which is in water supply and sanitation (WSS). It establishes the creditworthiness and therefore the acceptable debt level of all local governments.

Roles and responsibilities of municipalities

Municipalities provide water supply and sanitation services, as well as storm water management. In 1981, as a pragmatic response to water shortages and sewage problems in Istanbul, the government introduced a new service model in the city. It established a dedicated Water and Sewerage Administration (SKI) as a public utility owned by the municipality, but with an independent budget. The Istanbul SKI was entrusted to finance large WSS investments through international loans.

By 2014, Turkey had created 30 metropolitan municipalities by consolidating smaller ones in main urban areas, and created an SKI in each of them. The service area of metropolitan municipalities was extended to cover the entire province. As a result, 30 SKIs provide WSS services to 77% of the population (World Bank, 2016a). Other municipalities provide WSS services through a municipal department (about 847 municipalities with 16% of the population). Special provincial administrations provide services in non-municipal areas (rural population, about 5 million people) (TurkStat, 2014).

SKIs are also responsible for drainage and protection of water basins, even those outside the boundaries of their service area. The governance structures of SKIs include a general board, a management board and auditors. The Metropolitan Municipality Council serves as the general board of an SKI. Key responsibilities of the general board include review and approval of the five-year investment plan and annual investment programmes.

5.2.2. Interagency co-ordination at the national and subnational levels

The government is moving to address fragmented governance for water and wastewater management. In 2012, it created a Water Management Co-ordination Board to ensure inter-sectoral co-ordination and co-operation, to oversee an integrated basin management approach, and to develop strategies, plans and measures to achieve Turkey's national objectives and international commitments. The programme of measures for each RBMP is submitted to the board for approval. However, the board has met only four times since its establishment.

In addition to the Water Management Co-ordination Board, the Basin Management Central Committee co-ordinates activities in the 25 basins and receives reports of Basin Management Committees. Multi-stakeholder Water Management Co-ordination Committees in 81 provinces complete the water management structure. Turkey is committed to strengthening a legal basis for the central board and other water management committees.

Still, responsibility sharing between the main sectoral ministries (MAF and MEU) can be unclear, particularly in standards setting and investment approvals. This may lead to confusion, inefficiencies and delays. For example, any wastewater collection and treatment project requires approval of the GDWM (under the MAF) and of the MEU for a treatment plant, except investment projects developed by government institutions themselves. The MEU decides the level of treatment based on sensitivity of the receiving body. However, the MEU depends on the MAF, which determines the level of sensitivity. Furthermore, in

many cases, approvals involve ministries of health, tourism and agriculture. Having to deal with so many institutions in decision making on wastewater collection and/or treatment investments makes it challenging for utilities to secure project approvals. It also requires utilities to manage contradicting conclusions or requirements.

The government has prepared a draft Water Law to eliminate overlapping responsibilities of different government authorities to ensure effective co-ordination and enable public participation in water management practices. A national policy dialogue on water could be another opportunity for inter-sectoral co-ordination (Box 5.1).

Box 5.1. National policy dialogues in Eastern Europe, Caucasus and Central Asia

National policy dialogues (NPDs) on water are the main operational instrument of the European Union Water Initiative (EUWI) component for Eastern Europe, Caucasus and Central Asia (EECCA).

NPDs, driven by demand from host countries, are policy platforms where stakeholders meet to advance water policy reforms. Meetings are attended by multiple stakeholders, such as ministries and other government institutions, parliamentary bodies, non-governmental organisations (NGOs), academia and the business community.

Discussions in NPD meetings are supported by robust analytical work and international best practice. For instance, reviews of water pricing benefit from assessments of affordability and competitiveness impacts of alternative pricing scenarios. Development of RBMPs builds on similar experiences in European countries.

The main outcomes are policy packages, such as legislative acts, national strategies, ministerial orders and plans for implementation. In many cases, these apply the principles of the EU water policy.

EECCA countries benefit from the ongoing EUWI NPDs in part through better co-operation with EU Member States. Improved co-ordination with donors on water issues helps increase cost-effectiveness of official development assistance provided by EU Member States, as well as other donors. Furthermore, NPDs provide opportunities to transfer best practices and knowledge from EU Member States and international organisations (foremost, the OECD and UN Economic Commission for Europe, which facilitate NPDs) to beneficiary countries.

The OECD has established similar platforms in Brazil, the Republic of Korea, Mexico and the Netherlands.

Source: OECD (2016a), *Water Policy Reforms in Eastern Europe, the Caucasus and Central Asia*.

5.2.3. Regulatory framework

Efforts to achieve harmonisation with EU legislation have influenced the development of Turkey's water supply and sanitation regulatory framework. The tenth Development Plan assigns clear priority to improving sewerage and wastewater treatment infrastructure and ensuring its proper operation to meet discharge criteria identified for respective river basins.

Regulations and standards

Until recently, water pollution control and urban wastewater treatment regulations had different treatment standards for biological oxygen demand, chemical oxygen demand (COD) and total suspended solids (TSS). This led to many water utilities and private operators selecting for each parameter the more stringent requirement of the two regulations to comply with both. This issue was addressed as of 2018 when urban wastewater discharges became subject to the Regulation on Urban Wastewater Treatment only.

The MEU has power to require nitrogen and phosphorus removal in secondary treatment plants for settlements with at least 50 000 inhabitants to prevent eutrophication of water bodies. Indeed, Turkey has designated inland and coastal areas as "sensitive" or "potentially sensitive" to eutrophication. Turkey has identified water bodies sensitive to eutrophication. It has transposed relevant provisions of the EU Urban Wastewater Treatment and Nitrates Directives into national legislation.

RBMPs need to recognise trade-offs in wastewater collection and treatment. Nutrient removal requirements involve more complex and expensive treatment systems. They can also drive O&M costs up by more than 40%, mostly due to the cost of electricity and chemicals. In addition, nutrient removal generates about 30% more sludge, which can become a significant problem to handle. Long-term costs of sludge transportation and disposal to landfill, for example, are rarely quantified. Conversely, following UWWTD standards will avoid investments in urban wastewater treatment that would generate little or no social or environmental benefit.

Turkey is planning to address wastewater infrastructure deficiencies as part of priority setting for each river basin. This, in turn, is expected to be based on robust cost-benefit analysis and supported by financing strategies. The designation of "sensitive areas" should be reviewed once RBMPs are in place (by 2023) based on a better understanding of the receiving environment conditions.

Regulation of tariff structure and levels, as well as standards and quality of WSS services is carried out by two ministries (Section 5.2.1). Consolidating responsibilities for regulating economic aspects of WSS service provision within one government body would be advisable in the future.

The MAF has taken first steps to establish a benchmarking system for WSS services, including the structure and level of tariffs. These efforts are worth pursuing and expanding. Such a system should allow monitoring of actual performance of WSS facilities and costs of their services. This is critical for evaluating the impact of the sector's policies and programmes, and ensuring public accountability for tariffs and public investments.

Furthermore, international good practices suggest that having an independent economic regulator is an effective way of driving performance and investment of WSS service providers through best practice guidelines, procedures and benchmarking. Portugal represents one example of independent economic regulation in the water sector (Box 5.2).

Box 5.2. The role of the regulator in Portugal

The Portuguese water and waste services regulation authority was created in 1997 to do the following:

- ensure protection of water and waste sector users, focusing on improving quality of services and supervising the tariffs charged to end-users
- ensure equality with regard to access to water and waste services
- reinforce the public right to general information regarding the sector and each utility.

Under the scope of economic regulation, the Portuguese regulator (ERSAR) is committed to a tariff system that includes a tariff definition and structure, as well as rules for invoicing of services. Tariff-setting procedure follows the principles of recovery of investment and operating costs. It includes annual costs for maintenance and renewal of infrastructure and equipment. It also serves to drive utility efficiency and promote sustainable use of resources. Economic regulation by ERSAR also includes evaluation of each utility's capital investment plan.

To accomplish these goals, ERSAR publishes a tariff regulation and general recommendations for tariff renewal to standardise tariff calculation by the utilities. Audits may analyse the basis for approved tariffs, assess their level of compliance with the tariff regulation and/or validate accounts and supplementary data as part of *ex post* economic and financial performance review. In the event of non-compliance with the tariff regulation, the regulator may alert the utility of the need to correct some aspects or issue binding instructions in this regard. Where justified, the regulator may open administrative procedures against the utility and apply penalties.

Source: ERSAR (2018), "Entidade Reguladora dos Serviços de Águas e Resíduos" [Regulatory Body for Water and Waste Services], Lisbon, Portugal.

5.3. Policies and instruments

5.3.1. Key strategies and policy objectives

Turkey has started to integrate targets of the Sustainable Development Goals into planning documents. The tenth National Development Plan (NDP) sets clear objectives and targets for the sustainable use and effective management of water resources. It is consistent with Goal 6 on ensuring availability and sustainable management of water and sanitation for all. The plan emphasises improving sanitation and wastewater treatment infrastructures in cities and encouraging reuse of treated wastewater. It also covers basin-level planning, integration of quantity and quality measures, enhanced co-ordination among different government authorities and increased water efficiency (MoD, 2014).

There is a strong need to support harmonisation of urban development planning with priorities set through river basin planning. Turkey has various national strategies, plans and programmes that deal with water resource management. A National Water Information System is expected to gather all water-related data to support integrated planning and decision making in the water sector.

The National Basin Management Strategy aims to determine a set of policies for sustainable management of basins. It defines objectives for relevant institutions, and promotes co-ordination between public and private sectors, NGOs and scientific institutions. Turkey has already identified 25 hydrologic basins, defined "sensitive water bodies, urban-sensitive areas and nitrate-sensitive areas", and completed a river basin protection action plan (a precursor of an RBMP) for each. RBMPs are expected to be developed by 2023 for all 25 basins.

Several institutions involved in water governance have developed their own strategies or plans relevant to WSS development. These include the National Basin Management Strategy, Basin Protection Action Plans, the National Climate Change Strategy and the National Climate Change Action Plan. The MEU has completed an investment prioritisation for wastewater and sanitation services, while the MAF has prepared a Drinking Water Action Plan for settlements. For both sectors, decisions on allocation of funds are taken by the Strategy and Budget Office of the Presidency.

The tenth NDP sets key sanitation targets for 2018. First, it aims at 95% for "the ratio of municipal population served by sewerage system to total municipal population". Second, it aims at 80% for "the ratio of municipal population served by a wastewater treatment plant to total municipal population" (MoD, 2014). At the same time, according to the MEU's Strategic Plan (2013-17), 85% of municipal wastewater is expected to be treated by the end of 2017. The same plan, already being updated to cover 2018-22, anticipates total coverage of municipal population by wastewater treatment services by the end of 2023.

5.3.2. Economic instruments and incentives

Approximation with the EU's WFD requires the use of economic instruments, particularly water pricing, to cover the costs of water services. Economic instruments have a double purpose: providing incentives for sustainable water use by the various user groups and raising revenue. The latter is particularly important in Turkey, where water infrastructure needs financing for operation, maintenance and new investment. International good practices suggest that economic instruments work best when designed to address one particular objective (see Box 5.3 on the French experience).

Turkey is committed to moving towards full cost recovery in its water pricing. According to the 2010 Regulation on Procedures and Principles for Determination of Tariffs for Wastewater Infrastructure Facilities, wastewater fees are determined on the basis of full cost recovery. The Environment Law imposes the "polluter pays" principle: the polluter must clean up the damage or pay the costs incurred by the MEU for the clean-up.

Box 5.3. French water policies rely on a combination of economic instruments

Since 2008, French water agencies charge seven types of taxes in the following categories:

- Water pollution. For households, this tax is based on the annual volume of water billed. For cattle breeders, the tax is based on the size of the cattle herd. For industries, it is based on the annual discharge volume.
- Sewerage system. This tax is paid by all users connected to a sewerage system and based on volumes of drinking water supplied.
- Diffuse agricultural pollution. This is paid by retailers of pesticides with the rate varying according to toxicity of the substance.
- Abstraction of water resources. This tax is paid by any water user, based on annual volume of withdrawals. Rates depend on water uses and water bodies.
- Storage in low water periods. Owners of water reservoirs pay this tax.
- Obstacles on rivers. This tax is for structures like aqueducts that could impact river characteristics such as flow patterns.
- Protection of the aquatic environment. Fishers pay this tax through their unions.

In 2012, local authorities were granted the right to levy a tax to finance urban storm water management. It became the eighth water management tax in France.

In addition, France is considering charges to meet specific policy objectives. For instance, local authorities have recently been offered the possibility to charge for impervious surfaces. The objective is to discourage the extension of sealed surfaces – as they increase and accelerate run-off in cases of heavy rains – and to raise funds to finance the costs of storm water management.

Source: OECD (2012).

5.3.3. Information-based instruments

Water accounting provides a conceptual framework for organising economic and hydrological information. This enables consistent analysis of the contribution of water to the economy and of the impact of the economy on water resources.

The Turkish Statistical Institute (TurkStat), with its 26 regional offices, is the leading authority for overall data collection, statistical accounts, analysis and reporting services. The Department of Environment, Energy and Transport Statistics has been collecting and analysing data sets based on an OECD core set of environmental data and indicators since 1990. Data on water, wastewater, waste, air emissions, environmental employment, environmental expenditure and revenues, and environmental accounts are collected via questionnaires filled in by municipalities and other agencies.

Turkey does not have monetary water accounts or hybrid water accounts. Economic valuation of water and its application to making strategic decisions on water allocation would be an important step in making well-informed decisions in the water sector. TurkStat has implemented some pilot projects for the development of Physical Water Flow Accounts. These accounts refer to the abstraction of water resources, water use by different

economic sectors and water flows back to the environment. The Strategy and Budget Office of the Presidency, TurkStat and the MAF are keen to conduct valuation to explore and better understand the economic contribution of water resources to economic growth and to modify the national accounts accordingly. Furthermore, the MAF is willing to integrate water valuation as a key component of river basin management (World Bank, 2016b).

A fragmented monitoring system impairs the assessment of performance of urban wastewater management. The Urban and Industrial Pollution Monitoring Program is carried out in six priority river basins (Ergene, K. Menderes, Gediz, K. Aegean, Sakarya and Susurluk) four times a year.

Some 250 parameters are subject to monitoring of environmental quality of surface water resources. In 2017, the MEU designed a roadmap for wastewater management. One of its elements was reducing the number of monitored polluting parameters and selecting them based on ambient water quality conditions at the basin level.

The Communiqué on Continuous Wastewater Monitoring Systems (2015) lays down procedures for online monitoring activities for wastewater treatment plants with capacity of 10 000 m^3/day or above. Online monitoring stations measure seven parameters (pH, dissolved oxygen, temperature, flow, conductivity, COD and TSS). Monitoring results are collected from facilities through a real time system, and data are recorded in a centralised system.

Turkey will continue to improve monitoring of discharges and systematically reflect the pollution dilution and absorption capacity of the receiving water bodies as it may have an impact on the cost of treatment plant requirements. Turkey also needs a better understanding of ecosystem health to know whether water and land management and the controls on abstraction and pollution are effective and sustainable. Ecological conditions downstream of a major discharge can indicate whether permit limits are being regularly breached, in a way that occasional effluent samples might not be able to.

5.3.4. Performance of water utilities

There is no benchmarking system for the provision of WSS services that allows monitoring of actual performance of WSS facilities and of services they provide. Without proper information, government authorities cannot credibly assess whether objectives are adequate, investment plans are efficiently implemented or expected results are achieved. Reliable information is critical for evaluating sector policies and programmes, and ensuring accountability before the public for results achieved through tariff-revenue spending and other public investments.

The GDWM of the MAF has initiated a benchmarking system. The by-law that requests municipalities and SKIs to report to MAF annually on water losses, and to publish these reports on the Internet for one year, is a step in the right direction. However, a system that would require service providers to monitor, regularly report on key technical and financial performance indicators, and make this information available to the public, would further increase accountability (see Box 5.4 on the Portuguese experience).

Box 5.4. Measuring performance of water service providers in Portugal

The Portuguese water and waste services regulation authority (ERSAR) annually assesses the quality of service provided by almost 400 water and wastewater utilities against a series of 14 performance indicators.

The indicators have been developed to evaluate the efficiency or effectiveness of utility services. They address service coverage, affordability, flooding occurrences, cost recovery, sewer rehabilitation and method of sludge disposal. Each performance indicator has reference values for "good", "average" and "poor" quality of service. Performance indicator results receive a green, yellow or red score in a "traffic light" rating system.

Data reported by utilities are validated through audits that assess data quality and reliability. Each data set is classified from "very reliable" to "less reliable" according to the source.

In parallel with the performance indicator assessment, ERSAR is pilot-testing three indices developed on the principle that good management of water and wastewater systems requires:

- good knowledge of infrastructures, their state of conservation and operation
- a good short-, medium- and long-term plan of activities
- good understanding of the water and wastewater flows in the systems.

These indices are the Infrastructure Knowledge Index, the Infrastructure Asset Management Index and the Flow Measurement Index. Collectively, they allow the regulator to evaluate each aspect listed above and support the performance indicator assessment.

Evaluating the quality of service provision in this way allows ERSAR to regulate by benchmarking. It enables the establishment of baselines and definition of best practices, simulating a competitive environment within the sector. This enables utilities to get an independent perspective of their performance compared to other utilities with similar operating conditions.

Results of the benchmarking assessment are published. This introduces "peer pressure" and drives utilities to address their individual performance issues in the context of the sector as a whole.

Source: ERSAR (2018), "Entidade Reguladora dos Serviços de Águas e Resíduos" [Regulatory Body for Water and Waste Services], Lisbon, Portugal.

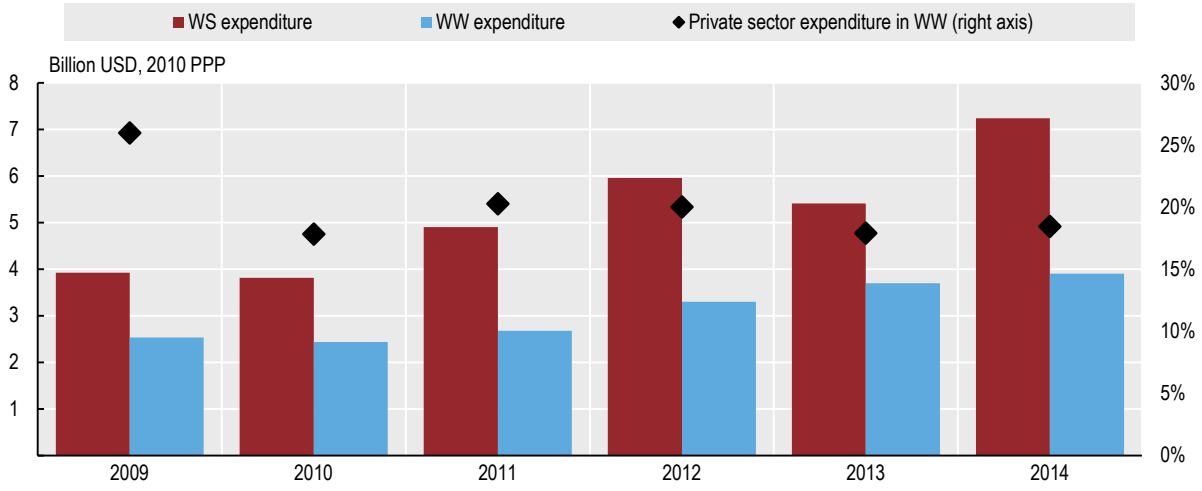
5.4. Investment and financing

5.4.1. Investment needs

Construction of sewerage and wastewater treatment infrastructure has gained momentum since the mid-1980s. Significant further investment will be required to provide access to levels of treatment consistent with EU requirements in the context of a growing population and needs to adapt to a changing climate.

Expenditures of water utilities increased rapidly over 2009-14 (Figure 5.4). The role of the private sector (private operators and domestic commercial financial institutions) in expenditure financing of wastewater management (e.g. build-operate-transfer schemes) is more prominent than in water supply. Notwithstanding the expenditure growth associated with the extension of the wastewater network and new wastewater treatment facilities recently put into operation, the share of private sector involvement remained quite stable, at about 20%. By contrast, water supply expenditure remains almost 100% public sector-financed.

Figure 5.4. Water supply and wastewater treatment expenditures are growing fast



Source: Country submission; OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933893048

Projected water infrastructure investment needs

The preliminary 2006 estimate of investment costs of compliance for the EU environmental acquis, including industrial, agricultural and urban infrastructure, was about TRY 110 billion (2017 USD 17.6 billion). The water and wastewater sectors have particularly high capital investment costs compared to other sectors. The total investment for the water and wastewater sector is estimated at around USD 9.8 billion until 2023 (MEU, 2016b).

The Wastewater Treatment Action Plan (2015-23), prepared by the MEU in 2015 and updated in 2017, estimated the total investment cost of the wastewater treatment plants to be renovated or constructed by 2023 at TRY 8.9 billion (about 2017 USD 1.4 billion). The necessary renewal of sewerage networks would cost TRY 8.7 billion (2017 USD 1.4 billion) by 2023. In addition, the cost of new sewerage networks planned to be constructed until 2023 has been estimated at TRY 9.6 billion (2017 USD 1.5 billion). The total cost of the investments to be made until 2023 for urban wastewater infrastructure is thus estimated at TRY 27.5 billion (2017 USD 4.4 billion). A recent study estimated the costs of Turkey's compliance with the UWWTD at USD 5.4-6.6 billion in additional investments (World Bank, 2016a).

Turkey has to ensure the efficiency of new investments, including full consideration of future O&M costs and social implications. To meet wastewater treatment requirements over time, Turkey may consider gradual implementation, which is applied by some EU Member States such as Croatia and Bulgaria.

5.4.2. Financing strategy and capacity

Turkey has so far relied on international assistance programmes as an important source of finance for wastewater collection and treatment. Shifting to more predictable sources of finance such as tariffs for wastewater collection and treatment, with additional funding for storm water management, would put the sector on a more robust financial path.

Wastewater tariffs: Cost recovery and affordability

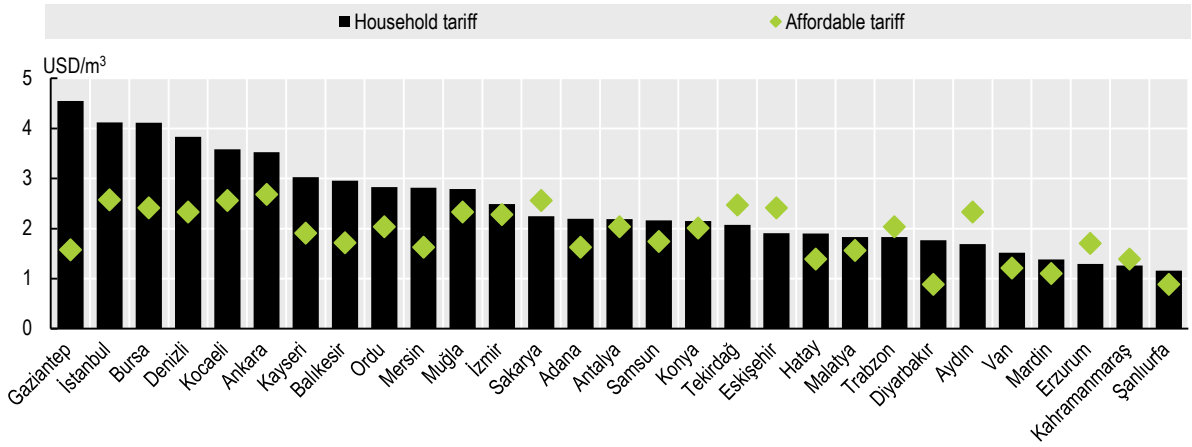
To ensure sustainability of environmental infrastructure services, the Turkish legislation empowers all wastewater infrastructure administrations to set up full-cost recovery water and wastewater user fees (i.e. tariffs covering installation, maintenance, operation, monitoring of wastewater treatment plants and other related services).

SKIs apply different water and wastewater tariffs depending on customer group. For example, the household tariff is discounted by up to 50% for customers with disabilities and veterans and by 25% for customers in a new SKI service area. This prevents tariffs from signalling the cost of pollution and of service operation. Targeted social measures are a more efficient use of taxpayers' money than low tariffs that benefit people who could afford a larger share of the costs of service provision. Water and wastewater tariffs also vary significantly from one service area to another. For example, Gaziantep, Denizli, Istanbul, Izmir and Mersin have among the highest tariffs. In addition, a 2018 regulation provides for maximum and minimum tariff levels for each service area.

The available financial information does not allow to judge whether the tariff revenues are sufficient to cover O&M costs. It is reported that SKIs recently established in new metropolitan municipalities still show lower financial sustainability, while "old" SKIs have a reasonably high collection rate of tariff revenues.

Only a small number of utilities still have capacity for tariff increases to finance new investments (Figure 5.5). Most utilities will have to implement cost-efficiency measures to accommodate higher capital costs within affordability constraints. Still, the share of wastewater fees in the total WSS tariff is less in Turkey than in most OECD member countries, where they account for roughly half of the total (OECD, 2012). This leaves some room for their increase based on a thorough assessment of the cost of pollution and service provision.

Figure 5.5. Household water and wastewater tariffs exceed affordability limits in many provinces



Note: The data are from 2016 and expressed in USD 2010 PPP; the threshold used for calculation of the affordable tariff per cubic metre is 2.5% of household income of the lowest quintile in the SKI service area.
Source: World Bank (2016), *Turkey Sustainable Urban Water Supply and Sanitation*; OECD (2018), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933892231

The EU Water Framework Directive stipulates that the tariff be set to allow a transparent vision of the cost recovery level. Implementation of the cost recovery principle requires that capital investments of utility services be financed from profits and depreciation of fixed assets. However, these funds are often insufficient to finance large investment needs.

In Turkey, when a municipality uses a loan to finance its capital investments, the full-cost recovery tariff includes a provision for debt service. However, to ensure capacity to pay, the tariff level should consider customer affordability. An affordable tariff per cubic metre is expected to be below 2.5% of the household income of the lowest quintile in the SKI service area in line with the current tariff regulation. Applying this threshold to all income groups does not provide proper incentives for water saving and deployment of cost recovery capacity of households (World Bank, 2016a).

To continue financing new investments from tariffs, the majority of Turkish municipal utilities will have to consider cost-efficiency measures. In this context, an economic regulator (Section 5.3.2) would help to respect an affordable tariff for poorest households, supported by targeted social measures, without compromising the full-cost recovery principle.

Domestic public finance and international aid

Turkish municipalities are supported by international loans and grants of the World Bank, the European Investment Bank, KFW and the Japan International Co-operation Agency. The European Union also provides financial support under the EU harmonisation process in different areas. During the 2007-13 budget period, the mechanisms of EU financial assistance to candidate and potential candidate countries were consolidated into a single Instrument for Pre-Accession Assistance (IPA).

Over 2011-17, the total water and wastewater investments by the Department of European Union Investments of the MEU reached USD 564 million. The European Union covered

85% of the cost of these projects, with the balance coming from the MEU and municipalities. In 2014, a Multi-Annual Action Programme on Environment and Climate Action for Turkey was approved under the IPA2 period with a maximum total contribution of EUR 182 million for 2014-16. While in the previous IPA period thematic concentration of the Environment Operational Programme was mainly on water and waste, this programme, in addition, focuses on climate action.

Extensive international assistance requires capacity to develop and implement projects. Training and capacity building are critical to the efficiency and long-term technical and financial sustainability of wastewater service provision. While the importance of training and capacity building is well understood and acknowledged in Turkey, a comprehensive programme to build capacity of WSS service providers is yet to be established.

TurkStat reported USD 2.1 billion of expenditures in the wastewater sector in 2015-16 under the Wastewater Treatment Action Plan, while the EU contribution for the same two-year period remained about USD 136 million. This shows that the national budget, municipalities and water companies continue bearing major capital costs in the sector.

ILBANK was created to provide technical and financial support to municipalities. Funding is mainly provided from the national budget. The amount of investments by ILBANK over 2003-15 is TRY 4.7 billion (USD 2.1 billion) for 648 sewerage projects and TRY 1.6 billion (USD 1.1 billion) for 182 wastewater treatment projects.

The government provides grants covering 50% of project costs to municipalities whose population is below 25 000. ILBANK extends long-term loans to municipalities for the remaining 50% of the project cost and supervises project implementation. ILBANK may also extend loans to municipalities with population above 25 000 under a decision of the Higher Planning Council. From 2011 to date, the total finance provided to municipalities for 1 028 projects is almost TRY 5.9 million (USD 3.9 million) (MoD, 2014).

The MEU provided about TRY 220 million (USD 146.4 million) to support 1 060 wastewater infrastructure development projects over 2008-17, which accounted for 18% of total conditional financial aid to municipalities. Up to 50% of energy expenditures of wastewater treatment plants operated in conformity with the legislation is compensated by the MEU. Within this scope, for example, incentive payments made to municipalities in 2016 were in the region of TRY 38 million (USD 8.1 million).

5.4.3. Options to meet finance needs

Increasing operational efficiency and innovative solutions

The MEU has set a 2023 target to provide wastewater treatment service to the entire municipal population. This target will be difficult to meet. Challenges faced in financing wastewater treatment plant construction seem to be the biggest constraint in reaching that target.

A range of innovative options could be explored to reduce costs and increase water and energy security. Technical solutions such as biogas production through sludge digestion can help reduce energy costs. Non-technical options include aggregating small utilities to generate economies of scale and make the best use of larger infrastructure. Indeed, in 2014, Turkey started to consolidate WSS services at the level of metropolitan municipalities. This trend will continue with amalgamation of smaller municipalities in coming years. This framework has encouraged service providers to finance large-scale investments through international loans under the Treasury Guarantee Scheme.

More efficient O&M of assets can reduce costs, while improving water security and services. Urban utilities in OECD member countries increasingly rely on computer tools, inspection robots and geographical information systems to gain precise knowledge of the state and performance of their assets, particularly those buried underground. This knowledge allows them to better phase their maintenance and renewal investments to improve system reliability, particularly with regard to repairing damaged pipelines. Innovative tools help enlarge the scale and scope of infrastructure monitoring, and extend the time horizon for asset management (OECD, 2015).

Replacing and expanding wastewater systems under a traditional engineering approach is very capital-intensive. It is worth exploring more efficient, lower-cost alternatives such as constructed wetlands for wastewater treatment (Box 5.5). These options should be compared using proper cost-benefit analysis.

Box 5.5. Ecosystems provide cost-effective wastewater treatment

Making use of processes occurring in natural ecosystems can be a lower-cost alternative to advanced wastewater treatment plants. Sewage treatment functions – equivalent to tertiary treatment processes – can be found in different natural and semi-natural systems, including floating aquatic plants and constructed wetlands.

Natural treatment systems represent the most cost-effective option in terms of both construction and operation, providing certain conditions are met. Operating costs, such as energy, are minimal compared to other treatment methods. However, natural systems have high land requirements and require frequent inspections and constant maintenance to ensure smooth operation. Furthermore, natural biological systems can produce effluents of variable quality depending on the time of year and type of plant, although they can handle fluctuating water levels.

According to the Centre for Alternative Wastewater Treatment, the capital costs of ecologically based wastewater treatment systems is USD 126-303 per m³ treated per day, while for traditional systems it is USD 593-741 per m³. Aquatic and terrestrial ecosystems are used for sewage treatment in a number of locations throughout the world, providing both low-cost sanitation and environmental protection.

Source: OECD, 2012.

Reflecting on future infrastructure needs for urban water management, countries now recognise that large-scale centralised systems may no longer be viable. This is due to high maintenance costs and resource needs, strong path dependency (particularly, when cities are already equipped with extensive grey infrastructures) and limited capacity to adjust to shifting conditions (urbanisation, climate change). The analysis holds true for water supply and wastewater infrastructure, storm water collection and drainage. Careful infrastructure decisions need to be made in light of these considerations and to be linked to long-term planning.

Private sector financing

Options for using private investment sources to fund urban water management include water service operators, financiers (who do not operate water services) and property developers. Private operators' capacity to generate efficiency gains can help to reduce financing needs. Most OECD member countries consider some form of private-sector

participation as an option to channel additional sources of financing to bridge upfront investment needs.

Turkey is planning to expand public-private partnerships for construction and operation of wastewater treatment plans in the coming years. However, these partnerships may succeed only if they are a result of a well-designed policy and institutional framework, and will require independent regulation of the sector (Section 5.3.2).

Mobilising commercial finance, in particular domestic sources, is another option to attract additional financing to the water sector. Blended finance (e.g. using development finance as collateral) is a promising approach to scale up financing flows for water. Further, blended finance can significantly improve the risk-return profile of water-related investments for commercial financiers and private operators. However, attracting these finance sources also requires policy reforms of the water sector to promote efficiency gains, cost reduction and cost recovery (OECD, 2018).

Recommendations on urban wastewater management

Institutional and regulatory framework

- Continue to strengthen the institutional framework by clarifying roles and responsibilities in the water sector.
- Adjust wastewater treatment standards based on consideration of carrying capacity of receiving water bodies and robust cost-benefit analysis to avoid excessive capital and operational infrastructure costs; consider phased implementation of treatment requirements.
- Consider consolidating responsibilities for regulating economic aspects of WSS service provision within one government body.

Strategic planning

- Develop a single water strategy that would cover all water management aspects at the national level and be aligned with economic development and urban planning objectives.
- Harmonise national and municipal planning of water infrastructure development and management; use river basin planning to determine the level of ambition, priorities and financing needs.

Investment and financing

- Develop and endorse robust and realistic financing strategies that cover O&M costs of existing assets, new investments and further developments identified in RBMPs.
- Issue national guidelines for improving WSS services; encourage better utility O&M performance to facilitate financing of further investments and O&M costs and keep tariffs affordable.

Innovation

- Continue aggregating small utilities to generate economies of scale and make the best use of larger infrastructure; introduce other new business models for water and wastewater utilities.
- Continue expanding the role of the private sector to improve performance and leverage private financing, particularly from domestic sources.

References

BMI (2014), *Turkey Water Report*, Business Monitor International, London, www.dk-export.dk/media/1321242/bmi-turkey-water-report-q1-2015.pdf.

EC (2016), *Turkey 2016 Report*, European Commission, Brussels, https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/pdf/key_documents/2016/20161109_report_turkey.pdf.

Gürlük, S. and F. Ward (2009), "Integrated basin management: Water and food policy options for Turkey", *Ecological Economics*, Vol. 68/10, Elsevier, Amsterdam, pp. 2666-2678, https://ideas.repec.org/a/eee/ecolec/v68y2009i10p2666-2678.html.

IPCC (2014), *Climate Change 2014*, Intergovernmental Panel on Climate Change, R.K. Pachauri and L.A. Meyer (eds.), Geneva.

MEU (2016a), *State of the Environment Report for Republic of Turkey*, Ministry of Environment and Urbanization, Ankara.

MEU (2016b), *EU Integrated Environmental Approximation Strategy 2016-2023*, Ministry of Environment and Urbanization, Ankara.

MEU (2012), *Climate Change Action Plan*, Ministry of Environment and Urbanization, Ankara, http://iklim.cob.gov.tr/iklim/Files/IDEP/%C4%B0DEP_ENG.pdf.

MoD (2014), *The Tenth Development Plan*, Ministry of Development, Ankara, www.mod.gov.tr/Lists/RecentPublications/Attachments/75/The%20Tenth%20Development%20Plan%20(2014-2018).pdf.

OECD (2018), "Financing water: Investing in sustainable growth", *OECD Environmental Policy Paper,* No. 11, www.oecd.org/water/Policy-Paper-Financing-Water-Investing-in-Sustainable-Growth.pdf.

OECD (2017), *Diffuse Pollution, Degraded Waters*, OECD Studies on Water, OECD Publishing, Paris,

www.oecd-ilibrary.org/docserver/9789264269064-en.pdf?expires=1529937065&id=id&accname=ocid84004878&checksum=82B935D9BAA9FED89DA8F23766E47CE6.

OECD (2016a), *Water Policy Reforms in Eastern Europe, the Caucasus and Central Asia*, OECD National Policy Dialogues on water in EECC, Paris, www.oecd.org/env/outreach/EUWI%20Report%20layout%20English_W_Foreword_Edits_newPics_13.09.2016%20WEB.pdf.

OECD (2016b), *OECD Council Recommendation on Water*, OECD Publishing, Paris, www.oecd.org/environment/resources/Council-Recommendation-on-water.pdf.

OECD (2016c), "Water, growth and finance", *Policy Perspectives*, OECD Publishing, Paris, www.oecd.org/environment/resources/Water-Growth-and-Finance-policy-perspectives.pdf.

OECD (2015), *Water and Cities: Ensuring Sustainable Futures*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264230149-en.

OECD (2014), *The Governance of Regulators*, OECD Best Practice Principles for Regulatory Policy, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264209015-en.

OECD (2013), *Water Security for Better Lives,* OECD Studies on Water, OECD Publishing, Paris, www.oecd.org/publications/water-security-9789264202405-en.htm.

OECD (2012), *A Framework for Financing Water Resources Management*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264179820-en.

OECD EAP Task Force (2010), *Proceedings from the Regional Meeting on Private Sector Participation in Water Supply and Sanitation in EECCA*, www.oecd.org/env/outreach/48493702.pdf.

TurkStat (2018), *Water Statistics* (database), Turkish Statistical Institute, www.turkstat.gov.tr/PreTablo.do?alt_id=1019 (accessed 16 October 2018).

World Bank (2016a), *Turkey Sustainable Urban Water Supply and Sanitation*, World Bank, Washington, DC, www.worldbank.org/en/country/turkey/publication/turkey-sustainable-urban-water-supply-and-sanitation-report.

World Bank (2016b), *Turkey's Future Transitions: Systematic Country Diagnostic*, World Bank, Washington, DC, http://documents.worldbank.org/curated/en/783401489432683796/pdf/112785-SCD-PUBLIC-TR.pdf.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where governments work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Union takes part in the work of the OECD.

OECD Publishing disseminates widely the results of the Organisation's statistics gathering and research on economic, social and environmental issues, as well as the conventions, guidelines and standards agreed by its members.

OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
(97 2019 01 1 P) ISBN 978-92-64-30974-6 – 2019

OECD Environmental Performance Reviews

TURKEY

Turkey is the fastest growing OECD economy with rapidly increasing greenhouse gas emissions. Since 2008, its economic growth has been relatively decoupled from air emissions, energy use, waste generation and water consumption. However, the high resource intensity of Turkey's economy and its heavy reliance on fossil fuels will continue to increase these environmental pressures in absolute terms. More progress is needed in the transition to a low-carbon, circular economy to improve the country's environmental performance.

This is the third Environmental Performance Review of Turkey. It evaluates progress towards sustainable development and green growth, with special features on climate change and urban wastewater management.

Consult this publication on line at ***https://doi.org/10.1787/9789264309753-en***.

This work is published on the OECD iLibrary, which gathers all OECD books, periodicals and statistical databases. Visit ***www.oecd-ilibrary.org*** for more information.

2019

OECD*publishing*

www.oecd.org/publishing

ISBN 978-92-64-30974-6
97 2019 01 1 P

9 789264 309746