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

This report reviews the environmental performance of Ireland since the previous review in 2010. 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 Ireland's historical environmental record, present state of the environment, physical endowment in natural resources, economic conditions and demographic trends.

The OECD is indebted to Ireland's Department of the Environment, Climate and Communications and the Department of Transport for their co-operation in providing information and in organising the virtual review mission (15-18 June 2020) and policy mission (29 October 2020), as well as for facilitating contacts inside and outside government institutions. Thanks are also due to all government departments and agencies that participated in the virtual missions and/or provided information and comments, as well as to the non-governmental organisations that provided written inputs, including An Taisce – The National Trust for Ireland, Chambers Ireland, Engineers Ireland, Irish Business and Employers Confederation, Irish Congress of Trade Unions, Irish Farmers' Association and the public transport provider Córas Iompair Éireann.

The OECD is grateful to the representatives of the two examining countries, Philippe Ayoun (France) and Therese Lundblad (Sweden), for participating in the review.

The authors of this report are Carla Bertuzzi, Nils Axel Braathen, Ivana Capozza, Eugene Mazur (OECD Environment Directorate) and Tatiana Samsonova (International Transport Forum – ITF), under the co-ordination and guidance of Ivana Capozza. Nathalie Girouard provided oversight. Carla Bertuzzi provided statistical support; Annette Hardcastle, Shellie Phillips and Fiona Smyth provided administrative support; and Mark Foss copy-edited the report. Natasha Cline-Thomas provided communications support. Preparation of this report also benefited from inputs and comments from Ellie Avery, Martha Baxter, Jane Ellis, Guillaume Gruère, Aimée Aguilar Jaber, Xavier Leflaive, Britta Labuhn, Mark Mateo, Anna Pietikainen, Douglas Sutherland, Jonas Teusch, Konstantinos Theodoropoulos of the OECD Secretariat, and Till Bunsen, Pierpaolo Cazzola, Jari Kauppila, Orla Therese McCarthy and Elisabeth Windisch of the ITF Secretariat.

The OECD Working Party on Environmental Performance discussed the Environmental Performance Review of Ireland at its meeting on 9 December 2020 and approved the Assessment and Recommendations.

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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, Colombia, Israel*, Japan, Korea, Mexico, New Zealand and the United States.

Costa Rica was not an OECD Member at the time of preparation of this publication. Accordingly, Costa Rica does not appear in the list of OECD members and is not included in the zone aggregates.

Country aggregates may include Secretariat estimates.

This publication presents European Union (EU) data that predate the United Kingdom's withdrawal from the European Union on 1 February 2020. Therefore, the EU aggregate presented here refers to the European Union including the United Kingdom, unless otherwise stated.

Currency

Monetary unit: Euro (EUR)

In 2020, USD 1 = EUR 0.919

In 2019, USD 1 = EUR 0.893

In 2018, USD 1 = EUR 0.847

Cut-off date

This report is based on information and data available up to 1 December 2020.

Abbreviations and acronyms

BIK	Benefit-in-kind
CNG	Compressed natural gas
CO_2 eq	Carbon dioxide equivalent
CSO	Central Statistics Office
DAFM	Department of Agriculture, Food and the Marine
DECC	Department of the Environment, Climate and Communications
DHLGH	Department of Housing, Local Government and Heritage
DMC	Domestic material consumption
DoT	Department of Transport
DPER	Department of Public Expenditure and Reform
DTTAS	Department of Transport, Tourism and Sport
EC	European Commission
EEA	European Environment Agency
EIA	Environmental impact assessment
EPA	Environmental Protection Agency
ETS	Emissions Trading System
EU	European Union
EV	Electric vehicle
GDP	Gross domestic product
GHG	Greenhouse gas
GNI	Gross national income
IEA	International Energy Agency
IPC	Integrated Pollution Control
IUCN	International Union for Conservation of Nature
LULUCF	Land use, land-use change and forestry
MOT	Mineral oil tax
MPR	Minimum parking requirement
Mtoe	Million tonnes of oil equivalent

NDP	National Development Plan
NEC	National Emission Ceilings Directive
NECP	National Energy and Climate Plan
NGO	Non-governmental organisation
NIECE	Network for Ireland's Environmental Compliance and Enforcement
NO_x	Nitrogen oxides
NPF	National Planning Framework
NTA	National Transport Authority
NWPP	National Waste Prevention Programme
OMV	Original market value
PM_{10}	Particulate matter smaller than 10 microns in diameter
$PM_{2.5}$	Particulate matter smaller than 2.5 microns in diameter
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
SEAI	Sustainable Energy Authority of Ireland
SMEs	Small and medium-sized enterprises
SO_x	Sulphur oxides
TII	Transport Infrastructure Ireland
TPES	Total primary energy supply
USD	United States dollar
VAT	Value added tax
VRT	Vehicle registration tax

Basic statistics of Ireland

2019 or latest available year (Numbers in parentheses refer to the OECD average)[1]

PEOPLE AND SOCIETY					
Population (million)	5		Population density per km^2	69	(36)
Share of population by type of region			Population annual growth rate, latest 5 years	1.1	(0.6)
Predominantly urban (%)	28	(48)	Income inequality (Gini coefficient)	0.30	(0.32)
Intermediate (%)	15	(28)	Poverty rate (% of pop. with less than 50% med. income)	9	(11)
Rural (%)	57	(24)	Life expectancy	82	(81)
ECONOMY AND EXTERNAL ACCOUNTS					
Total GDP (National currency, billion)	356		Imports of goods and services (% of GDP)	113	(27)
Total GDP (USD billion, current PPPs)	447		Main exports (% of total merchandise exports)		
GDP annual real growth rate, latest 5 years	9.8	(2.2)	Medicinal and pharmaceutical products	32	
GDP per capita (1 000 USD current PPPs)	91	(47)	Organic chemicals	20	
Value added shares (%)			Electrical machinery, appliances, n.e.s.	6	
Agriculture	1	(2)	Main imports (% of total merchandise imports)		
Industry including construction	39	(25)	Other transport equipment	23	
Services	60	(74)	Medicinal and pharmaceutical products	8	
Exports of goods and services (% of GDP)	126	(27)	Office and automatic data processing machines	6	
GENERAL GOVERNMENT					
Percent of GDP					
Expenditure	25	(40)	Education expenditure	3.2	(5.0)
Revenue	26	(37)	Health expenditure	5.0	(7.7)
Gross financial debt	69	(108)	Environment protection expenditure	0.4	(0.5)
Fiscal balance	0.6	-(2.9)	Environmental taxes (% of GDP)	1.4	(1.6)
			(% of total tax revenue)	5.7	(5.3)
LABOUR MARKET, SKILLS AND INNOVATION					
Unemployment rate (% of civilian labour force)	5.0	(5.4)	Patent in environment-related technologies (% of all technologies, average of latest 3 years)[2]	6	(10)
Tertiary educational attainment of 25-64 year-olds (%)	47	(38)	Environmental management	2	(4)
Gross expenditure on R&D (% of GDP)	1.0	(2.4)	Water-related adaptation technologies	0.2	(0.5)
			Climate mitigation technologies	5	(8)
ENVIRONMENT					
Energy intensity TPES per capita (toe/cap.)	2.7	(4.1)	Road vehicle stock (vehicles/100 inhabitants)	57	66
TPES per GDP (toe/1 000 USD 2015 PPPs)	0.03	(0.09)	Water stress (abstraction as % of avail. resources)	3	(9)
Renewables (% of TPES)	11.1	(10.8)	Water abstraction per capita (m^3/cap./year)	338	(710)
Carbon intensity (energy-related CO_2)			Municipal waste per capita (kg/capita)	590	(525)
Emissions per capita (t/cap.)	7.3	(8.9)	Material productivity (USD, 2010 PPPs/DMC, kg)	3.5	(2.9)
Emissions per GDP (t/1 000 USD 2015 PPPs)	0.08	(0.20)	Land area (1 000 km^2)	69	
GHG intensity[3]			% of arable land and permanent crops	6.5	(12)
Emissions per capita (t CO_2 eq/cap.)	12.6	(12.0)	% of permanent meadows/pastures	58	(22)
Emissions per GDP (t CO_2 eq/1 000 USD 2015 PPPs)	0.18	(0.30)	% of forest area	11	(31)
Mean population exposure to air pollution ($PM_{2.5}$), µg/m^3	7.8	(13.9)	% of other land (built-up/other land)	24	(34)

Note: 1. Values earlier than 2014 are not taken into consideration. Where the OECD aggregate is not provided in the source database, a simple OECD average of latest available data is calculated where data exist for a significant number of countries. 2. Patent applications for higher-value inventions that have sought protection in at least two jurisdictions. 3. Excluding emissions/removals from land use, land-use change and forestry. Emissions expressed in CO_2 equivalent.

Source: Calculations based on data extracted from the databases of the following organisations: OECD, Eurostat, International Energy Agency and the World Bank.

Executive summary

Additional effort is required to pursue the Sustainable Development Goals related to climate, energy, water and biodiversity

Over the last decade, Ireland's environmental outcomes broadly followed the economic cycle. Major environmental pressures, such as emissions of greenhouse gases (GHGs) and air pollutants, nitrogen balance, waste generation and material consumption declined during the 2007-12 recession. Significant underinvestment in the wake of the recession affected the quality of infrastructure and slowed down environmental progress. Environmental pressures rose with the fast economic growth of 2014-19. They are likely to intensify with population growth and increasing urban sprawl, road traffic and livestock. The positive environmental effects of the COVID-19 crisis are expected to be temporary.

Ireland needs to follow through on plans to meet its ambitious climate goals

The 2020 target for emissions outside the European carbon market appears out of reach, despite the impact of the COVID-19 crisis. GHG emissions rose by 3% in 2014-19. More determined action is needed to tackle emissions from buildings, transport and agriculture (especially from ruminant livestock). Ireland committed to phase out coal and peat electricity generation in the 2020s. The share of renewables in the energy mix – especially wind power – has more than doubled since 2010. However, fossil fuels dominate, with coal, peat and oil providing about half of home heating. Ireland needs to phase out residential fossil fuel boilers more rapidly, while considering fuel-poverty risks. It should also focus support for energy efficiency on deep building renovations.

The 2019 Climate Action Plan takes a major step towards bringing emissions outside the European cap-and-trade system in line with the 2030 target of -30% (compared to 2005). It would also put Ireland on the path to the net-zero emission goal by 2050. The plan's implementation requires considerable investment. Given public finance constraints, engaging the private sector is crucial to direct investment towards renewables, home retrofitting and electric vehicles (EVs), among others.

Ireland needs to maintain commitment towards a "just transition" to a carbon-neutral economy. The negative net impact on employment is expected to be modest but concentrated in some areas. The government appointed a Just Transition Commissioner and launched a dedicated fund to address the short-term job losses in the Midlands associated with the peat phase-out.

Ireland needs to consolidate the good outcomes of air and waste management

Emissions of most air pollutants have declined since 2010 and air quality is generally good. However, ammonia from agriculture has continued rising and further reducing nitrogen oxides (NO_x) emissions from transport is challenging. Localised air pollution is mostly associated to urban road transport and solid fuel

burning for home heating. The ban on “smoky fuels” in selected locations has helped reduce emissions of fine particulate matter, and should be eventually extended to the whole country.

The progressive increase of the landfill tax has contributed to largely diverting waste from landfills, but municipal waste recycling has stagnated. A large share of recyclable and reusable materials is incinerated or exported. Much waste is not properly sorted. Not all service providers charge separate fees for recyclable or food waste. The Waste Action Plan for a Circular Economy 2020-25 includes a wide range of actions to prevent waste and achieve the post-2020 recycling targets.

Inadequate water infrastructure and farming exert high pressure on water quality

Measures to address diffuse water pollution from nutrient losses are urgently needed. Ireland provides financial and technical support to improve farming practices, but needs to shift towards payments based on measurable environmental improvements. Some agricultural inputs benefit from favourable tax treatment. Removing these exemptions would contribute to a more efficient use of resources, improving water quality and reducing GHG and ammonia emissions.

Investment in water infrastructure increased considerably, but Ireland still suffers from high water losses, hot spots of low drinking water quality and inadequate wastewater treatment. Ireland stands out in the OECD in not charging households for water services. Only households that use water above a certain threshold will have to pay an excess use charge from 2022. Hence, the state budget covers the vast majority of water sector financing needs. This model may not be able to keep up with the scale of required investment.

More consistent action is needed to halt biodiversity loss

Ireland has strengthened its biodiversity policy framework, but most habitats remain in unfavourable condition mainly due to pressures from agriculture, resource extraction, and housing and infrastructure development. The national peatland programme, which has helped restore some bog habitats, could be accelerated. Most funding for biodiversity conservation is channelled through agri-environmental payments, but their effectiveness is uncertain. Site-specific conservation objectives and measures are lacking for many sites in the terrestrial Natura 2000 network, and the marine Natura 2000 network is incomplete. In a welcome move, the government pledged to protect 30% of Ireland’s marine waters by 2030, compared to the current 2%, as well as to complete a national marine planning framework.

Environmental governance is deliberative, participative and transparent, but compliance assurance needs to be strengthened further

Ireland implements good international practices in many aspects of environmental governance. National and local environmental institutions collaborate well horizontally and vertically. *Ex ante and ex post* evaluations support policy making in an effective manner. However, Ireland needs to consolidate regulations, especially in the water domain, in the wake of a disorderly transposition of EU directives. Access to environmental information and justice is widely guaranteed. Public participation is a central element of policy, licensing and planning decisions. Environmental licensing has become more efficient, but extending general binding rules would help reduce the administrative burden on low-impact installations.

Enforcement and compliance promotion are well co-ordinated, but non-compliance levels are relatively high. Inspections are largely based on systematic risk assessment of regulated activities. In a rare practice in the OECD, enforcement fees recover most inspection and enforcement costs. Enforcement mostly relies

on criminal law, imposing a substantial burden on the regulator. Criminal monetary penalties are capped at relatively low levels. Their deterrent effect should be increased by linking them to the economic benefit of non-compliance. Ireland should also introduce variable administrative fines to decriminalise less serious environmental offences.

The response to the COVID-19 crisis should help make the economy greener and more inclusive

Swift action is needed to steer the recovery towards the green transformation and avoid a rebound of environmental pressures. As part of its response to the crisis, the government provided sizeable funding to accelerate investment in sustainable transport, energy efficiency, water infrastructure and peatland rehabilitation in 2020-21. Ireland stepped up public investment but needs to further mobilise private finance. The National Development Plan (NDP) 2018-27 allocates around EUR 30 billion (more than a quarter of its outlays) to the climate and energy transition. The NDP in-depth review, to be completed in 2021, provides an opportunity to further align investment priorities with the Sustainable Development Goals.

There is scope to foster eco-innovation and expand green markets. Ireland has a sound innovation system and highly educated human resources. However, public spending on environment- and climate-related research and development is among the lowest in the OECD. It should be increased and better support small and medium-sized enterprises. Ireland has prioritised research on renewables and energy efficiency. It has specialised in some green technologies, but the number of environment-related patents is relatively small.

Ireland should continue greening the tax and subsidy system

A credible trajectory of carbon prices would encourage low-carbon consumption, investment and innovation. In a welcome move, the government committed to continue increasing the carbon tax to reach EUR 100 per tonne of carbon dioxide in 2030, from EUR 33.50 in 2021. Part of the carbon tax receipts will be used to prevent fuel poverty; ensure a just transition of displaced workers; and finance climate-related investment. To maintain a consistent price signal, Ireland should gradually remove remaining tax exemptions and rebates that encourage wasteful fuel use in agriculture, fishery, heating and transport. Some support to coal and peat has already been phased out.

Mobility patterns and trends are a source of rising environmental pressures

Ireland's dispersed settlement pattern and low population density imply that road transport is by far the dominant transport mode. Road transport is a major and increasing source of GHG emissions. The progressive shift to diesel and second-hand vehicles raises concerns over urban air pollution. Transport activity sharply declined in 2020 due to measures to contain the pandemic. However, medium- and long-term effects of the COVID-19 crisis on mobility patterns and environmental impacts are unclear.

Ireland has taken positive steps to reduce environmental damage from mobility

Ireland has implemented a CO_2- and NO_X-based vehicle taxation system and provided generous grants for the purchase of EVs. The government committed to higher investment in rail, public transport and active mobility and to two-to-one spending on public transport over roads, as well as to reallocate road space to more sustainable modes. Co-ordination of land-use and transport planning has improved to promote compact growth. However, Ireland should better enforce planning regulations to ensure that all

developments promote settlements with easy access to transport links and include a network of safe walking and cycling routes.

Better incentives are needed to manage travel demand

Reducing reliance on private vehicles and providing credible alternatives remains a challenge. Congestion and its costs have grown and are expected to increase further, especially in the Greater Dublin Area. Except for the Dublin Tunnel, Ireland does not use road use charges to manage travel demand. Hidden car use subsidies, such as free parking at a workplace, provide implicit incentives to commute by car. Ireland should consider congestion charges alongside investment and policies to enhance travel conditions for pedestrians, cyclists and public transport users. Revenue from charges could fund such investment and provide income support to vulnerable households.

The cost-effectiveness of EV promotion could be enhanced

Ireland set a target of almost 1 million EVs by 2030 as the main pillar of its strategy to decarbonise transport. Generous subsidies have supported sales of EVs, although their share in the fleet remains negligible. Ireland should complement its costly EV subsidies with travel demand management – including road pricing – higher taxation of conventional vehicles and a more extensive charging network. Focusing transport taxation on road use will better address environmental and congestion costs, as well as help offset declining revenue from fuel taxes due to the shift to EVs over the medium term.

The low-carbon transition of the freight sector needs a coherent strategy

In Ireland, the majority of goods are moved by road, as the capacity and usage of rail for freight transport are limited. The government has been promoting the use of alternative fuels for trucks, with a focus on natural gas. Potential remains to integrate road freight, rail and shipping and rebalance economic incentives in favour of rail freight. Additional measures, such as standardisation and data sharing, could improve logistics efficiency and help reduce GHG emissions. Ireland should remove the cap on diesel prices for road hauliers, which limits their incentives to shift to more fuel-efficient vehicles, driving habits and logistics systems.

Assessment and recommendations

The Assessment and Recommendations present the main findings of the OECD Environmental Performance Review of Ireland. They identify 43 recommendations to help the country make further progress towards its environmental objectives and international commitments. The OECD Working Party on Environmental Performance discussed and approved the Assessment and Recommendations at its meeting on 9 December 2020.

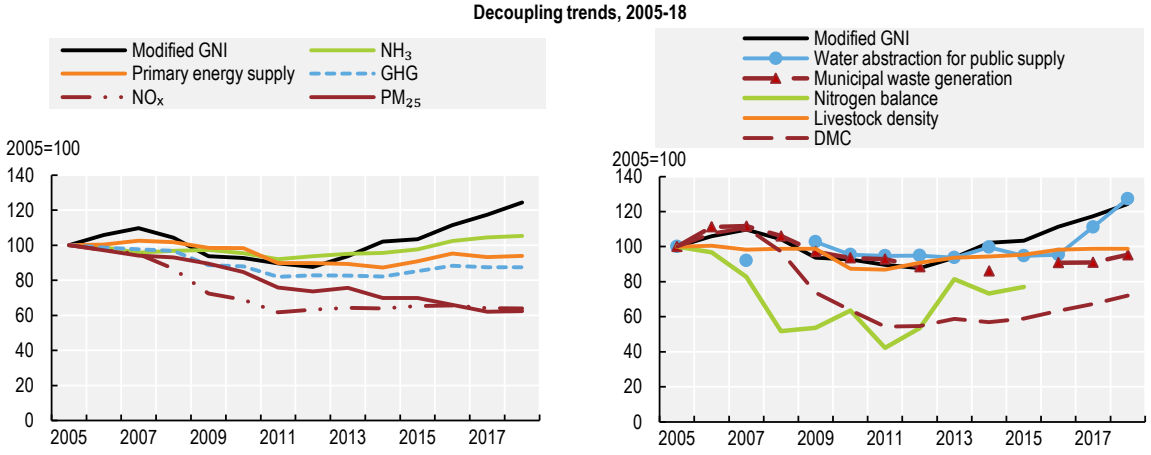
1. Environmental performance: Trends and policy developments

Progress in decoupling the economy from the main environmental pressures has been uneven

Ireland is mostly a sparsely populated rural country, with several dynamic high-tech industrial clusters concentrated in sprawling urban areas. The export-oriented agro-food sector is based around dairy and beef production from grassland, and it makes a notable contribution to the economy and employment. Ireland hosts a large share of Europe's remaining peatlands, which have been under pressure from peat extraction for electricity generation and domestic heating.

The global financial crisis plunged the economy into a severe recession in 2007-12. This affected environmental outcomes in two ways. Emissions of greenhouse gases (GHGs) and air pollutants, waste generation and material consumption declined during the crisis (Figure 1). However, the need for fiscal consolidation meant lower public investment in environmental protection and resource management (Section 3). This has slowed down progress. With the economic recovery and fast growth, environmental pressures have risen since the mid-2010s, although at a slower pace than the economy (Figure 1).

Figure 1. A mixed performance in delinking environmental pressures from economic growth



Note: Modified GNI: Gross national income in constant prices, excluding highly mobile economic activities that affect the measurement of the Irish economy (retained earnings of re-domiciled companies; depreciation of Irish-based, foreign-owned, intellectual property assets; aircrafts).
Left panel: GHG emissions: without land use, land-use change and forestry (LULUCF).
Right panel: DMC: Domestic material consumption calculated as the sum of domestic extraction of raw materials used by an economy and their physical trade balance. Livestock density: based on livestock units (LSU), where one LSU is the grazing equivalent of one adult dairy cow producing 3 000 kg of milk annually, fed without additional concentrated foodstuffs. Nitrogen balance is calculated as the difference between the nutrient inputs and the nutrient outputs.
Source: CSO (2020), "National Accounts", *StatBank* (database); FAO (2020), *FAOSTAT* (database); IEA (2020), *IEA World Energy Statistics and Balances* (database); OECD (2020), *OECD Environment Statistics* (database).

StatLink https://doi.org/10.1787/888934232010

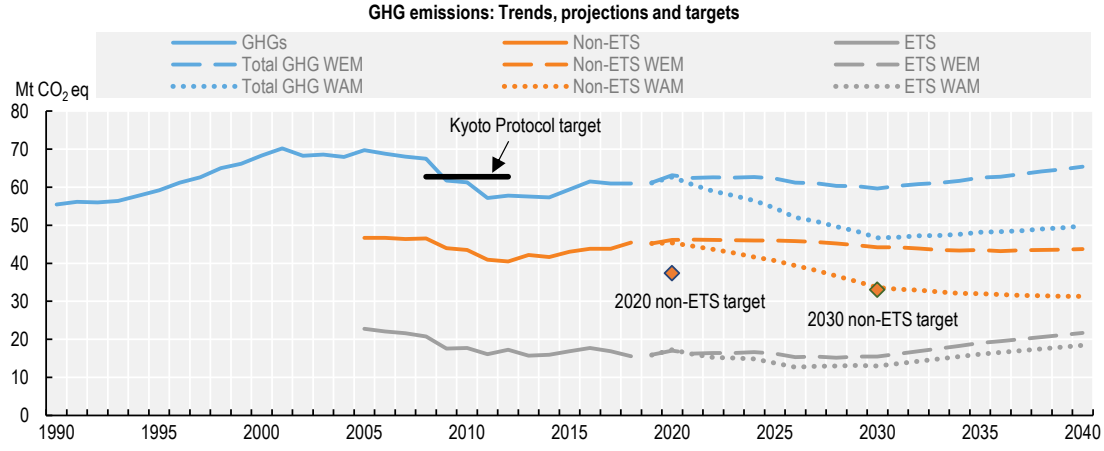
Ireland has made considerable progress towards the Sustainable Development Goals (SDGs) linked to poverty and inequality reduction, economic growth and jobs, education, cities and communities, industry and innovation. However, additional effort is required to pursue the SDGs related to climate, energy, water and biodiversity. Climate, circular economy and environmental policies have gained renewed impetus in recent years, with various well-designed policy initiatives. These need to be thoroughly implemented in a timely fashion to alleviate the growing pressures from demographic development, urban sprawl, road traffic and intensification of agricultural practices. As in other countries, the COVID-19 crisis has had some positive environmental effects. Ireland's own history shows that early action is needed to steer the economic recovery towards low-carbon and circular patterns and avoid a rebound of environmental pressures. This would also make the economy and environment more resilient to future shocks.

The 2020 climate target appears out of reach despite the impact of the COVID-19 crisis

Ireland has one of the highest rates of GHG emissions per capita in the OECD and in Europe. It has an unusual GHG emission profile: agriculture accounts for more than a third of emissions, second only to New Zealand among OECD member countries. Biogenic methane emissions from livestock make up the bulk of these emissions. Transport, mostly by road, is the second largest emission source, making up 20% of emissions (Section 4). Only a quarter of Ireland's GHG emissions are covered by the European Union Emissions Trading System (EU ETS); these are emissions from fossil-fuel based energy generation and energy-intensive industry. Under the EU climate policy framework, Ireland is required to reduce its emissions outside the EU ETS (i.e. three-quarters of its total emissions) by 20% by 2020 and by 30% by 2030 compared to the 2005 level.

Ireland's GHG emissions declined markedly during the sovereign debt crisis. This allowed the country to meet the Kyoto Protocol target under the first commitment period (2008-12) (Figure 2). With the economic recovery, GHG emissions rose by 8% in 2014-18. In 2018, emissions were marginally above their level at the beginning of the decade. Provisional data for 2019 show a 4.5% decrease from the previous year, owing to lower power generation from coal and peat, reduced application of nitrogen fertilisers and lime on soils, and a warmer winter. This is the largest annual emission reduction since 2011. Nonetheless, in 2019, Ireland exceeded its annual non-ETS emission limit for the fourth consecutive year. It is unlikely to meet its 2020 target (Figure 2), regardless of the impact of the COVID-19 crisis (EPA, 2020a). Modelling suggests that the COVID-19 crisis led to a nearly 10% decline in overall GHG emissions in 2020 compared to a business-as-usual scenario (de Bruin, Monaghan and Yakut, 2020), which does not appear enough to meet the 20% reduction target by 2020.

Figure 2. Ireland can achieve the 2030 targets if it implements additional measures



Note: GHG = Greenhouse gas emissions excluding land use, land-use change and forestry (LULUCF); ETS = Emissions Trading System. The dashed lines show GHG emission projections with existing measures (WEM), i.e. with measures in place by the end of 2018. The dotted lines show GHG emission projections with additional measures (WAM) scenario, which assumes the full implementation of the measures included in the 2019 Climate Action Plan. The 2020 target requires non-ETS emissions (i.e. emissions from agriculture, transport, residential, commercial, non-energy intensive industry and waste) to be 20% below their 2005 levels. The 2030 target requires non-ETS emissions to be 30% below their 2005 level. The targets are achievable through the use of flexibility mechanisms as defined by the EU Effort Sharing Decision and Effort Sharing Regulation. The WEM and WAM projections do not include the use of these flexibilities.
Source: EPA (2020), *Ireland's Greenhouse Gas Emissions Projections 2019-2040*.

StatLink https://doi.org/10.1787/888934232029

Ireland has raised its ambition in transitioning towards a low-carbon economy…

The adoption of the Climate Action Plan in 2019 represented a major step forward in Ireland's climate mitigation policy. The plan identifies the pathway to reduce GHG emissions in the sectors not covered by the EU ETS by 30% by 2030, consistently with the net-zero emission goal by 2050. It provides a strong signal to economic operators and households to drive future investment and consumption. The June 2020 Programme for Government raised the ambition to more than halving national emissions between 2021 and 2030. The Climate Action and Low Carbon Development (Amendment) Bill, under preparation at the time of writing, is expected to enshrine the 2050 climate-neutrality goal in law and to require five-year carbon budgets. New policies and measures will have to be identified to make the Climate Action Plan consistent with these more ambitious goals.

…but needs to consistently follow through on planned measures to meet climate targets

Engaging the private sector will be essential to deliver

Fully implementing the Climate Action Plan in a timely fashion would bring Ireland's non-ETS emissions down by 29% in 2030 compared to 2005, close to the 2030 target (Figure 2) (EPA, 2020b). The emission drop linked to the COVID-19 crisis is not expected to substantially change the long-term outlook (de Bruin, Monaghan and Yakut, 2020). However, achieving the climate objectives is challenging. The plan's implementation requires considerable investment and financial resources, but these have not been sufficiently assessed (EC, 2020). Given public finance constraints, mobilising the private sector and financial markets is crucial. Planned actions such as massive home retrofitting and expansion of the use of electric vehicles (EVs) (Section 4) call for households' willingness to invest. Providing stronger price signals (e.g. via the carbon tax, vehicle taxes and road pricing) would encourage businesses and households to make low-carbon investment, production and consumption choices. Consideration should be given to affordability issues, employment impact and regional disparities (Section 3).

Ireland is not on track to achieve its 2020 renewables and energy savings targets

The country heavily depends on fossil fuels, including solid fuels, for both electricity generation and residential heating. It has committed to phase out coal and peat electricity generation by 2025 and 2028, respectively. About a third of active peat bogs have already been closed to extraction. The share of renewable sources in the energy mix has more than doubled since 2010, thanks to a rapid expansion of wind power. However, in 2018, renewables accounted for 11% of the gross final energy consumption, compared to the 2020 target of 16%. Ireland has vast potential for offshore wind, but the lack of a marine spatial planning and development consent framework for offshore facilities has hampered development (IEA, 2019). The Climate Action Plan aspires to reach 70% of electricity generated from renewables by 2030, nearly double the 2019 share. New support systems for renewable electricity and heat were launched in 2020 to help attract investment in the sector.

Energy use has been on the rise since the mid-2010s. Reducing energy use and GHG emissions from transport will require substantial changes in mobility patterns and land-use planning, in addition to a massive shift to EVs foreseen by the Climate Action Plan (Section 4). Several grant schemes have supported energy efficiency improvements in buildings and contributed to reducing energy use and related GHG emissions in the residential sector since 2010. However, per capita carbon dioxide (CO_2) emissions from fuel combustion of households were still 52% above the OECD Europe average in 2018. New housing has increasingly moved away from oil boilers, but carbon-intensive fossil fuels (coal, peat and oil) provide about half of home heating in Ireland. The implementation of the near-zero energy building standard, as from late-2019, will help improve energy performance of new buildings.

The Climate Action Plan pledges to retrofit a third of the housing stock by 2030, install 600 000 heat pumps and upgrade the energy rating of all public sector buildings. In line with this commitment, the government budget for 2021 increased the funding for residential and community energy efficiency by over 80% compared to the previous year (Section 3). However, residential energy efficiency support programmes have targeted simpler and cheaper upgrades, which have already been implemented.

Reducing GHG emissions from agriculture remains a major challenge

Emissions from agriculture rose by 10% between 2010 and 2019 as the dairy herd and milk production increased. The implementation of the measures foreseen in the Climate Action Plan is expected to help bend the curve (EPA, 2020b). In 2019, the Department of Agriculture, Food and the Marine (DAFM) released a draft roadmap (Ag-Climatise) to translate the plan's targets into more detailed actions and targets for agriculture and land use. However, there are concerns over Ireland's ability to reconcile increased agro-food production and exports with climate, air, water and biodiversity objectives.

Ireland's approach to managing the carbon footprint and environmental impacts of farming (especially of ruminant livestock) has focused on increasing production efficiency. In addition to mandatory requirements, the policy mix relies on agri-environmental support schemes, guidelines and advisory services to encourage famers to improve their technology and practices, as well as herd genetics. However, the continuously increasing GHG and ammonia emissions, as well as water pollution from nutrients, suggest this approach needs to be strengthened to achieve further environmental improvements (EPA, 2020b; OECD, 2020a). Completing the policy mix with outcome-based support to farmers and pricing instruments could help improve effectiveness (OECD, 2020b). Transitionary compensation measures could help maintain income security and well-being of farmers. The government aims to triple the country's share of organic-farmed land to bring it to the EU average of 7.5%.

Efforts to adapt to climate change impact have intensified

Ireland's economic losses due to extreme weather and climate-related events were among the highest in the European Union – about EUR 1 000 per capita over 1980-2017 (EEA, 2019). The highest climate-related risks are increased frequency of storms and intense precipitation events, with associated flooding and damage to agriculture, the built environment and infrastructure. More than half of the population lives near rivers and coasts, where risks are the highest.

Ireland has made considerable progress in preparing for the impact of climate change. It adopted a National Adaptation Framework in 2018, followed by sectoral and local adaptation plans. These plans should be reviewed in line with the national climate risk assessment released by the Environmental Protection Agency (EPA) and the Centre for Marine and Renewable Energy in 2020. The web-based platform Climate Ireland provides information and practical guidance to help decision makers, adaptation practitioners and citizens plan for a changing climate and take preventive measures. In 2019, the EPA updated its guidelines on integrating climate factors, including resilience to climate-related risks, into strategic environmental assessment (SEA) of plans and programmes. The National Development Plan (NDP) 2018-27 includes public funding for investment in flood defence and enhanced infrastructure resilience. The private sector, including the insurance sector, should be more engaged in climate-proofing investment.

More progress is needed to meet the air emissions and air quality objectives

Emissions of major air pollutants, with the exception of ammonia, have declined since 2010 (Figure 1). This decline was partly due to the economic crisis and partly thanks to reduced use of coal and peat in power generation and residential heating, upgrade of power plants and renewal of the car fleet. However, after dropping at the beginning of the decade, emissions of nitrogen oxides (NO_x) have stabilised. Reducing

NO_x emissions from transport has proven difficult; the benefits of improved technology have been offset by the increasing number of vehicles, especially diesel vehicles (Section 4). Ammonia emissions, mostly from increasing cattle population and nitrogen fertiliser use, have risen steadily since the early 2010s and are projected to continue rising.

The National Air Pollution Control Programme (forthcoming in 2021) will consider the Climate Action Plan, as many measures outlined in the plan (e.g. in the transport and residential sectors) will help reduce local pollutant emissions. Only full implementation of these measures, especially a shift to electric mobility, will bring NO_x emissions below the 2030 target of the EU National Emissions Ceilings Directive. Compliance with the 2020 and 2030 ceilings for ammonia will require new measures in farming (EPA, 2020c). Such measures are expected to be included in the forthcoming DAFM's roadmap Ag-Climatise.

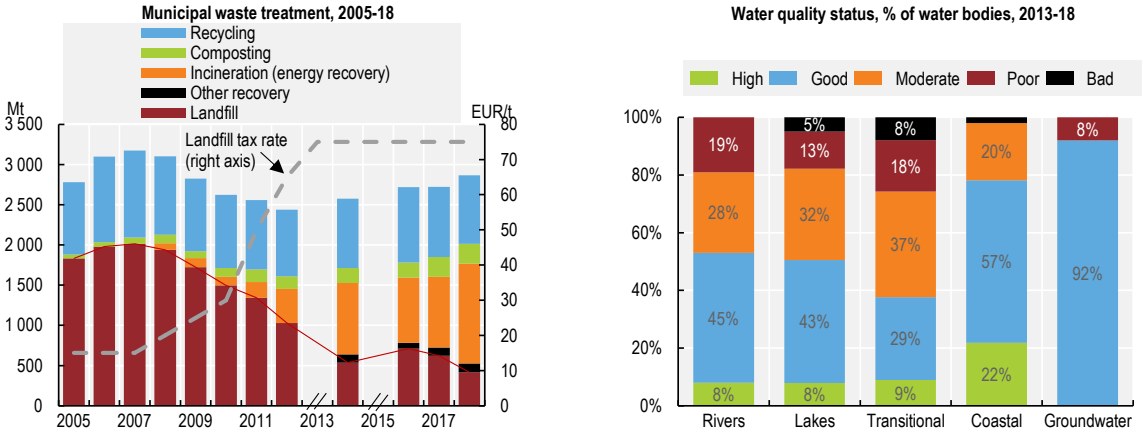
Air quality is generally good. However, in 2019, the EU annual average limit values for nitrogen dioxide (NO_2) were exceeded in Dublin at one urban location due to traffic pollution. In the same year, concentrations of fine particulate matter ($PM_{2.5}$) exceeded the World Health Organization (WHO) guideline value at more than a third of monitoring stations. This was mostly due to the burning of solid fuels in cities and towns (EPA, 2020d). The ban on the sale and use of bituminous coal (or "smoky fuel") in selected larger urban centres (so-called Low Smoke Zones) has helped reduce pollution from particulates. In September 2020, the ban was extended to cover half of Ireland's population. However, more determined action is needed to move away from solid fuels for heating, while considering fuel-poverty risks. Since 2017, Ireland has expanded its air quality monitoring network and modelling capacity remarkably. This has allowed it to identify where localised air pollution problems exist.

Waste management has greatly improved, but circularity could be further developed

The progressive increase of the landfill tax rate (EUR 75/tonne), together with limits on disposal of biodegradable waste, has contributed to diverting waste from landfills (Figure 3). In 2018, landfilling accounted for about 15% of treated municipal waste, less than half the OECD average. Ireland is on track to meet the 2020 EU target for landfilled biodegradable waste, but it may be challenging to reduce recourse to landfills further. Waste incineration with energy recovery has mostly replaced landfilling. Extended producer responsibility programmes have helped increase recycling of several waste streams and meet the related EU targets. However, increased incineration and composting may discourage recycling and prevent Ireland from meeting the post-2020 recycling targets (EC, 2019).

Domestic material consumption and waste generation increased with the rebound of the economy (Figure 1). Material consumption and municipal waste generation per capita are high in international comparison. Municipal waste recycling stagnated for most of the decade, and slightly declined in 2016-18 (EPA, 2020e). Only a minor share of materials is recovered and fed back to the economy, and a large share of waste is not properly sorted. In 2017-18, Ireland rolled out waste collection fee systems based on weight or volume of the waste collected. However, not all service providers apply differentiated fees to recycling or food waste bins. Ireland exports a large part of its waste for recycling, recovery or disposal due to infrastructure capacity constraints (EPA, 2020e).

Figure 3. Waste management has improved; quality of many water bodies is less than good



Left panel: Break in time series in 2014; data for 2018 are preliminary.
Source: EPA (2020), *National Waste Statistics - Report for 2018*; EPA (2019), *Water Quality in Ireland 2013-2018*; OECD (2020), "Municipal waste generation and treatment" and "Environmental policy: Environmental policy instruments", *OECD Environment Statistics* (database).

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The transition to a circular economy calls for developing new recycling industries and secondary raw material markets to better use the stock of materials contained in waste. There is potential to better exploit synergies with policies in other sectors, including industrial and innovation policies, education and active labour market policies, and green public procurement. This is all the more important in response to the disruption of global trade caused by the COVID-19 crisis. A circular economy approach will help increase resilience of supply chains and self-sufficiency (OECD, 2020c). The Waste Action Plan for a Circular Economy (WAPCE) 2020-25 responds to the need for a more consistent approach to a circular economy in Ireland. It aims to mainstream the circularity concept in all economic sectors and includes a wide range of actions to encourage waste prevention, recycling and material recovery. A whole-of-government circular economy strategy and legislation were under preparation at the time of writing.

Inadequate water infrastructure and farming exert high pressure on water quality

Investment in water infrastructure has increased, but financing needs are high

Ireland has considerably improved its water governance with the establishment of Irish Water (the national water utility), the development of the River Basin Management Plan (RBMP) 2018-21 and the adoption of a water services policy statement and funding framework. The latter is based on a mix of government funding (for domestic services and capital investment) and user charges (for non-domestic services).[1] The new institutional setting has made it possible to better identify investment and financing needs in the water sector and to re-launch much-needed investment in infrastructure and services.

The water supply and wastewater treatment infrastructure is ageing and needs to be upgraded. There is sporadic non-compliance with drinking water quality parameters, especially from small private suppliers that serve 20% of the population. Water losses of about 45% have resulted in high and increasing water abstraction for public water supply (Figure 1). A third of the population, mostly living in dispersed rural settlements, relies on independent water treatment systems, with variable performance. Despite infrastructure improvements, treatment in many agglomerations, including Dublin and Cork, still does not conform to the requirements of the EU Urban Wastewater Treatment Directive (compliance was required by 2005). Some smaller settlements continue to discharge untreated wastewater in the environment. The NDP 2018-27 commits to investment of about EUR 8.5 billion in public water infrastructure. This commitment appears sufficient to reduce water losses and bring Ireland in compliance with the EU legal

requirements. However, meeting the water infrastructure needs of a growing population and economy will require a much higher investment (OECD, 2020d).

Ireland stands out among OECD member countries in not charging households for drinking water and wastewater services (OECD, 2020d). Domestic water charges were introduced in 2015 but were abolished a year later due to strong social opposition. Households that use water above a certain threshold will have to pay an excess use charge from 2022. In practice, the charge will apply to less than 10% of metered domestic households. These households account for almost 40% of domestic water consumption and their excessive use is supposed to be due to leaks. The new charge is expected to help reduce water losses and excessive consumption. The limited use of water charges implies the state budget covers the vast majority of water sector financing needs. The funding model may not be able to keep up with the scale of required investment.

Urgent measures are needed to improve water quality

Agriculture and inadequate wastewater treatment are the main drivers of declining water quality in Ireland (Figure 3). Organic pollution of Irish rivers and nutrient concentrations in groundwater bodies are among the lowest in the European Union. However, water bodies have suffered from increasing nutrient pollution. Nitrogen balance has been rising since 2011, together with livestock and nitrogen fertiliser use (Figure 1). Pressures from chemicals have also intensified, with some drinking water supplies exceeding pesticide limits (EPA, 2019). Initiatives such as the Local Authority Waters Programme and the Agricultural Sustainability Support and Advisory Programme appear to be contributing to some water quality improvement in selected priority areas (EPA, 2019). However, urgent measures are needed to address the causes of water quality deterioration, and particularly nutrient losses from agriculture.

There is scope to enhance effectiveness of biodiversity policy

Ireland has strengthened its biodiversity policy framework with the adoption of the Strategic Plan for Biodiversity 2011-20 and the third National Biodiversity Action Plan 2017-21. However, implementation challenges remain due to the variety of sectors that affect biodiversity (e.g. agriculture, fishery, wind energy) and the multitude of actors involved. Government transfers related to biodiversity, mostly for agri-environmental schemes, averaged nearly 30% of all public environment-related transfers in 2010-18. However, funding that directly targets species and habitat conservation is limited. The declining conditions of habitats raise questions about the effectiveness of spending. An assessment of financial needs for biodiversity protection will be concluded in 2021. It is expected to support a public and private finance mobilisation plan. There is a need to extend the whole-of-government approach adopted for climate mitigation to biodiversity policy.

Little progress has been made in extending the protected area network

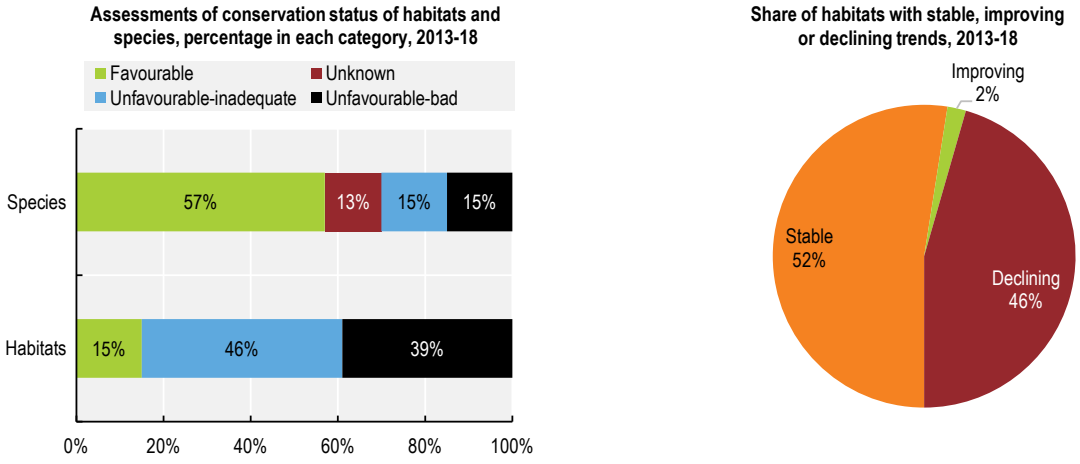
According to national estimates, nearly 17% of Ireland's land surface and inland waters are protected, in line with the 2020 Aichi target. This percentage may be overestimated, as some terrestrial protected areas include marine and coastal waters. International sources, including the OECD and the International Union for Conservation of Nature, indicate that about 14% of the terrestrial areas are protected. Ireland completed its terrestrial Natura 2000 network under the EU Birds and Habitats directives, but site-specific conservation objectives and measures are lacking for many sites (EC, 2019). The vast majority of protected sites are privately owned and nearly 60% are farmed. Engaging land owners is, therefore, crucial to implementing effective conservation and restoration measures.

The marine Natura 2000 network is incomplete. Marine protected areas represent less than 2% of the country's exclusive economic zone, far from the 2020 Aichi target of 10%. Little progress has been made in designing and implementing specific measures to achieve good environmental status of marine waters by 2020, as required by the EU Marine Strategy Framework Directive (EC, 2019). Most coastal waters are in at least good ecological status (Figure 3), but the share of bathing coastal sites with excellent water quality has declined. The June 2020 Programme of Government pledges to protect 30% of Ireland's marine waters by 2030, as well as to complete a national marine planning framework and an overarching 20-year strategy to manage the country's seas (Project Ireland Marine 2040).

The quality of key habitats has deteriorated

Agriculture, housing and infrastructure development, alien species and resource extraction are among the main pressures on Ireland's biodiversity. While over half of assessed species were in favourable conservation status in 2013-18, only 15% of habitats (as defined by the EU Habitats Directive) had a good status. The conservation status of almost half of habitats is deteriorating (Figure 4). The national peatland programme has resulted in some recent progress in conservation and restoration of bogs. The COVID-19 recovery package launched in July 2020 and the 2021 Budget have allocated funds to peatland restoration (Section 3). However, Ireland should ensure that peat harvesting is compatible with the conservation of bog habitats (EC, 2019).

Figure 4. The conservation status of several habitats is of concern



Source: EEA (2020), *National Summary Dashboards - Habitats Directive Art. 17* (database); NPWS (2019), *The Status of EU Protected Habitats and Species in Ireland*; Volume 1 Summary Overview.

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Recommendations on climate, air, waste, water and biodiversity

Climate change mitigation and air quality

- Fully implement the measures outlined in the 20[1]9 Climate Action Plan in all sectors in a timely fashion; continue to promote broad citizen engagement in climate policy design and implementation, and provide stronger regulations and price signals to mobilise private sector low-carbon investment and consumption.
- Set a target for biogenic methane emissions consistent with the climate-neutrality goal, as recommended by the Climate Change Advisory Council; work within the European Union to establish an emissions trading or similar system for agricultural GHG emissions.
- Ensure that the roadmap for a low-carbon transition of farming and the agro-food sector strengthens coherence between production targets and climate goals, as well as with objectives related to air emissions, water quality and biodiversity; regularly monitor the roadmap implementation.
- Establish a roadmap for accelerating the phase-out of fossil fuel boilers and the switch to renewable alternatives (biomass, biogas and heat pumps) for residential heating; introduce minimum energy efficiency standards in the rental sector to encourage renovation of existing housing units.
- Ensure that grants for energy efficiency programmes in the residential sector target deep renovations, giving priority to the publicly owned housing stock (social housing), to most vulnerable households and most carbon-intensive residential buildings; systematically monitor energy savings resulting from retrofitting projects and assess cost-effectiveness of the energy efficiency programmes.
- Accelerate the extension of the ban on bituminous fuels with a view to establishing a nationwide ban; consider expanding the scope of the ban to other “smoky” fuels (peat and wet wood) in selected locations, while helping people at risk of fuel poverty to shift towards cleaner heating fuels.

Circular economy and waste management

- Thoroughly implement actions outlined in the Waste Action Plan for a Circular Economy Action Plan (WAPCE) 2020-25, including the ban on single-use items, the extended producer responsibility obligation for all packaging producers, deposit-return schemes and the levies on virgin plastics in packaging and virgin aggregates in construction projects; systematically evaluate the implementation of the plan and its effectiveness.
- Introduce a levy on the incineration and exports of reusable and recyclable waste, as foreseen by the WAPCE 2020-25, and increase the landfill levy at the same time.
- Mandate all waste service providers to set differentiated collection fees for unsorted, recyclable and organic waste.

Water quality and management

- Accelerate investment in extending and upgrading water supply and sanitation infrastructure to ensure adequate wastewater treatment throughout the country, reduce water losses and make the water system resilient to climate change impacts.
- Assess whether the funding model for water services is sufficient to cover the high investment costs and whether household water charges would be an appropriate financing source.

- Ensure that independent wastewater treatment systems comply with environmental regulations; improve small-scale water supply systems (e.g. wells) to extend access to good quality drinking water.
- Swiftly implement measures to address diffuse water pollution from nutrient losses; as part of the national strategic plan under the new EU Common Agriculture Policy, shift farmer income support towards agri-environment payments based on environmental outcomes, including reduction of nutrient losses, GHG and ammonia emissions; consider introducing pricing instruments to address nutrient losses from agriculture (e.g. charges on nutrient losses or water quality trading), accompanied by transitionary compensatory measures.

Biodiversity conservation and sustainable use

- Finalise the designation of marine areas under the Natura 2000 network and accelerate the expansion of marine protected areas; put in place the necessary site-specific conservation measures at Natura 2000 sites.
- Accelerate the restoration and management of raised and blanket bog habitats; support the afforestation and bog restoration efforts of local communities.
- Develop and adopt the marine spatial planning framework as soon as possible, with a view to bringing coherence between the development of the ocean economy (including shipping, offshore wind energy and fishing) and sustainable use of marine biodiversity.

2. Environmental governance and management

Ireland implements good international practices in many aspects of environmental governance, including licensing, compliance monitoring and promotion, as well as providing access to environmental information. It has made substantial progress on most governance-related recommendations of the 2010 OECD Environmental Performance Review, from integrating environmental considerations into spatial planning to environmental democracy (OECD, 2010).

National and local environmental institutions collaborate well horizontally and vertically

The national-level institutional fragmentation of environmental policy making in recent years has been mitigated through increased co-ordination using memoranda of understanding and advisory committees and groups. Co-ordination between the main policy implementation actors – the EPA and local authorities – has been particularly effective. The EPA provides guidance to, and evaluates performance of, local authorities; the latter increasingly pool their resources and expertise through shared services on water, waste and climate change adaptation. Both the EPA and environmental services of local governments have enjoyed better funding since 2015 after a long period of budget constraints (OECD, 2020e).

The regulatory framework needs to be streamlined

The country has made substantial progress in aligning its legislation with EU directives and demonstrating compliance with them. The number of open infringements with EU directives has more than halved in the last decade, but problems remain with regard to water and biodiversity protection. The legal transposition has in many cases led to multiplication of laws and regulations addressing priorities of the day. Regulatory consolidation, already recommended by the 2010 OECD Environmental Performance Review, remains needed, particularly in the water domain. This process should be supported by regulatory impact assessment and the recently introduced *ex post* evaluation of legislation.

Environmental licensing has become more efficient but needs greater diversification based on potential impact

The EPA and local authorities institutionally separate the determination of licences for industrial and waste installations on the one hand and enforcement of their requirements on the other, avoiding potential conflicts of interest. The EPA reviews and revises all its licences when best available techniques are updated. The EPA has shifted the licensing process from paper to an electronic format, simplified notification and reporting from licensed facilities, centralised data flows and reduced the administrative burden on both regulated entities and the agency itself. However, even low-impact installations, with the exception of small-scale waste-handling facilities, require a bespoke permit. This imposes significant administrative costs on small businesses and local authorities that regulate them. Competent authorities charge substantial licensing fees, which do not, however, recover the respective administrative costs because their levels have not been reviewed in a long time.

A broad range of both infrastructure and facility projects require an environmental impact assessment (EIA) to get a development consent, whereas only facilities with a potentially significant environmental impact need an EIA to obtain a licence. However, a development consent can be granted even if an EIA is negative with regard to project location. This may lead to environmentally unfavourable sites for infrastructure investments, which do not undergo an additional environmental licensing process.

Strategic environmental assessment is widely applied in land-use and development planning

SEA is used to evaluate land-use plans, as well as a growing number of development plans and environment-relevant policies. Along with strategic flood risk appraisal and assessment of impact on biodiversity, SEA helps integrate climate change, biodiversity, nature conservation and green infrastructure aspects into land-use planning at the national, regional and local levels. SEA appears to be effective in promoting environmentally friendly policy approaches and solutions. However, many SEAs do not include sufficient analysis of alternatives, and environmental effects of plan or programme implementation are seldom monitored (González et al., 2020).

A 20-year National Planning Framework (NPF) was adopted in 2018 as a result of a large whole-of-government consultation and consensus. It aims to integrate climate change considerations into land-use plans at all levels. The Office of the Planning Regulator ensures that regional and local land-use plans are consistent with the national framework and promotes public participation in planning decisions. This helps promote coherent investment in sustainable transport, housing, water supply and sanitation services. The multi-annual investment plan NDP 2018-27 is aligned with the NPF spatial strategy (Section 3).

Compliance monitoring is getting stronger, but more effective enforcement is needed

Compliance assurance responsibilities are divided between the EPA and local authorities. A high share of inspections at both levels is based on systematic risk assessment of regulated activities. The growing sectoral focus of compliance assurance and the practice of multi-agency site visits increase the effectiveness and efficiency of inspections. In a rare practice among OECD member countries, the EPA and local authorities charge enforcement fees that recover up to 90% of inspection and enforcement costs from operators.

A lot of compliance monitoring information is available to the public: site visit reports, formal enforcement correspondence with operators, annual environmental reports and other environmental performance and self-monitoring reports of licensed facilities. The Network for Ireland's Environmental Compliance and Enforcement brings together all key central government stakeholders, including the police and prosecutors,

as well as local authorities. Together, they co-ordinate compliance monitoring and enforcement, and exchange good practices.

However, non-compliance levels are relatively high (EPA, 2020f). Exceedance of emission limit values prescribed in facility licences is the main type of violations recorded at the national level, while waste-related offences are especially problematic at the local level. Administrative fines are available only for minor offences and have low fixed rates. Enforcement mostly relies on criminal law, imposing a substantial burden on the regulator. Criminal monetary penalties are capped at relatively low levels in the legislation and do not account for the violator's benefit from non-compliance, reducing their deterrent impact.

Liability rules ensure environmental damage remediation but not for abandoned industrial sites

Ireland has an effective system for enforcing liability for, and remediation of, environmental damage from currently licensed operators. The EPA requires high-risk operators to make adequate financial provisions to cover the full cost of emergency response and remediation measures in case of an incident, as well as the cost of the facility's eventual closure and decommissioning. As of March 2020, the EPA had accumulated a total of EUR 746 million in financial provisions. The EPA uses a risk-based approach in the assessment and remediation of contaminated land and groundwater at its licensed sites.

The government has a budget for remediating historic landfill sites that have been identified, risk-assessed and managed by local authorities. However, there is no specific legislation on contaminated land that would require the government to clean up abandoned contaminated industrial sites. This causes significant delays in their remediation.

Green business practices could be promoted better through public procurement

The EPA assigns high priority to promoting compliance and uses a wide range of information tools. It maintains a list of worst environmental offenders – National Priority Sites – to identify and put public pressure on industrial and waste management operators with poor environmental performance to change their behaviour. Several partnerships between the government and businesses (e.g. Origin Green and CirculEire) foster green business practices and a circular economy. Since 2017, Ireland has been implementing its second national plan on corporate social responsibility. The number of certifications to the ISO 14001 environmental management system (EMS) standard has been rising. Ireland also has a simplified, low-cost EMS certification scheme – EcoMerit – that targets primarily small and medium-sized enterprises (SMEs).

The government is promoting green public procurement (GPP) through its Green Tenders national action plan and subsequent guidance for eight sectors with clear environmental criteria. The government plans to include green criteria in all procurements using public funds by mid-2023. GPP progress reporting became mandatory for the central government in 2020. A reporting methodology to support this requirement is under development. GPP promotion is among the key government measures for the transition to a circular economy (Section 1).

Environmental governance is transparent and participative, with strong public outreach

Government authorities are obliged to proactively make environmental information publicly available, as well as to respond to information requests. The information dissemination tools include Ireland's Environment portal, the Environmental Open Data Portal, the national Geoportal and the state of the environment report published every four years, as well as the new Environmental Performance Reporting online application. This ensures high transparency of Ireland's environmental governance system.

The government has published public policy consultation guidelines for its departments and local authorities as part of the Open Government Partnership National Action Plan. Public participation is also a central element of EIA, licensing and planning decisions. The EPA engages actively with civil society, a recent example of which is the National Dialogue on Climate Action. Among other efforts to deepen public engagement, the 2019 Climate Action Plan envisages establishing a community outreach programme to drive change at the local level.

The public and non-governmental organisations have broad legal standing to ask for judicial review on planning and environmental matters. They can also intervene via the courts to ensure enforcement of environmental requirements. In line with good practice in several OECD member countries, the government intends to create a Planning and Environmental Law Court – a dedicated division of the High Court with specialised judges – to speed up the relevant judicial process. However, high litigation costs are a barrier in access to justice, and provisions for financial assistance with court fees are limited.

The government has integrated environmental and sustainable development education into curricula at all levels, from childhood to postgraduate education. The Green Schools and several awareness-raising programmes operated by the National Trust of Ireland promote climate action and environmentally friendly behaviour among students, teachers and the wider community. The EPA is active in environmental outreach in waste prevention, water conservation and energy efficiency.

Recommendations on environmental governance and management

- Streamline and consolidate national environmental legislation, particularly in the area of water, while expanding the use of *ex post* assessment of laws and regulations.
- Make EIA conclusions, if negative, binding on development consent decisions; continue to improve SEA practices through appropriate consideration of alternatives and monitoring of environmental effects of plans and programmes.
- Reduce the administrative burden on competent authorities and small enterprises by developing activity-specific standard requirements (general binding rules) for more categories of facilities with low environmental impact.
- Introduce variable administrative fines to decriminalise less serious environmental offences; increase the deterrent effect of monetary penalties by assessing and recovering economic benefit of non-compliance.
- Adopt legislation on remediation of contaminated land and establish provisions for cleaning up abandoned industrial sites, including appropriate financing mechanisms.
- Make GPP mandatory for public authorities and implement regular GPP monitoring and reporting.
- Facilitate access to justice by following through with the plan to establish a Planning and Environmental Law Court and providing financial assistance for public litigation on environmental matters.

3. Towards green growth

Ireland is a small, open economy whose population has enjoyed growing well-being levels. Determined structural reforms and fiscal consolidation helped Ireland emerge from the 2008 global financial crisis and start to recover in 2012/13. Economic growth outpaced the OECD average in the second half of the 2010s,

until the COVID-19 pandemic hit the world economy in 2020. The economy is projected to contract by 3.2% in 2020. It is forecast to start recovering only in mid-2021 and expand at over 4% in 2022, although the pace of the recovery remains uncertain (OECD, 2020f).

While Ireland has an extensive suite of policies addressing the SDGs, it needs to strengthen the linkages among these policies to achieve the goals cost-effectively by 2030. There are concerns over the country's effective capacity to deliver on its ambitious plans for the transition to a climate-neutral and circular economy. The scale of the investment needs is remarkable, while additional sizeable fiscal spending is required to support the economic recovery from the effect of the COVID-19 pandemic. There is a need to mobilise the private sector and financial markets, increase efforts on eco-innovation, provide stronger price signals and remove harmful subsidies to encourage businesses and households to take action, while taking into account affordability, employment impact and regional disparities.

The COVID-19 crisis is an opportunity to make the economy greener and more inclusive

In response to the COVID-19 pandemic, the government provided support measures for an unprecedented EUR 24.5 billion in 2020 (7% of 2019 gross domestic product [GDP]). Recovery support measures amounted to about 30% of the overall fiscal effort. These were grouped under the July Stimulus Package, which explicitly aimed to protect employment and prepare for a greener and more digital economy. Work started in 2020 to develop a set of well-being indicators for policy design and evaluation, with a view to capturing the economic, social and environmental dimensions of the COVID-19 crisis and the recovery.

Some measures of the July Stimulus Package can be considered green, although it is difficult to quantify the balance between green and non-green spending. About half of the capital investment of the package was environment- and climate-related (EUR 250 million or 3.5% of the stimulus). The package provided funding to accelerate existing investment plans on sustainable transport and energy efficiency retrofitting that could be delivered quickly. These would create job opportunities in the construction sector, while contributing to reducing GHG emissions (OECD, 2020g). A multi-year peatland rehabilitation programme also received funding. The programme aims to create "green" jobs in the Midlands, where peat bogs have been closed to extractions. The package also allocated resources for skill training in emerging sectors (e.g. retrofitting) and higher incentives to purchase bicycles for commuting to work. However, the environment-related conditions to access support were relaxed in some cases. Examples include some support to farmers (OECD, 2020h) and the loans under the Pandemic Stabilisation and Recovery Fund.

Ireland has stepped up capital investment for the low-carbon transition …

In line with OECD guidance (OECD, 2020c), the budget for 2021 put a strong focus on investment for the green and low-carbon transition and increased the carbon tax (see below). About a third of the EUR 10 billion investment envelope was allocated to, among others, sustainable transport and water infrastructure, energy efficiency and renewables, landfill remediation and peatland rehabilitation. However, the government did not meet its commitment of a two-to-one spending ratio of sustainable transport over roads (Section 4).[2]

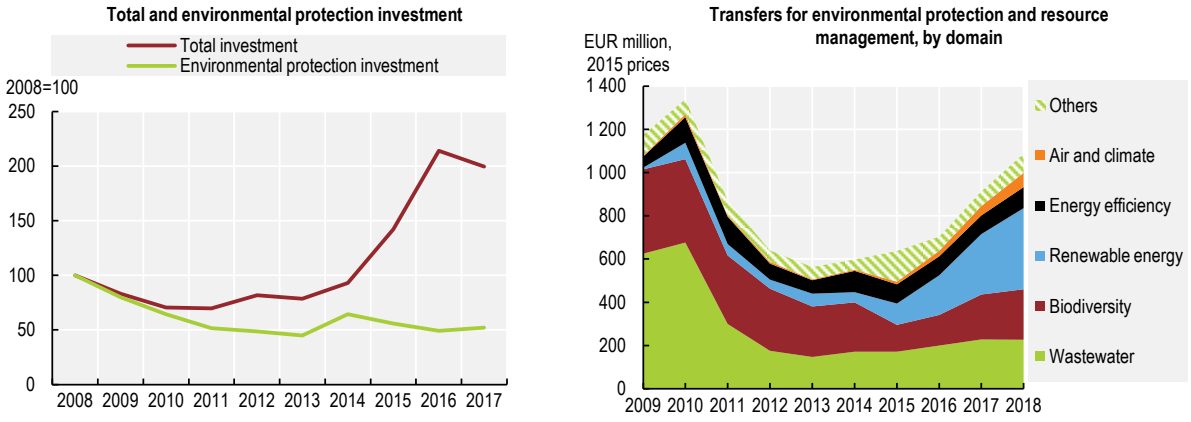
Ireland developed a sound multi-annual investment framework. The policy initiative Project Ireland 2040 outlines the country's development strategy. Its implementation is expected to help achieve the SDGs. As part of Project Ireland 2040, the NDP 2018-27 commits around EUR 30 billion (or more than a quarter of the NDP outlays) to addressing the climate and energy transition. To better consider climate objectives in public expenditure, the 2019 Public Spending Code revised the shadow costs of GHG emissions to be used in public investment appraisal. The in-depth review of the NDP, to be completed in 2021, provides an opportunity to further align investment priorities with the goal of a just transition to a climate-neutral and

circular economy by 2050. Ireland should use the EU Recovery and Resilience Facility in line with these objectives.[3]

… but investment needs remain high

The NDP is a response to the significant underinvestment during, and in the aftermath of, the economic recession. Subdued investment affected the quality of national infrastructure, especially in the transport and water sectors, and slowed down progress towards climate and environmental quality objectives (Section 1). The recession hit environmental protection investment harder than total investment in the economy. Investment to provide environmental protection services more than halved in 2008-12. It subsequently grew but less quickly than total investment; in 2017, it was just above half the pre-crisis level (Figure 5).

Figure 5. Environment- and climate-related investment and transfers have recovered



Left panel: Gross fixed capital formation and environmental protection investment of total economy at 2015 prices.
Right panel: Environmental subsidies and transfers are current or capital transfers according to the SNA 2008 that are intended to support activities that protect the environment or reduce the use and extraction of natural resources.
Source: CSO (2020), "Environmental subsidies and similar transfers 2018", *StatBank* (database); Eurostat (2020), *Environmental Protection Expenditure* (database); OECD (2020), *OECD National Accounts Statistics* (database).

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In line with a change in policy priority, there has been a marked shift in the allocation of environment-related transfers (to businesses, households, public bodies and international environmental organisations) from the typical environmental protection activities (e.g. biodiversity conservation, waste management and wastewater treatment) to resource management activities, and particularly to subsidies for renewable power generation and energy savings. The amount of transfers to air and climate programmes has grown more than ten-fold (Figure 5). In 2020, the central government's climate-related capital and current expenditure increased by 23% from the previous year to reach 3% of total budget expenditure. The bulk of the expenditure targets transport and agri-environmental payments. Ireland is one of the few EU countries to have started green budgeting practices to identify climate-related expenditure.

However, Ireland has not managed to sufficiently mobilise private investment. In 2017, the share of environmental protection investment in total business investment was less than 0.1%, the lowest in the European Union. The public sector accounts for more than 85% of investment in environmental protection (mostly wastewater management), compared with 40% on average in the European Union. Public financial support should target investment that would not occur otherwise, with a view to enhancing cost-effectiveness of public spending and effectively leverage private investment. This is the intention of the Climate Action Fund, although it is too early to assess its outcomes.

There is scope to foster eco-innovation and expand green markets

Higher investment is also needed to spur climate- and environment-related innovation. Ireland has a sound innovation system and highly educated human resources. It has been increasingly investing in research and development (R&D). However, both government and businesses spend relatively little on R&D.[4] Less than 2% of government R&D outlays were directed to environmental and energy research in 2019, among the lowest shares in the OECD. By comparison, 13% of government R&D outlays focused on agriculture, which may include research projects to improve the environmental performance of the sector. This R&D effort should be further channelled towards the decarbonisation of agriculture. Half of the energy public R&D budget targeted renewable sources in the second half of the 2010s, with a strong focus on ocean technology. Low environment-related R&D spending has translated into a relatively low number of patents in environment-related technologies compared to the OECD average. Nevertheless, Ireland has specialised in some green technologies such as those related to waste management, soil remediation and climate change mitigation for buildings.

Several organisations provide funding for climate-related research in Ireland. The Climate Research Coordination Group aims to improve co-ordination between relevant funding organisations and to offer a platform to exchange knowledge and disseminate research findings. There is scope to enhance co-operation between firms and research bodies to develop and deploy environment-related technologies and applications on a commercial basis. There is a sizeable disparity in innovation capacity and activity between multinational enterprises and domestic SMEs. Investment in environmental and low-carbon technology and innovation can pose a higher financial burden on SMEs. However, large enterprises manage to claim most of the public R&D support, which is primarily channelled through tax credit.

Nonetheless, Irish SMEs have been increasingly active in resource efficiency and circular economy measures. In 2017, the environmental goods and services (EGS) sector grew faster than the whole economy, although it contributed less than 1% to GDP and exports – among the lowest shares in the European Union. The sector is dominated by waste management, renewable energy and energy efficiency, which reflects the policy emphasis on these sectors (Section 1). These are also the EGS activities where employment is the highest. Employment in the EGS sector more than doubled between 2013 and 2017, to reach some 2% of total employment. The development of the bioeconomy and the circular economy provides considerable opportunities for Ireland's businesses and can greatly contribute to job creation, as does investment in energy efficiency.

Ireland needs to maintain the commitment to a just transition

The transition to a carbon-neutral economy is expected to have a modest negative net impact on employment in Ireland over the next decade. However, the impact will be concentrated in small areas and communities. This will likely exacerbate regional disparities and affordability issues. The most immediate impact arises from the commitment to phase out peat harvesting and peat-generated electricity in the Midlands by 2028 (NESC, 2020).

Systematic dialogue with the affected communities and active engagement of local governments would help customise the just transition measures to local needs and build consensus. This is even more important in the context of a post COVID-19 recovery. The 2019 appointment of a Just Transition Commissioner is, therefore, welcome. The Commissioner has a mandate to engage with relevant stakeholders in the Midlands region and advise the government on possible policy measures. The Just Transition Fund for the Midlands (EUR 11 million in 2020) provides financial support for retraining workers and projects that can generate sustainable jobs in the region (e.g. building retrofitting, peatland rehabilitation, tourism projects and development). The fund is partially fed by the carbon tax receipts.

Progress has been made in greening the tax and subsidy system

Ireland introduced a carbon tax in 2010, and has gradually extended its coverage to include all fossil fuels. The tax rate was increased from EUR 20 per tonne of CO_2 in 2019 to EUR 33.50 per tonne of CO_2 in 2021. The government committed to continue increasing the carbon tax each year to reach EUR 100 per tonne of CO_2 in 2030. This is a welcome announcement. A credible future trajectory of carbon prices will provide incentive for low-carbon consumption, investment and innovation without immediately imposing the burden on households and recovering firms (OECD, 2020g). However, even if the tax rate increases are implemented as announced, it will be challenging to achieve the targeted 51% reduction in overall GHG emissions from 2021 to 2030.

The government committed to use the revenue from the carbon tax increase (EUR 9.5 billion over ten years) to prevent fuel poverty, ensure a just transition of displaced workers and finance climate-related investment. In line with this commitment, the government allocated part of the carbon tax revenue to enhance some social welfare schemes in 2021. This is expected to mitigate the impact of the carbon tax on vulnerable households and even contribute to reducing poverty (O'Malley, Roantree and Curtis, 2020). Such earmarking of revenue can help create political support for the tax increases, but it may limit the flexibility of public authorities to adapt public spending to changing needs.

The introduction of the carbon tax has helped address the negative environmental externalities related to coal and peat use. It has also partially contributed to aligning the tax rate on diesel to that of petrol. However, motor fuel tax rates continue to give an incentive for using diesel vehicles, with potentially negative consequences for local air pollution and human health. A cap on diesel prices for road hauliers limits their incentives to purchase more fuel-efficient vehicles or EVs, and to adopt more fuel-efficient driving habits and logistics systems (Section 4). As from 2023, the taxable value of the benefit-in-kind (BIK) employees receive from the personal use of company cars will increase with the CO_2 emissions of the vehicle. However, the tax rules can encourage unnecessary driving because the taxable BIK value declines with distance driven for business purposes.

The recent introduction of a NO_x element in the motor vehicle registration tax is a welcome development. However, it only addresses the first registration of the vehicles in Ireland, not the use of existing vehicles. There are preliminary indications this measure has contributed to reducing the share of diesel vehicles in new vehicle registrations. However, the tax rate applied for high-emitting vehicles seems quite high compared to the estimated damage costs of NO_x emissions, the abatement incentives in other sectors and the rates applied in other countries.

The attainment of Ireland's ambitious target of almost 1 million EVs by 2030 is costly with policy instruments that are primarily focused on generous purchase subsidies (Section 4). The planned increase in the share of EVs will also contribute to a significant loss of public revenues from motor fuel taxes and motor vehicle purchase taxes, as the latter are linked to the CO_2 emissions of the vehicles (OECD/ITF, 2019). There is a need to shift road transport taxation from a focus on fuel use to road use over the medium term. While also raising needed revenues, such road pricing could help better address distance-based externalities, such as pavement wear and tear, accidents and congestion.

Ireland has made progress in phasing out wasteful fossil fuel subsidies, as recommended by the 2010 OECD Environmental Performance Review. However, tax exemptions and rebates continue to apply to fuels used in agriculture, fishery and freight transport. Ireland extended the carbon tax to coal and peat in 2013 and discontinued support to peat-fired electricity generation in 2019. Vulnerable households benefit from a fuel allowance during winter to help with heating expenses. The allowance tends to support use of fossil fuels, which are the main source of residential heating (Section 1). It is a means-tested lump sum that is not required to be spent on heating. However, the name of the allowance is unfortunate and may have some undesirable behavioural effects. For example, recipients may be more inclined to spend it on polluting fuels and not encouraged to invest in energy efficiency.

Ireland's support to agriculture follows the EU framework and is largely decoupled from production or input use. However, some agricultural input benefits from favourable tax treatment, which can encourage their inefficient use. Farmers benefit from a tax relief for the increase in the carbon tax rate on farm diesel. This is in addition to the income tax deductibility of costs of agricultural diesel as business expenses, and results in a double tax deduction. Fertilisers and animal feeds are exempt from the value added tax (VAT). Removing the VAT exemption on fertilisers would help reduce fertiliser use (Morgenroth, Murphy and Moore, 2018), with benefits in terms of GHG and ammonia emissions and water quality (Section 1).

Recommendations on green growth

Greening the economic recovery

- Maintain the stringency of environmental requirements, including to access financial aid, during the COVID-19 crisis; as the recovery gains ground, consider linking future support for businesses and households to meeting environment- and climate-related requirements.

Promoting low-carbon investment, eco-innovation and green jobs

- Ensure the revised NDP continues to prioritise investment in low-carbon transport infrastructure and energy efficiency, and to promote eco-innovation and reduction of the carbon footprint of agriculture, in line with the goal of a climate-neutral and circular economy; identify evaluation mechanisms and indicators to assess the effectiveness and environmental outcomes of the plan.
- Increase government spending on R&D related to environment, climate and low-carbon energy solutions; extend direct funding instruments to encourage eco-innovation in SMEs; establish a national database of environment- and climate-related research to improve co-ordination and efficiency of public research funding.
- Customise the just transition measures to the local needs by: i) offering targeted skill and entrepreneurship training programmes to affected workers; ii) promoting green business opportunities and supporting SMEs; iii) providing targeted social benefits schemes to vulnerable households (e.g. for switching to cleaner heating fuels); and iv) ensuring widespread access to adequate infrastructure and services.

Greening the tax and subsidy system

- Maintain the commitment to progressively increase the carbon tax rate; continue to provide carefully designed compensation measures targeted at the most vulnerable parts of the population.
- Increase the diesel tax rate gradually so that it at least reaches the petrol tax rate in the medium term; phase out the current price cap for diesel used by road hauliers as soon as possible; assess whether the tax rules on company cars encourage substantial unnecessary driving and, if so, consider correcting the system.
- Consider if the NO_x element in the motor vehicle tax appropriately reflects the social costs of NO_x emissions, especially as regards high-emitting vehicles.
- Prepare to shift the focus of road transport taxation from fuel use to road use over the medium term through road use pricing based on geographic information systems, which consider where and when the driving takes place and the type of vehicle driven.
- Establish a process to systematically screen actual or proposed subsidies and tax provisions to identify those that are not justified on economic, social and environmental grounds; develop a plan to phase out fossil fuel and other environmentally harmful subsidies.

- Remove the VAT exemptions on fertilisers and animal feeds and the tax concession on fuel used for farm operations, while recycling the revenue to support general agricultural services or to individual farmers (on the basis of farm size and type); consider introducing a tax on pesticide based on toxicity of the active ingredient.
- Consider rebranding the fuel allowance and providing it to eligible households during the whole year with a view to fully delinking it from heating fuels.

4. Sustainable mobility and freight

Ireland's mobility patterns and trends are a source of rising environmental pressures

Ireland's strong economic growth led to increased movement of people and goods in the second half of the 2010s. The country's dispersed settlement pattern and low population density led to road transport being by far the dominant transport mode for both passenger and freight movement (Figure 6). Prior to the COVID-19 outbreak, projections indicated that, in the absence of strong policy action, population and sustained economic growth would further increase demand for transport, together with related emissions of GHGs and air pollutants.

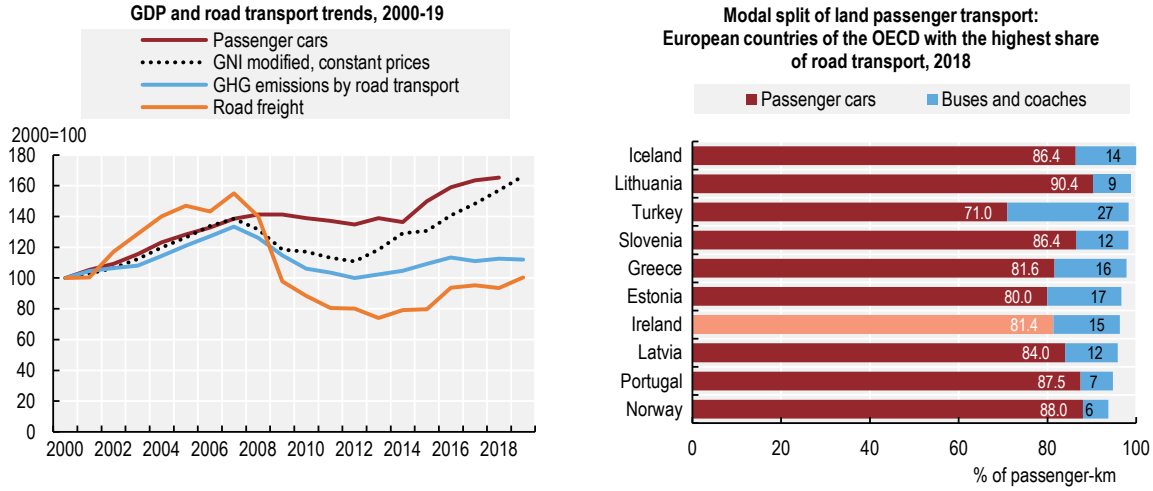
Ireland has taken positive steps towards reducing environmental damage from mobility. It has implemented a CO_2- and NO_X-based vehicle taxation system (Section 3); provided generous grants for the purchase of EVs; committed to higher investment in rail, public transport and active mobility; and improved co-ordination between land-use and transport planning. However, implementation challenges have often impeded achieving expected results. Ireland needs to move at a faster pace and implement additional travel demand management measures to reduce reliance on private vehicles.

Decarbonising transport is essential to meet national long-term climate mitigation goals

The transport sector plays a key role in meeting the binding target of cutting non-ETS emissions by 30% by 2030. It is the second largest contributor to GHG emissions after agriculture, and accounts for more than a quarter of Ireland's non-ETS emissions. Private car use accounts for more than half of transport-related GHG emissions and commercial vehicles account for more than a quarter. GHG emissions from transport, particularly on roads, have been only relatively decoupled from economic growth (Figure 6). They increased with the recovery of the economy from the financial crisis; in 2019, they were 13% above their 2000 level. Emissions from cars and freight are expected to rise until at least 2023. Projections suggest that full and timely implementation of the additional measures identified in the 2019 Climate Action Plan could bring transport GHG emissions 42% below their 2005 level by 2030 (EPA, 2020b; see Section 1).

Projections do not account for the impact of COVID-19. The pandemic has significantly affected the transport sector, with both passenger and freight transport activity sharply declining in 2020 from measures to contain the pandemic. The pandemic is estimated to have reduced transport CO_2 emissions by more than 20% in 2020 compared to a business-as-usual scenario (de Bruin, Monaghan and Yakut, 2020). Medium- and long-term effects of the COVID-19 crisis on GHG emissions are, however, unclear and are subject to changes in mobility patterns. As of September 2020, Dublin car traffic, for instance, had gone back to 75% of pre-lockdown levels, while public transport use had only returned to 50%. It is also not yet clear how the growth in teleworking will affect housing and transport demand in the long term.

Figure 6. Ireland's heavy reliance on road transport has led to growing GHG emissions



Left panel: Transport: based on data expressed in passenger-kilometre (passenger cars) and tonne-kilometre (road freight).
Modified GNI: Gross national income in constant prices, excluding highly mobile economic activities that affect the measurement of the Irish economy (retained earnings of re-domiciled companies; depreciation of Irish-based, foreign-owned, intellectual property assets; aircrafts).
Right panel: Countries with the highest share of passenger cars, buses and coaches in the modal split of land passenger transport.
Source: CSO (2020), "National Income and Expenditure Annual Results 2019", *StatBank* (database); EC (2020), *EU Transport in Figures - Statistical Pocketbook 2020;* EPA (2020), *Ireland's Provisional Greenhouse Gas Emissions 1990-2019 (website).*

StatLink https://doi.org/10.1787/888934232105

A growing number of diesel vehicles threatens air quality

Ireland's motorisation rate is below the EU average, yet car ownership among households has been showing an upward trend. As in many other European countries, the car market is skewed towards diesel vehicles (with 57% of registered passenger cars being diesel in 2019). A shift to diesel-engine vehicles has been largely a result of historically lower tax rates on diesel than on petrol, as well as the change from engine-based vehicle taxation to a CO_2-based system in 2008 (Section 3). The increasing preference towards diesel cars has contributed to improving fuel efficiency and reducing the average CO_2 emissions from newly registered passenger cars to one of the lowest levels in the European Union. However, this trend, as well as an increasing share of second-hand vehicles, has raised concerns over urban air pollution. In Dublin and other major urban areas, concentrations of NO_2 and $PM_{2.5}$, partially caused by traffic, exceed WHO guideline values and are a risk to health (EPA, 2020d). The addition of the NO_X component to the vehicle registration tax in 2020 is projected to reduce the share of diesel and second-hand vehicles in new registrations (Section 3).

Ireland needs to better manage car use in urban areas

Better incentives are needed to manage travel demand

The combination of several policy distortions has encouraged growing car use and exacerbated car dependency. This trend has generated associated problems of GHG emissions, air pollution, noise, traffic injuries and congestion. Although recent years also saw increases in the use of public transport, cycling and walking in urban areas, private cars accounted for about three-quarters of all trips in 2019 (DTTAS, 2019). The under-pricing of the use of urban space and of the external costs of car use has contributed to increased driving and peak-hour traffic, with congestion costs estimated to reach EUR 2 billion per year by 2030 (DTTAS, 2017). Parking policy in Irish cities, which entails high rates for

curbside parking, has helped discourage car trips to specific destinations. However, other hidden car use subsidies, such as free parking at a workplace, provide implicit incentives to commute by car.

Except for the Dublin Tunnel, Ireland does not use road use charges to manage travel demand. The government believes that limited availability of public transport would make the introduction of fiscal or regulatory policy instruments (such as congestion charges or low-emission zones) unfair and socially unacceptable. However, other countries have overcome public scepticism and minimised equity implications, by accompanying fiscal measures to manage travel demand with investments in improved public transport (ITF, 2018). Any form of demand management should be aligned with policies that improve public space and liveability by enhancing travel conditions for pedestrians, cyclists and public transport users. This is important especially to ensure that post COVID-19 recovery does not result in additional urban car traffic.

Congestion charging remains one of the most efficient demand-side instruments to curb peak-time congestion, as the experience of other countries shows. To minimise distributional impacts, revenue from charges could be used to improve public transport and active mobility infrastructure. Additionally, income support provided to vulnerable and car-dependent households could help address equity concerns. Effective communication and implementation of a charging system on a pilot basis could help gain the population's confidence, while showcasing the benefits of the policy.

Reallocating road space to public transport, cycling and walking should be a priority

Historically, Ireland has catered to the growth in the number of cars by planning and building roads and parking spaces. This has resulted in "induced demand", with increases in road capacity leading to additional traffic. Heavy congestion and inadequate road design and management practices affect public transport performance, reliability and attractiveness. The 2013 Design Manual for Urban Roads and Streets requires the design of streets to facilitate sustainable mobility. Recent national, regional and metropolitan transport strategies have committed to road space reallocation, including proposals for bus, cycling and walking priority schemes. However, these projects have progressed slowly or been delayed.

The COVID-19 crisis and associated physical distancing requirements imposed additional constraints on the use of space. Due to public health concerns, public transport use may decrease in the short term. This means that other modes will need to accommodate trips previously made by public transport. Ireland needs to progressively reallocate space to allow for physically spaced walking and cycling, while strengthening measures to manage excess post-confinement car traffic, to ensure that "displaced" trips are made by sustainable modes. In line with this goal, a COVID-19 Interim Mobility Intervention Programme seeks to turn the heart of Dublin City into a priority zone for walking, cycling and public transport. In June 2020, the government issued guidance for the National Transport Authority and local authorities, requiring them to align the works done to address immediate public health concerns with longer-term sustainable mobility objectives.

Ireland needs to increase investment in rail, public transport and active mobility

Roads have received the bulk of land transport funding, although the gap has narrowed more recently. In 2019, for example, public transport accounted for 35% of budget outlays for land transport (DTTAS, 2019). The NDP 2018-27 allocated more than EUR 10 billion to advance major infrastructural projects, increase capacity of rail services and support the transition of the public transport fleet to lower emission vehicles. However, the National Roads Programme 2018-27 still identifies a number of major road construction plans with limited attention to the potential role of high-quality rail links to achieve inter-regional connectivity. Ireland needs to prioritise investment in public transport, cycling and walking infrastructure; road investment should be limited to necessary maintenance and construction of small-scale town bypasses. Ensuring regional links through public transport can help free up bottlenecks on existing roads and overall promote a move towards more sustainable travel.

In line with these objectives and recommendations of the 2017 Citizens' Assembly, the June 2020 Programme for Government commits to two-to-one spending on public transport over roads. It also commits to allocate 20% of the transport capital budget for cycling and pedestrian projects, which signals a welcome increase in funding towards more sustainable modes. The government also plans to further develop the Local Link services in rural areas (mix of scheduled bus lines and on-demand services) to reduce car dependence of rural communities. Following the COVID-19 crisis, public transport faces additional challenges related to reduced capacity, social distancing rules and economic downturn. Ireland should plan to increase funding for public transport as part of the resumption of full economic activity.

Co-ordination of land-use and transport planning has improved but requires stronger enforcement

Urban sprawl and low-density development have locked in unsustainable travel patterns. This has created places that lack adequate public facilities, have diminished liveability and, crucially, are dependent on private cars for long commutes, particularly into Dublin and other cities. Ireland has been moving towards more effective co-ordination of land-use and transport planning to maximise efficiency of urban transport. The 2018 NPF and statutory planning guidelines promote compact growth and the regeneration and densification of urban settlements. However, development projects often remain car-centric in practice. They are frequently located on the fringes of cities, far from transport links or services, with foot and cycle paths limited to the area around the dwellings. Many areas suffer from a legacy of poorly connected street networks and inadequate pedestrian/cyclist facilities. There is a need to further tighten and enforce planning regulations, while ensuring they reflect priorities of improving accessibility to jobs and services, rather than increasing movement.

Ireland could enhance the cost-effectiveness and fairness of its EV promotion strategy

The main pillar of Ireland's strategy to curb GHG emissions from the transport sector has been to increase the share of EVs in the vehicle stock. However, there are trade-offs in terms of congestion and non-exhaust particulate emissions (tyre, break and road wear), as EV promotion goes in the direction of fostering car ownership and use. To achieve the target of almost 1 million EVs on Irish roads by 2030 (including about one-third of all cars), Ireland has introduced some of the most generous subsidies for the purchase of EVs in the OECD. These include: a purchase grant, vehicle registration tax relief, a toll incentive, a home charger installation grant and reduced motor tax rates. Ireland has also invested to expand the network of EV charging points across the country. However, in 2019, electric and plug-in hybrid electric cars accounted for less than 1% of total stock of passenger cars in Ireland and the charging network remains small.

The cost for the public budget of the EV support has grown significantly. It is expected to grow further as the shift towards EVs will reduce revenue from fuel excise and vehicle taxes (Section 3). Despite being high, the EV purchase grant does not cover the price differential between an EV and a conventional car. Hence, they tend to benefit mostly wealthy households, which can afford to bridge the price gap. On the other hand, the level of taxation of conventional cars is not sufficiently high to encourage a shift to EVs. The experience of other countries shows that a successful and balanced EV promotion strategy needs to complement purchase subsidies with travel demand management measures (such as congestion charging and low-emission zones), higher taxation of internal combustion engine vehicles (ICEVs) and a more extensive charging network.

A more comprehensive approach is needed to address the environmental and climate impact of freight transport

The logistics sector also plays a vital role in achieving GHG emissions targets, as emissions from freight are set to increase up to 2030. To reduce environmental impacts of road freight transport, the government has been exploring use of alternative fuels, with a focus on compressed natural gas (CNG) and liquefied natural gas. The 2019 Budget introduced an accelerated capital allowance programme for gas-fired commercial vehicles and refuelling equipment to encourage their uptake as an economic and environment-friendly alternative to diesel (IEA, 2019). The government is also assessing the impact of installing CNG refuelling stations and setting up a large-scale renewable gas injection point on the gas network. However, when all tank-to-wheel emissions (including methane and nitrous oxide) are considered, the GHG effects of CNG are only comparable to best-in-class diesel. In the long run, freight electrification could make significantly higher contributions to the low-carbon transition.

Given that developing low-carbon solutions is particularly challenging in the freight sector, a comprehensive and dynamic policy agenda for decarbonising the sub-sector is needed. The Irish road freight sector is fragmented with small enterprises operating on a tight margin. Potential exists to accelerate collaboration between businesses, and thereby improve logistics efficiency and contribute to reducing CO_2 emissions. However, with issues of competitiveness at stake, promoting standardisation and sharing of assets have proven difficult.

Ireland has a limited capacity and usage of rail for freight transport, as the small scale of the domestic market is insufficient to justify large-scale capital expenditure. However, Ireland should consider the potential for switching some activity to rail freight. Some ways to increase rail freight include carbon or tax credits for shippers and reduction of track access charges to make rail more competitive with road freight.

Improving climate resilience of transport infrastructure remains a challenge

Ireland developed an adaptation strategy for the land transport sector, focusing on the potential impact of more intense rainfall and increases in groundwater levels. Transport Infrastructure Ireland and Irish Rail have standards and procedures to address climate issues in the planning, development and operation of infrastructure. Climatic factors have been factored into the design standards of national roads for several years.

However, as in other countries, there is a need to prioritise, fund and climate-proof assets across the network given uncertainty about climate and socio-economic changes. Ireland needs to identify assets where disruptions could be critical and that would require investment in improved resilience. To date, Ireland lacks criteria to identify and subsequently prioritise investment in adaptive capacity. Such criteria should consider the social, economic and environmental functions performed by each asset. Information and quantitative data on climate hazards, exposure and network vulnerabilities will be required to inform regional risk assessments and the development of climate-resilient infrastructure. Ensuring climate resilience of individual assets is not sufficient. This should be embedded within a strategic approach to infrastructure network planning that accounts for the direct and indirect effects of climate change (ITF, 2016). In addition, improved understanding of potential cascading impacts between sectors would allow for identification of sectoral assets critical to the functioning of other sectors. This would require better inter-institutional co-ordination.

Recommendations on sustainable mobility and freight

Prioritising public transport and active mobility

- Ensure that national investment programmes prioritise sustainable mobility; follow through on the commitment to two-to-one spending on public transport over roads and an allocation of 20% of the total transport capital budget for cycling and pedestrian infrastructure projects.
- Use road space allocation to proactively manage traffic by changing the road layouts, giving more space to cyclists, pedestrians and public transport; put in place significant investment and timetabled targets to support implementation.
- Enforce planning regulations systematically and thoroughly at the local level to ensure that all developments promote compact settlements with easy access to transport links and include a network of safe walking and cycling routes.

Managing travel demand

- Consider introducing policy instruments such as congestion charges to better manage travel demand in urban areas and curb increasing congestion, particularly in the Greater Dublin Area; consider a pilot implementation and clearly communicate the public benefits of any reform to increase social acceptability; assess potential distributional impacts of the introduced measures and mitigate them by providing direct support to the most affected and vulnerable households.
- Address availability of parking, including by phasing out parking subsidy in the form of free parking at a workplace and encouraging employers to provide parking cash-outs in lieu of a parking space; make public transport and emerging transport services (such as bike sharing) eligible for commuter benefits; consider allowing employers to make tax-free payments to employees who walk or bike to work.

Promoting the uptake of electric vehicles

- Increase the taxation of purchases and use of ICEVs, with a view to equalising the difference in purchase price or lifetime cost between EVs and ICEVs; continue to extend the charging points across the road network.

Shifting to low-carbon freight transport

- Develop a coherent strategy for the low-carbon transition of the haulage sector, focusing on integrating road freight, rail and shipping and rebalancing economic incentives in favour of rail freight; in the road sector, improve efficiencies of logistics operations and introduce sectoral standards, such as mandatory eco-driving training.
- Assess the economic efficiency and environmental effectiveness of the policy promoting CNG technology to reduce environmental impacts of road freight transport.

Improving climate resilience of transport infrastructure

- Fill the information gap about exposure and vulnerabilities of transport infrastructure to climate hazards and assess the social, economic and environmental functions performed by all transport infrastructure assets; based on these data, conduct a full priority impact assessment to identify critical national assets and costs of adaptation actions to justify investments in improved resilience.

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Notes

[1] The water sector funding model is based on the 2017 recommendations of Joint Oireachtas (Parliamentary) Committee on the Future Funding of Domestic Water Services and the Water Services Act.

[2] The 2021 state budget allocated EUR 1.8 billion to public transport and active mobility and EUR 1.3 billion to roads.

[3] Ireland will benefit from nearly EUR 1.3 billion in grants in 2021-23 from the EU Recovery and Resilience Facility and EUR 176 million under the Just Transition Fund, in addition to more than EUR 1 billion for cohesion policy in 2021-27. The Recovery and Resilience Plan needs to be submitted to the European Commission by the end of April 2021.

[4] Gross domestic expenditure on R&D was 1.1% of GDP in 2018, or half the EU average. However, this indicator is affected by the disproportionate weight of capital assets and earnings of foreign-owned businesses on Irish GDP.

Annex 1. Actions taken to implement selected recommendations from the 2010 OECD Environmental Performance Review of Ireland

Recommendations	Actions taken
Chapter 1. Environmental performance: Trends and recent developments	
Climate change	
Realise the opportunities that have been identified to further improve material productivity and energy efficiency cost-effectively, for example in the residential, tertiary and transport sectors.	Several grant schemes have supported energy efficiency improvements in buildings (e.g. Greener Homes, Better Energy Homes and Warmer Homes Schemes, Better Energy Communities Programme). The near-zero energy building standard is required for all new buildings whose construction started as from November 2019 (with a transition period). The 2019 Climate Action Plan foresees to renovate half a million homes, install 600 000 renewable heating systems and improve the energy rating of public sector buildings. The 2021 government budget increased funding for residential and community energy efficiency by over 80% compared to the previous year.
Consider how payments under the agri-environmental programmes could be better linked to meeting the 2020 greenhouse gas reduction commitment.	The Green, Low Carbon, Agri-Environment Scheme (GLAS) provides grants for farmers to implement agricultural practices that address GHG emissions, water quality and biodiversity loss. Applicants are required to implement a nutrient management plan as a prerequisite. The Targeted Agricultural Modernisation Schemes support capital investment in a number of target areas, including practices to reduce GHG emissions (e.g. low-emissions slurry spreading equipment). The Beef Data and Genomics Programme provides per hectare payments to participants to reduce GHG emissions by improving the genetic merits of the beef herd.
Complete the preparation of a national climate change adaptation strategy, based on expected adaptation costs and benefits, and develop a plan for its implementation.	The National Adaptation Framework (NAF) released in 2018. The NAF mandates the preparation and implementation of local adaptation strategies and sectoral adaptation plans (water and emergency planning; marine agriculture and forestry; biodiversity and heritage; transport; energy; flood defence; health). Both the sectoral adaptation plans and the local adaptation strategies were approved in 2019.
Air management	
Implement additional measures to reduce NO_x emissions in order to achieve current and forthcoming NEC Directive requirements; consider how these requirements could be achieved most cost-effectively among the relevant sectors.	Ireland adopted the National Air Pollution Control Programme in 2019. A revised programme is being prepared to consider measures under the 2019 Climate Action Plan.
Complete retrofitting of the coal-fired Moneypoint power plant to reduce SO_2 emissions; carry out further investment in combined heat and power installations in the industrial, commercial and service sectors; and ensure compliance of large combustion plants with requirements of the National Emissions Reduction Plan.	The coal-fired Moneypoint power plant underwent a EUR 500 million environmental retrofit in 2016. The installed capacity of combined heat and power installations increased and reached 348 MWe (419 units) in 2017. About 92% of the operational capacity was gas-fuelled.
Waste and resource management	
Implement the National Waste Prevention Programme, in particular priorities identified under its 2009-13 Prevention Work Plan; improve co-ordination of regional waste management plans to achieve national waste targets more efficiently, in particular those for biodegradable and hazardous waste.	The implementation of the National Waste Prevention Programme builds on a number of projects in key sectors and waste streams. In 2019, the programme was revised to align its policies with the goal of a transition to a circular economy. The National Co-ordination Committee provides a platform for the sharing of information and experience among waste management planning regions. It comprises the three Lead Authorities of the waste management planning regions, the Environmental Protection Agency, the National Waste Collection Permit Office and the National Transfrontier Shipment Office. The Department of the Environment, Climate and Communication chairs the Committee.

Extend producer responsibility initiatives to cover a wider range of end-of-life products.	Extended producer responsibility initiatives are in place for waste electrical and electronic equipment, batteries, packaging, end-of-life vehicles, waste tyres and farm plastics. The 2020 Waste Action Plan for a Circular Economy pledges to introduce mandatory extended producer responsibility for all packaging producers before the 2024 EU deadline.
Extend waste collection programmes further to cover as many properties as feasible; accelerate the roll-out of programmes for separate collection, giving priority to organic and hazardous waste from households and commercial activities.	Since July 2016, separate collection for food waste has been in place in all agglomerations of more than 500 people. At regional level, waste awareness campaigns have been launched along with the development of a web portal gathering all the waste-related data and information (MyWaste.ie).
Accelerate implementation of the Market Development Programme for Waste Resources to increase recycling of waste and the use of recycled materials within Ireland; extend market-based mechanisms for waste collection, sorting and recovery to encourage private investment in waste recycling and treatment facilities.	In 2017-18, Ireland rolled out waste collection fee systems that consider the weight or volume of the waste collected. These replace the previous flat rate fees for waste collection.
Strengthen provisions in contracts and licences for waste management operations so that all service providers, public or private, have the same obligation to meet high delivery and quality standards; consider transferring the Regulatory and monitoring authority for waste management to regional or national level.	All waste collection permits contain a single set of conditions depending on type of waste. The permit conditions specify the service level required (e.g. frequency of collection, waste types collected). Waste collectors are required to maintain a customer charter. In 2013, the number of waste management planning regions was reduced from ten to three: Southern, Eastern Midlands and Connacht-Ulster. They developed the three Regional Waste Management Plans 2015-21. In addition, three Waste Enforcement Regional Lead Authorities co-ordinate waste enforcement activity of local authorities.
Water management	
Further consolidate water-related legislation into a coherent framework.	Since 2010, there has been a series of legislative amendments to adopt improved water quality and wastewater discharge standards. However, the comprehensive Water Environment Bill has been delayed since 2017. In 2019, Ireland received a second formal notice from the EC regarding issues with transposition of the Water Framework Directive.
Consider establishing dedicated river basin agencies to implement the Water Framework Directive.	There are no river basin agencies in Ireland. The second national River Basin Management Plan (RBMP) (2018-21) is implemented through the Local Authority Waters Programme – a shared service that works with individual local authorities; the Environmental Protection Agency; the Department of Housing, Local Government and Heritage; and other government bodies.
Strengthen measures to achieve "good" quality status, at least, for Irish waters by 2015, paying special attention to eutrophication; improve protection of drinking water sources.	Measures during the first cycle of RBMP 2009-15 included the licensing of urban wastewater discharges (with an associated investment in urban wastewater treatment) and the implementation of the Nitrates Action Programme (Good Agricultural Practice Regulations). Measures under the RBMP 2018-21 include: – Investment in urban wastewater collection and treatment and in leakage reduction by Irish Water. – The National Inspection Plan for Domestic Water Treatment Systems 2018-21 and the grant scheme for repairing defective systems. – The Local Authority Water Programme shared service (LAWPRO) to co-ordinate and promote mitigation measures in 190 prioritised Areas for Action (including 726 water bodies); a Community Water Development Fund has been established by LAWPRO to support local community water initiatives. – The Good Agricultural Practice Regulations for the management and application of livestock manures and other fertilisers to agriculture land. – The Sustainability Support and Advisory Programme for farmers.
Introduce water pricing for households, in a way that takes account of environmental, economic and social considerations.	Domestic water charges were introduced in 2015 but abolished a year later. A Household Water Conservation Charge will be effective from 2022. The charge will apply to annual water consumption exceeding a free annual allowance of 213 000 litres per household, increased by 25 000 litres per person if the household is larger than four occupants.
Further integrate water quality and flood risk management considerations into spatial planning and development management processes.	Land-use plans at the national, regional and local levels undergo strategic environmental assessment (SEA), as well as strategic flood risk appraisal.

Biodiversity conservation	
Speed up preparation of detailed, time-bound management plans for Natura 2000 sites and natural heritage areas, and implement them.	The National Peatland Strategy was adopted in 2015. A process for setting site-specific conservation objectives for Natura 2000 sites was established. By April 2020, detailed site-specific conservation objectives had been published for 364 Natura 2000 sites. The National Raised Bog Special Areas of Conservation (SACs) Management Plan was released in 2017. As of June 2020, 53 management plans of raised bogs had been developed. Restoration measures on 260 hectares of state-owned lands have been completed on three raised bog SACs.
Continue efforts to adopt, resource and implement an island-wide strategy on invasive alien species.	A website dedicated to invasive alien species (IAS) was launched to gather and disseminate available data and information, as well as to raise awareness. Ireland transposed in 2015 the EU IAS Regulation and has worked on its implementation.
Improve consistency of the Planning and Development Act with the protection and enhancement of biodiversity outside protected areas (e.g. by establishing "green corridors" linking nationally and locally important biodiversity areas).	All land-use plans are subject to appropriate assessment of impact on biodiversity under the EU's Habitats and Birds Directives. Green infrastructure of open spaces, green corridors and natural areas have been included in several development plans.
Improve integration of biodiversity concerns in sectoral policies and projects, including through rigorous implementation of SEA and EIA procedures.	SEA is used to evaluate land-use plans, as well as a growing number of development plans and environment-relevant policies. The Seafood Operational Programme 2014-20 and National Strategic Plan for Aquaculture 2014-20 underwent SEA focused on biodiversity protection.
Improve the match between spending on agri-environmental measures and ecological needs, e.g. by placing more emphasis in or near Natura 2000 sites.	The GLAS is the main agri-environmental programme targeting biodiversity. The majority of GLAS payments relate to practices that encourage biodiversity.
Chapter 2. Environmental governance and management	
Maintain recent efforts towards harmonisation of Irish environmental legislation with EU Directives and promote implementation, particularly regarding environmental impact assessment.	Ireland has prioritised the timely transposition of, and compliance with, EU Directives. In 2019, the country had 15 open cases of infringement against EU Directives compared to 34 in 2009.
Consider how best to consolidate environmental regulations into a coherent framework with the aim of simplifying and clarifying requirements and promoting better compliance.	The transposition of EU Directives into national legislation has often resulted in multiplication of regulations. Their consolidation has not progressed.
In the context of the on-going review of local governance, examine the environmental responsibilities of different administrative levels to identify opportunities for better co-ordination, economies of scale and improved policy development and implementation, e.g. as regards provision of water services and establishment of waste management infrastructure.	In 2014, Ireland undertook a far-reaching reform of local government, reducing the number of local and regional authorities. It also introduced a comprehensive system of local governance, with municipal districts replacing town councils. Irish Water, a national water utility established in 2013, took over from local authorities the responsibility for drinking water supply and sanitation services across the country. In 2013, the number of waste management planning regions was reduced from ten to three. The National Waste Collection Permit Office issues waste collection permits centrally on behalf of all local authorities.
Further improve access to environmental information by building capacity in public agencies on rights and obligations related to access to, and provision of, information; apply consistent and fair charges; abolish fees for appealing to the Commissioner for Environmental Information decisions that denied requests for information.	Government authorities have an obligation to make environmental information publicly available, as well as to respond to information requests. Access to information training events has been conducted regularly since 2014. If an information request is refused or inadequately answered, this decision can be appealed administratively to the Commissioner for Environmental Information and then, if needed, to the High Court.
Make sure that Irish legal provisions for public participation and access to justice are consistent with the main requirements of the Aarhus Convention, with a view to the ratification of the Convention.	Ireland ratified the Aarhus Convention in 2012. Public participation requirements are included in many environmental regulations and procedures. Ireland has an interest-based approach to legal standing on environmental matters: everyone who can demonstrate legitimate interest in the case has a right to sue. Standing rights for non-governmental organisations (NGOs) are written into law. However, high litigation costs are a barrier in access to justice.
Promote broader participation by NGOs and relevant public organisations in the development and implementation of national and local development policies, programmes and projects.	Government departments follow the 2017 Consultation Principles & Guidance produced as part of the Open Government Partnership National Action Plan. The EPA meets twice a year with the Irish Environment Network of NGOs. The Public Participation Network is planned to be leveraged to share information and knowledge, as well as encourage local community groups to get involved in climate action initiatives.

Chapter 3. Towards green growth	
Finalise the revision of the National Sustainable Development Strategy, make it fully operational with the introduction of targets, indicators and monitoring mechanisms, and assure consistency between it and existing sectoral policy frameworks.	The National Sustainable Development Strategy "Our Sustainable Future" was adopted in 2012. After adoption of the United Nations Agenda 2030, Ireland developed the first SDGs National Implementation Plan 2018-20 to integrate the SDGs into national policy.
Phase out environmentally harmful subsidies (e.g. for electricity generation from peat and for domestic aviation) and tax concessions (e.g. on coal and on fuel oil used by households and farmers) that create economic distortions and social inequity	In 2020, Ireland discontinued support to peat-fired power plants under the Public Service Obligation levy. The solid fuel carbon tax introduced in 2013 covers coal and peat.
Replace some current taxes with appropriate environmentally related fiscal measures in the framework of a comprehensive environmental tax reform.	Ireland introduced a carbon tax in 2010 (see below).
Implement the commitment in the 2007-12 Programme for Government to introduce a carbon levy on sectors outside the ETS, focusing efforts where further emission reductions can be achieved most cost-effectively.	The carbon tax was introduced in 2010. It initially applied to liquid and gaseous fuels at the rate of EUR 15 per tonne of CO_2. It was extended to solid fuels in 2013. There were phased increases of the tax to reach EUR 33.5 per tonne of CO_2 on automotive fuels in October 2020 and on all fuels as of May 2021. As of 2020, the carbon tax applies to all fuels used in sectors not covered by the EU ETS.
Maintain the Commitment to meet the objectives in the main environmental policies and programmes, in spite of the difficult economic context, by increasing cost-effectiveness of environmental policies and providing adequate funding for environmental infrastructure.	Public funding for environmental infrastructure and investment declined in 2008-13. Public funding for environment- and climate-related investment and actions has increased in the second half of the 2010s.
Chapter 4. Sustainable mobility and freight	
Implement the 2009 Sustainable Travel and Transport Action Plan, particularly measures to improve public transport in urban areas; assess how road pricing/congestion charges could contribute to achievement of the plan's objectives; and reinforce programmes to support public transport options in rural areas.	Ireland partially implemented the 2009 Sustainable Travel and Transport Action Plan. In 2012-16, the Department of Transport, Tourism and Sport (DTTAS) received EUR 65 million to implement the plan, including for measures to improve public transport. In 2019, the DTTAS commissioned a study to explore the introduction of congestion charges along with other instruments, such as low-emission zones, to provide incentives for reducing urban congestion. The frequency of some bus and rail services has increased and connectivity between rail and bus services was improved. In 2016, funding for the Rural Transport Programme – "Local Link" increased from EUR 12.2 million to EUR 21 million to introduce new regular rural services, improve demand responsive services, and pilot new evening and late night services.
Develop measures to better link land use and transport planning with a view to controlling urban sprawl.	The 2018 National Planning Framework promotes compact growth and the regeneration and densification of urban settlements. It sets a target of at least 40% of all new housing within existing built-up areas of cities, towns and villages on infill and/or brownfield sites. Planning regulations support apartment development and increasing the number of units per floor development. Owners of commercial properties can convert unused space for residential use without securing planning permission. Since 2017, Ireland has reduced parking requirements for new developments, particularly in areas well-served by public transport.

Source: OECD Secretariat based on country submission

Part I
Progress towards sustainable development

1 Environmental performance: Trends and policy developments

Ireland's progress in improving environmental outcomes has been uneven in the last decade. Environmental pressures – such as emissions of greenhouse gases and air pollutants, waste generation, material consumption and nutrient losses to water bodies – declined in the aftermath of the global financial crisis. However, they rose in the second half of the 2010s, before the COVID-19 pandemic halted the country's fast economic growth. This chapter provides an overview of Ireland's environmental achievements since 2010, and its remaining challenges. It reviews progress in moving towards a low-carbon, climate-resilient and circular economy, improving air quality and management of water resources, and reducing pressures on biodiversity, as well as in pursuing the related Sustainable Development Goals.

Recommendations on climate, air, waste, water and biodiversity

Climate change mitigation and air quality

- Fully implement the measures outlined in the 20[1]9 Climate Action Plan in all sectors in a timely fashion; continue to promote broad citizen engagement in climate policy design and implementation, and provide stronger regulations and price signals to mobilise private sector low-carbon investment and consumption.
- Set a target for biogenic methane emissions consistent with the climate-neutrality goal, as recommended by the Climate Change Advisory Council; work within the European Union to establish an emissions trading or similar system for agricultural GHG emissions.
- Ensure that the roadmap for a low-carbon transition of farming and the agro-food sector strengthens coherence between production targets and climate goals, as well as with objectives related to air emissions, water quality and biodiversity; regularly monitor the roadmap implementation.
- Establish a roadmap for accelerating the phase-out of fossil fuel boilers and the switch to renewable alternatives (biomass, biogas and heat pumps) for residential heating; introduce minimum energy efficiency standards in the rental sector to encourage renovation of existing housing units.
- Ensure that grants for energy efficiency programmes in the residential sector target deep renovations, giving priority to the publicly owned housing stock (social housing), to most vulnerable households and most carbon-intensive residential buildings; systematically monitor energy savings resulting from retrofitting projects and assess cost-effectiveness of the energy efficiency programmes.
- Accelerate the extension of the ban on bituminous fuels with a view to establishing a nationwide ban; consider expanding the scope of the ban to other “smoky” fuels (peat and wet wood) in selected locations, while helping people at risk of fuel poverty to shift towards cleaner heating fuels.

Circular economy and waste management

- Thoroughly implement actions outlined in the Waste Action Plan for a Circular Economy Action Plan (WAPCE) 2020-25, including the ban on single-use items, the extended producer responsibility obligation for all packaging producers, deposit-return schemes and the levies on virgin plastics in packaging and virgin aggregates in construction projects; systematically evaluate the implementation of the plan and its effectiveness.
- Introduce a levy on the incineration and exports of reusable and recyclable waste, as foreseen by the WAPCE 2020-25, and increase the landfill levy at the same time.
- Mandate all waste service providers to set differentiated collection fees for unsorted, recyclable and organic waste.

Water quality and management

- Accelerate investment in extending and upgrading water supply and sanitation infrastructure to ensure adequate wastewater treatment throughout the country, reduce water losses and make the water system resilient to climate change impacts.
- Assess whether the funding model for water services is sufficient to cover the high investment costs and whether household water charges would be an appropriate financing source.

- Ensure that independent wastewater treatment systems comply with environmental regulations; improve small-scale water supply systems (e.g. wells) to extend access to good quality drinking water.
- Swiftly implement measures to address diffuse water pollution from nutrient losses; as part of the national strategic plan under the new EU Common Agriculture Policy, shift farmer income support towards agri-environment payments based on environmental outcomes, including reduction of nutrient losses, GHG and ammonia emissions; consider introducing pricing instruments to address nutrient losses from agriculture (e.g. charges on nutrient losses or water quality trading), accompanied by transitionary compensatory measures.

Biodiversity conservation and sustainable use

- Finalise the designation of marine areas under the Natura 2000 network and accelerate the expansion of marine protected areas; put in place the necessary site-specific conservation measures at Natura 2000 sites.
- Accelerate the restoration and management of raised and blanket bog habitats; support the afforestation and bog restoration efforts of local communities.
- Develop and adopt the marine spatial planning framework as soon as possible, with a view to bringing coherence between the development of the ocean economy (including shipping, offshore wind energy and fishing) and sustainable use of marine biodiversity.

1.1. Introduction

Ireland's increasing population enjoys a relatively high level of well-being. Three-quarters of the country are farmland, mostly grassland, which sustain a competitive agriculture sector. Several dynamic high-tech industrial clusters are concentrated in sprawling urban areas. The country's dispersed settlement pattern and low population density imply that roads are the dominant transport mode. Ireland hosts a large share of Europe's remaining peatlands.

In the last decade, Ireland's progress in decoupling the economy from the main environmental pressures has been uneven. Major environmental pressures – such as emissions of greenhouse gases (GHGs) and air pollutants, waste generation and material consumption – declined in the aftermath of the global financial crisis. They have risen since the mid-2010s with Ireland's strong economic recovery. As in other countries, the COVID-19 crisis had some positive effects on GHG emissions, pollution and biodiversity, but it has also led to increased waste disposal.

Climate, circular economy and environmental policies have gained renewed impetus in recent years, with various major well-designed policy initiatives, strategies and plans. These need to be thoroughly implemented in timely fashion to alleviate the growing pressures from demographic development, urban sprawl, road traffic and intensification of agricultural practices.

This chapter provides an overview of the main environmental trends observed in Ireland. It highlights the progress the country made in the last decade towards its national and international goals, as well as the challenges to be met for green growth and sustainable development. Where possible, trends are compared with those of other OECD member countries.

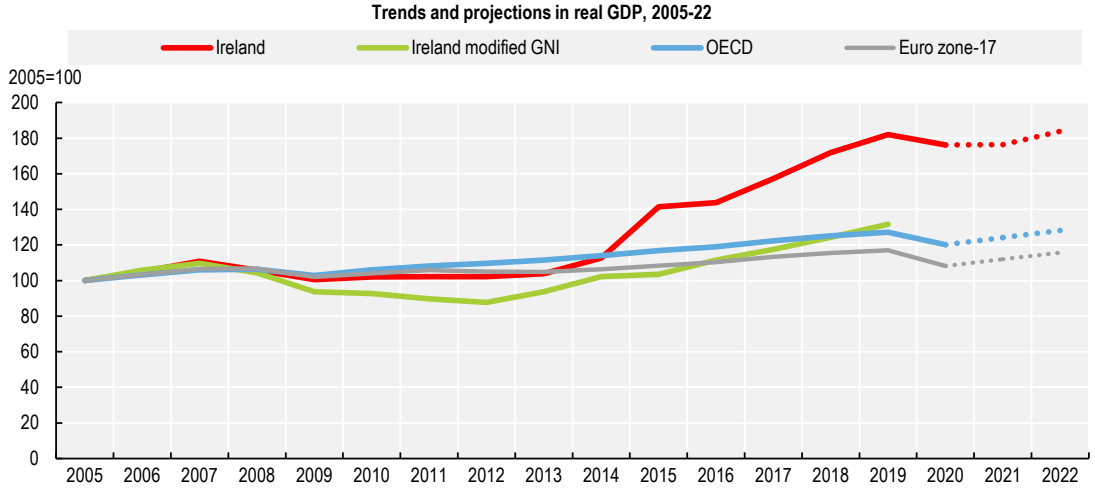
1.2. Promoting sustained and inclusive economic growth

1.2.1. Structure and performance of the economy

Ireland is a small, open economy and one of the most attractive European destinations for foreign direct investment. In 2019, exports of goods and services accounted for about 130% of gross domestic product (GDP). Industry (including construction) accounted for 39% of GDP, compared to the OECD average of 25%. This reflected the weight of high-value added sectors such as pharmaceutical, chemicals and communication technology. The technological intensity of the economy rose steadily. In 2019, Ireland had the highest proportion of high-tech goods exports of any European economy (OECD, 2020a). Agriculture accounted for about 1% of GDP, but the agro-food industry plays an important role in terms of employment and exports; in 2019, it accounted for about 7% of total employment and 9.5% of merchandise exports (DAFM, 2020).

A severe banking and fiscal crisis plunged the economy into a deep recession in 2008. Determined structural reforms and fiscal consolidation helped Ireland start to recover in 2012/13.[1] GDP exceeded the pre-crisis level in 2014 and grew by about 7% per year in 2016-19, more than three times the OECD average. However, GDP figures are affected by the large role of the intangible assets of multinational enterprises in the Irish economy. When considering modified gross national income, economic growth is slower but still robust (Figure 1.1).[2] Unemployment declined from the peak of 15.5% in 2012 to 5% in 2019.

Figure 1.1. The COVID-19 pandemic halted Ireland's fast economic growth



Note: 2020-22 data are OECD forecasts. The Irish national accounts framework supplements GDP data with indicators aimed at isolating the disproportionate impact on the Irish economy of the activities of multinational enterprises operating in the country. Modified gross national income (GNI) = Gross national income in constant prices, excluding highly mobile economic activities that affect the measurement of the Irish economy (retained earnings of re-domiciled companies; depreciation of Irish-based, foreign-owned, intellectual property assets; aircrafts).
Source: CSO (2020), "National Accounts", *StatBank* (database); OECD (2020), *OECD Economic Outlook No. 108: Statistics and Projections* (database).

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The COVID-19 pandemic caused an unprecedented shock to the economy. Domestic demand contracted strongly in the first half of 2020. The full extent of the impact on the economy is difficult to predict, given the uncertain evolution of the pandemic. Ireland's GDP is estimated to have contracted by 3.2% in 2020. The economy is projected to start recovering only in mid-2021 and to expand at over 4% in 2022 (Figure 1.1; OECD, 2020b). Unemployment is forecast to jump to 12.5% in 2021 (CBI, 2020). The sizeable COVID-19 fiscal stimulus will make Ireland's already high public debt increase. This may reduce the country's ability to adequately finance long-term spending needs linked to population ageing (for pensions and health care). Other risks to the economy include the reliance on volatile corporate tax receipts from a

small number of multinationals and the change in trading arrangements between the European Union (EU) and the United Kingdom, a key trade partner (OECD, 2020a, 2020b).

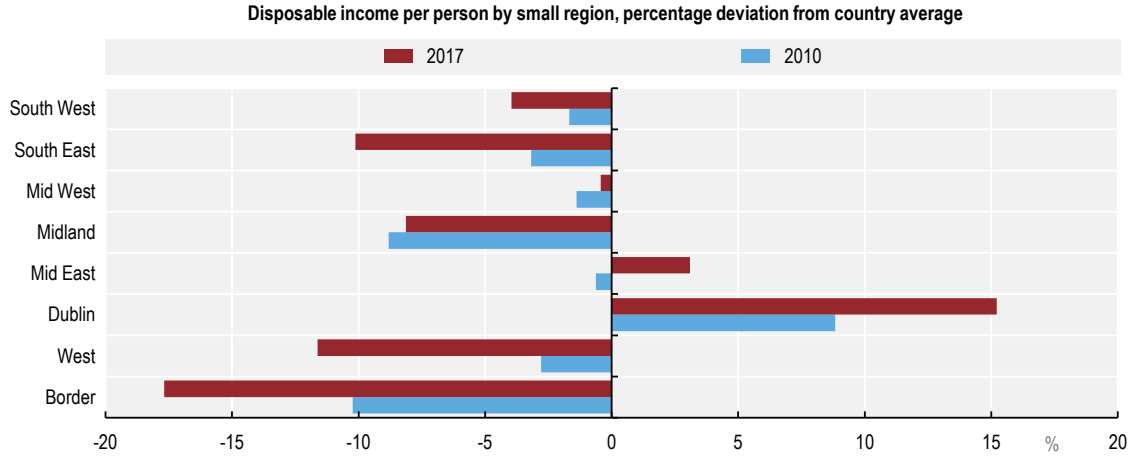
1.2.2. Well-being and inequality

Well-being of Ireland's population improved in the second half of the 2010s (OECD, 2020c). In the same period, Ireland made considerable progress towards the Sustainable Development Goals (SDGs) linked to poverty and inequality reduction; good health; education quality; economic growth and decent work; industry, innovation and infrastructure; and sustainable cities and communities. Ireland enjoys peaceful and democratic conditions, and has a long-standing commitment to a just and peaceful multilateral global system (Government of Ireland, 2018). However, progress on gender equality in leadership positions and employment has been insufficient, housing affordability is a concern and bottlenecks in transport and water infrastructure remain (Eurostat, 2020a).

Inequality (as measured by the Gini coefficient) and relative poverty (as measured by the ratio of people living with less than half the median OECD household income) declined. In 2017, they were lower in Ireland than on average in the OECD (Table of basic statistics). The country's tax and benefit system has been effective in reducing income inequality and mitigating the risk of people falling into poverty (OECD, 2020a).

However, regional disparities widened during the decade. The shift towards high-added value sectors contributed to modify the geographic distribution of economic activity. Dublin and Cork have experienced much faster growth than many other parts of Ireland since 2010 (EC, 2020a; OECD, 2020a). In most small regions, the disposable income per person moved further away from the country average between 2010 and 2017 (Figure 1.2). The Dublin region (Dublin City and county) had the highest average disposable income per person in 2017, about 15% higher than the country average. In the South East, West and Border regions, the disposable income per capita is 10% or more below the country average (Figure 1.2).

Figure 1.2. Regional income inequality increased during the decade



Source: CSO (2020), "County Incomes and Regional GDP", *StatBank* (database).

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Ireland's population increased by 8% in 2010-20 to reach nearly 5 million inhabitants. It is projected to grow by an additional 1 million by 2040, which will require extending the housing stock, as well as water, energy and transport infrastructure. While population density is relatively low in Ireland in international comparison, the population density of the small region of Dublin is 21 times the national average. Nearly 40% of the country's population lives in the Greater Dublin Area.[3] However, people have been moving out

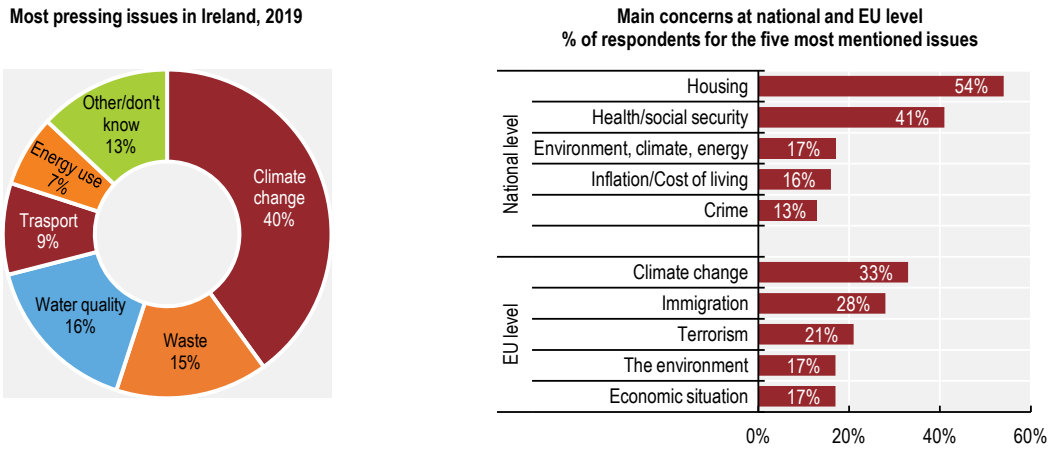
of the capital due to escalating housing prices (OECD, 2020a). More than a quarter of the population lives in predominantly remote rural areas (i.e. in areas where at least half of the regional population needs more than an hour to reach a large urban centre by motor vehicle). Nearly 90% of the country is predominantly rural, the second highest share among the European countries of the OECD (after Iceland) (OECD, 2018).

1.2.3. Public awareness on environment and sustainable development

Ireland's population has showed an increasing level of engagement for environmental protection and sustainable development. According to a 2020 national survey by the Environmental Protection Agency (EPA), 87% of Ireland's adult population recognised the environment as a valuable asset for the country (EPA, 2020a). Forty percent of adults considered climate change the most urgent environmental issue, followed by water quality and waste management (Figure 1.3). Public awareness of the SDGs also increased but, at 36% in 2018, it was below the EU average (Government of Ireland, 2018). Increasing SDG awareness in Ireland is a strategic priority of the SDG National Implementation Plan 2018-20 (Chapter 3).

According to a 2019 Eurobarometer survey, half of Ireland's respondents indicated climate change and environment as the main challenges for the European Union. However, national priorities differ. When asked about the most pressing issues the country faces, Ireland's respondents primarily indicated housing, health and social security, and only 17% indicated environment and climate change (Figure 1.3). In addition, significantly fewer Irish people are taking climate-related actions (changing transportation mode, using less energy, etc.) than on average in the European Union (EC, 2020b). To address this issue, the 2019 Climate Action Plan envisages a community outreach programme to drive change at the local level (Chapter 2).

Figure 1.3. Climate change and environment are among the main concerns of Ireland's citizens



Left panel: Based on the responses to a national omnibus survey carried out on behalf of the EPA in January 2020.
Right panel: Percentage of Irish citizens responding to the question "What do you think are the two most important issues faced by Ireland and the EU at the moment?"
Source: EPA (2020), *Environmental Protection Agency - 2019 in Review*; European Commission (2019), "Public Opinion in the European Union", *Standard Eurobarometer* 91, Spring 2019.

StatLink https://doi.org/10.1787/888934231383

1.3. Moving towards a low-carbon and climate-resilient economy

1.3.1. Climate change mitigation strategy

The adoption of the Climate Action Plan in 2019 represented a major step forward in Ireland's climate mitigation policy, after years of subdued efforts. The plan is more ambitious and comprehensive than previous plans and strategies. It identifies the pathway to reduce GHG emissions in the sectors not covered by the EU-wide Emissions Trading System (ETS) by 30% by 2030, consistently with the net-zero emission goal by 2050. The plan is the result of an extensive public consultation process and enjoys cross-party political support, which is expected to facilitate implementation over time. It adopts a whole-of-government approach and establishes the governance for implementation and monitoring.

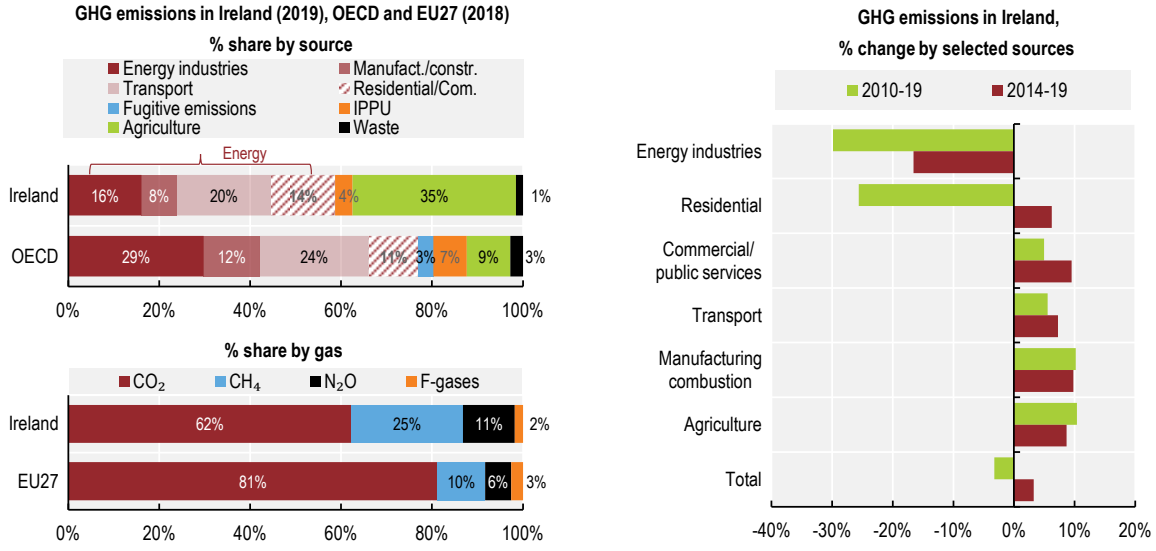
Economic analysis (marginal abatement cost curve) underpinned the projections of emission reductions in each sector and the choice of actions to achieve the target. Some key actions and targets in the electricity, transport, building and agricultural sectors are expected to deliver the largest emission abatement. These include phasing out coal and peat-fired power generation; increasing the share of electricity generated from renewable sources to 70%; reaching 1 million electric vehicles (EVs); increasing biofuel use; installing over 600 000 heat pumps and retrofitting half a million homes; using protected urea fertilisers; and improving animal health and low-emission slurry spreading.

The draft Climate Action and Low Carbon Development (Amendment) Bill, endorsed by the government in October 2020, enshrines the 2050 climate-neutrality goal in law.[4] It requires five-year carbon budgets to set sectoral emissions ceilings and annual revisions of the Climate Action Plan. It also calls for development of a National Long-Term Climate Action Strategy every ten years, strengthens the role of the Climate Change Advisory Council and includes new oversight by and accountability to parliament. The Climate Action Plan and the draft bill provide a strong signal to economic operators and households to drive future investment and consumption. The June 2020 Programme for Government raised the ambition to reducing emissions by 51% between 2021 and 2030. The government plans to update the Climate Action Plan and identify new policies and measures consistent with this goal.

1.3.2. Greenhouse gas emissions profile, trends and outlook

Ireland has an unusual GHG emission profile within the OECD. As of 2019, agriculture accounts for more than a third of emissions (Figure 1.4), second only to New Zealand among member countries. Biogenic methane emissions from livestock make the bulk of these emissions, reflecting the role of dairy and meat production in Ireland's agriculture. Overall, methane emissions account for 25% of total emissions, a share much above the OECD average. Transport, mostly by roads, is the second largest emission source, making up for 20% of emissions. The residential and service sectors are a larger source of emissions than on average in the OECD (Figure 1.4).

Figure 1.4. GHG emissions from most sectors increased in the second half of the 2010s



Note: Total greenhouse gas (GHG) emissions excluding land use, land use change and forestry.

Source: EEA (2020), *GHG data viewer* (database); EPA (2020), *Ireland's Provisional Greenhouse Gas Emissions 1990-2019 (website);* OECD (2020), "Air and climate: Greenhouse gas emissions by source", *OECD Environment Statistics* (database).

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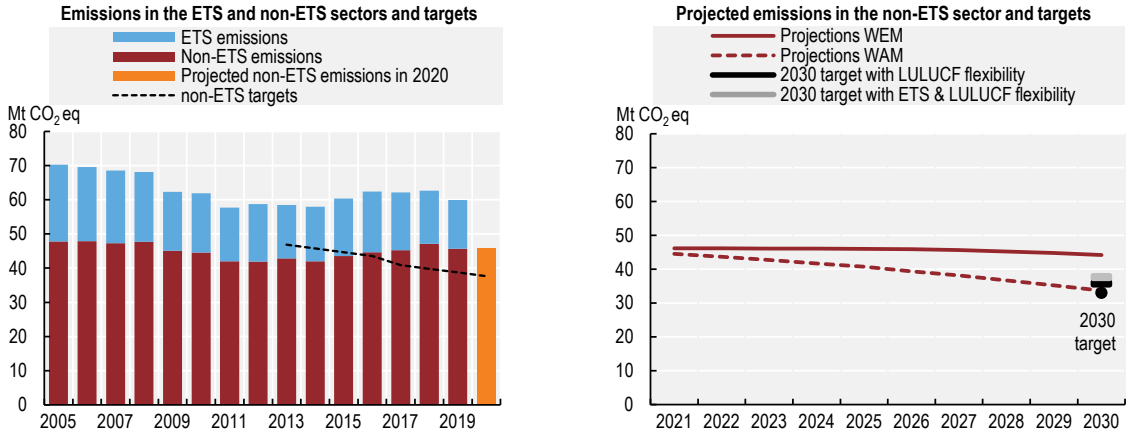
Only one-quarter of Ireland's GHG emissions come from fossil-fuel based energy generation and energy-intensive industry and are, therefore, covered by the EU ETS. This compares to 45% at EU level. Non-ETS emissions (i.e. three-quarters of Ireland's total emissions) are subject to binding targets under the EU Effort Sharing legislation: a reduction by 20% by 2020 and by 30% by 2030 compared to the 2005 level.[5] Agriculture makes up the bulk of these emissions (45%), followed by transport (26%) and residential buildings (14%).

Additional effort is required to achieve SDG 13 on climate action. Ireland has one of the highest GHG emissions per capita in the OECD and in Europe (OECD, 2020d). Its GHG emissions (excluding emissions from land use, land-use change and forestry, or LULUCF) declined markedly during the sovereign debt crisis years in 2008-12 (Figure 1.5). This allowed the country to meet the 2008-12 Kyoto Protocol target of limiting the increase of GHG emissions to 13% of its 1990 level (Figure 2, Assessment and recommendations). With economic recovery, GHG emissions grew by 8% in 2014-18, although more slowly than the economy. Total GHG emissions stabilised in 2016-18 at a level marginally above that at the beginning of the decade (Figure 1.5). Provisional data for 2019 show a 4.5% decrease from the previous year, owing to lower power generation from coal and peat, reduced application of nitrogen fertilisers and lime on soils, and a warmer winter. This is the largest annual emission reduction since 2011 (EPA, 2020b). The 2019 drop brought emissions 3% below the 2010 level and well below the pre-crisis level. Nonetheless, in 2019, Ireland exceeded its annual non-ETS emission limit for the fourth consecutive year (Figure 1.5). Total emissions and emissions from all sources, with the exception of those from the energy industry, grew in 2014-19 (Figure 1.4; Section 1.3.3).

Figure 1.5. Implementing the 2019 Climate Action Plan is key to meeting the 2030 target



Note: National projections with existing (WEM) and additional (WAM) measures, respectively. The WEM scenario includes measures in place by the end of 2018. The WAM scenario assumes implementation of planned policies and measures adopted after the end of 2018, including the 2019 Climate Action Plan. The 2020 target requires emissions outside the EU Emissions Trading System (ETS) to be 20% below their 2005 levels. The 2030 target requires non-ETS emissions to be 30% below their 2005 level. The 2030 target is achievable through access to ETS allowances and credits from actions in the land use, land-use change and forestry (LULUCF) sector.

Source: EPA (2020), *Ireland's Greenhouse Gas Emissions Projections 2019-2040* and *Ireland's Provisional Greenhouse Gas Emissions Data 1990-2019 (website)*.

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The -20% emission target by 2020 appears out of reach. Prior to the COVID-19 crisis, the EPA estimated that non-ETS emissions would decrease by only 4% in 2005-20 under the with-additional-measures (WAM) scenario. WAM assumes implementation of planned policies and measures adopted after the end of 2018, including the 2019 Climate Action Plan (EPA, 2020c) (Figure 1.5). Modelling suggests the COVID-19 crisis led to a nearly 10% decline in overall GHG emissions in 2020 compared to a business-as-usual scenario. However, this will not be enough to meet the target (de Bruin, Monaghan and Yakut, 2020).

Fully implementing the Climate Action Plan in a timely fashion would bring Ireland's non-ETS emissions down by 29% in 2030 compared to 2005. Credits from actions in the LULUCF sector could fill the small gap remaining to achieve the target (Section 1.2.4).[6] The incomplete or delayed implementation of the plan would imply missing the target by a large margin, for which even the full use of flexibility mechanisms could not compensate (EPA, 2020c) (Figure 1.5).[7] The emission drop linked to the COVID-19 crisis is not expected to substantially change the long-term outlook (de Bruin, Monaghan and Yakut, 2020).

Achieving the 2030 climate objectives is challenging. The implementation of the Climate Action Plan requires considerable investment and financial resources, but these have not been sufficiently assessed (EC, 2020a). Given public finance constraints, mobilising the private sector and financial markets is crucial. Planned actions such as massive home retrofitting and expansion of EVs call for households' willingness to invest. Providing stronger price signals (e.g. carbon tax, vehicle taxes and road pricing) would encourage businesses and households to make low-carbon investment, production and consumption choices. Consideration should be given to affordability issues, employment impact and regional disparities (Chapter 3).

1.3.3. Reducing GHG emissions from energy generation and use

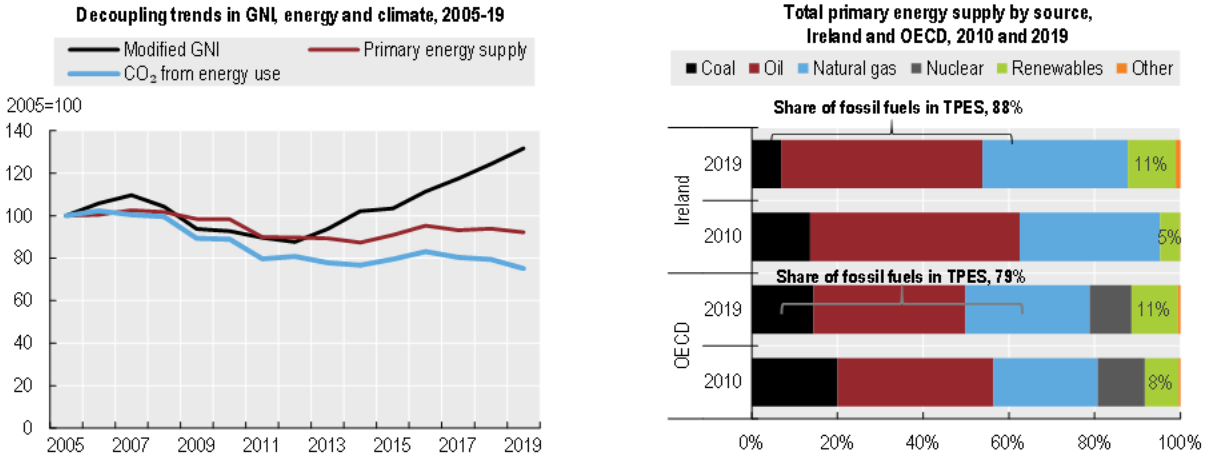
Ireland has made considerable progress in expanding the use of renewable energy sources and improving energy efficiency on the way towards SDG 7 on affordable and clean energy. However, progress has been insufficient to put the country on track to meet its 2020 renewables and energy efficiency targets. Therefore, additional measures are needed to reduce fossil fuel use and energy consumption.

Decarbonising the energy mix

The Climate Action Plan aspires to reach 70% of electricity generated from renewables by 2030, nearly double the 2019 share. This, together with the phase-out of peat and coal power generation, could reduce emissions from energy industries by 34% in 2018-30 (EPA, 2020c). Decarbonising the electricity sector is essential to meet growing electricity demand due to forecasted population and economic growth, localisation of data centres in the country and electrification of heating and transport.

Ireland depends heavily on fossil fuels, including solid fuels, for both electricity generation and residential heating. In 2019, fossil fuels accounted for about 90% of total primary energy supply (TPES), well above the OECD average and among the ten highest shares in the OECD (Figure 1.6). In particular, peat, a carbon-intensive fuel, was about 4% of TPES. Ireland is the second most important producer of peat in the OECD, after Finland.[8] Coal and peat-fired plants generated 8% of Ireland's electricity in 2019 (Figure 1.7).[9] Ireland committed to phase out coal and peat electricity generation by 2025 and 2028, respectively. About a third of active peat bogs have already been closed to extraction.

Figure 1.6. Energy supply has grown less than the economy but relies heavily on fossil fuels



Left panel: Modified GNI = Gross national income in constant prices, excluding highly mobile economic activities that affect the measurement of the Irish economy (retained earnings of re-domiciled companies; depreciation of Irish-based, foreign-owned, intellectual property assets; aircrafts).
Right panel: The breakdown of total primary energy supply (TPES) excludes electricity trade.
Source: IEA (2020), *IEA World Energy Statistics and Balances* (database).

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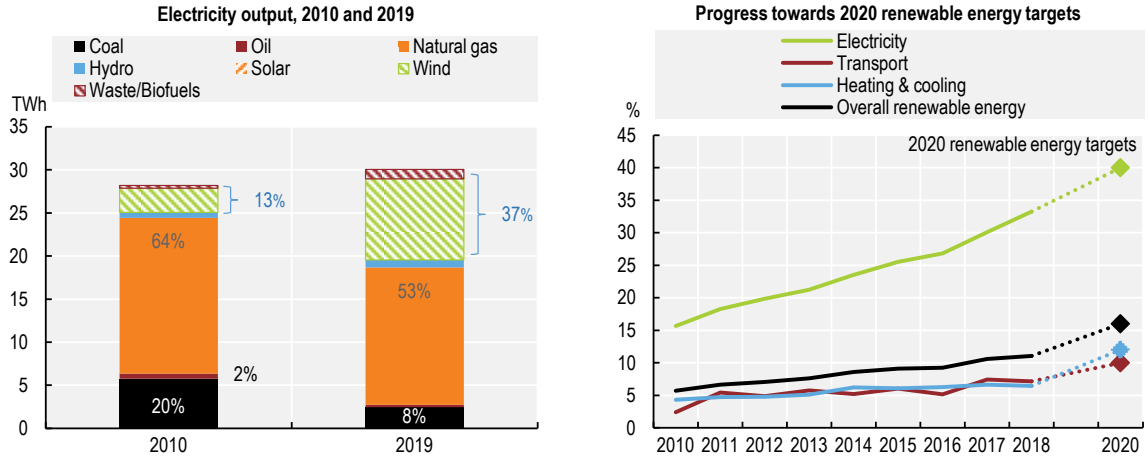
The share of renewable sources in the energy mix has more than doubled since 2010. This, together with a partial shift from coal and oil to natural gas for power generation and heating, has contributed to reducing CO_2 emissions from fuel combustion (Figure 1.6 and Figure 1.7). Total GHG emissions from energy industries declined by 30% in 2010-19 (Figure 1.4). The carbon intensity of electricity generation improved by almost 30% since 2010 to below the OECD average.

The share of electricity generated from renewable sources nearly tripled in 2010-19, reaching 37% (Figure 1.7). This largely reflects the surge in wind power generation, which generated 85% of total renewable electricity in 2019. Wind energy represents about half of Ireland's renewables supply and 6% of its TPES, the second highest share in the OECD after Denmark. Offshore wind represents a minor share of wind power, despite Ireland's vast potential (IEA, 2019). Waste and solid biofuels made up about one-quarter of renewable energy supply in 2019.

Three consecutive renewable energy feed-in tariff programmes have supported power generation from onshore wind, hydro and biomass technology development. A new auction-based renewable electricity

support scheme was launched in 2020. A support scheme for renewable heat became operational in 2020, and the government plans to launch a micro-generation support programme in 2021 (Chapter 3).

Figure 1.7. Ireland will fall short of its 2020 renewables targets despite the wind power boom



Right panel: Share of energy from renewable sources in gross final energy consumption and renewable energy targets as defined in the European Union Directive 2009/28/EC.
Source: Eurostat (2020), *Energy Statistics* (database); IEA (2020), *IEA World Energy Statistics and Balances* (database).

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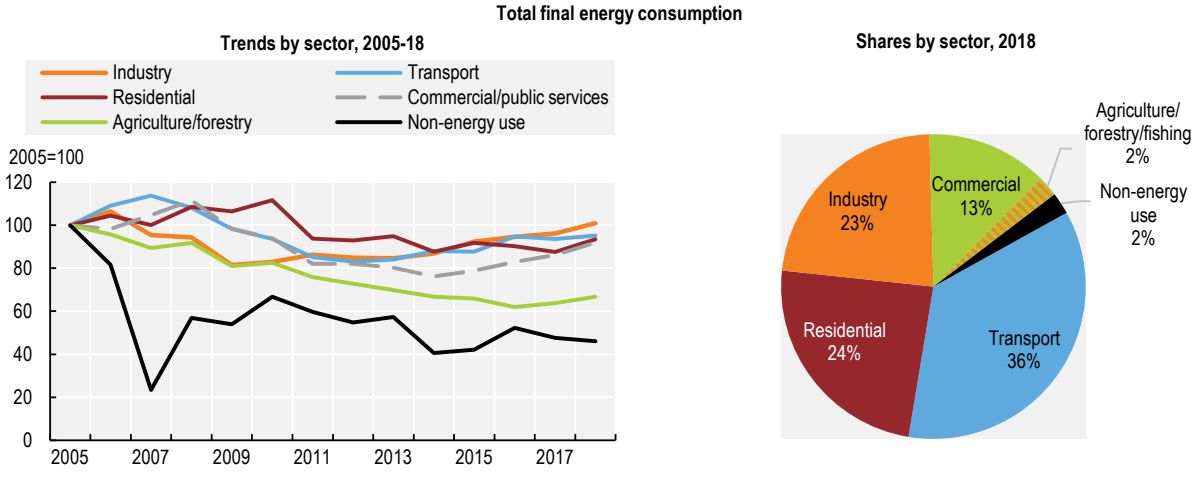
Despite progress, Ireland is not on track to achieve its 2020 renewables target. In 2018, renewables accounted for 11% of gross final energy consumption, one of the lowest shares in the European Union. This compares to the 2020 target of 16%. The 2020 National Energy and Climate Plan (NECP) indicates that the overall and sectoral 2020 targets – for renewables in the electricity, heating and transport sectors – are unlikely to be met (Figure 1.7).

Reducing energy use

Ireland is not on track to achieve its 2020 target of reducing final energy consumption by 20% compared to the 2001-05 average. The 2020 NECP indicates that Ireland will achieve 16% energy savings by 2020. Primary energy supply dropped considerably in the aftermath of the global financial crisis but went back to growth in 2015 (Figure 1.6). Similarly, total final energy consumption (TFC) has been on the rise since the mid-2010s, due to growing consumption in the transport, industry, residential and commercial sectors (Figure 1.8). As a result, GHG emissions from all these sectors grew in 2014-19 (Figure 1.4).

Like in many countries, transport is the main energy user. Transport, mainly road, represented more than one-third of TFC in 2018 (Figure 1.8). Reducing energy use and GHG emissions from transport will require substantial changes in mobility patterns and land-use planning, as well as the massive shift to EVs foreseen by the Climate Action Plan (Chapter 4). EPA (2020c) estimates that achieving the target of 1 million EVs by 2030, jointly with increased biofuel use, would reduce transport GHG emissions by 38% in 2018-30.

Figure 1.8. The transport and residential sectors are the largest end-users of energy



Source: IEA (2020), *IEA World Energy Statistics and Balances* (database).

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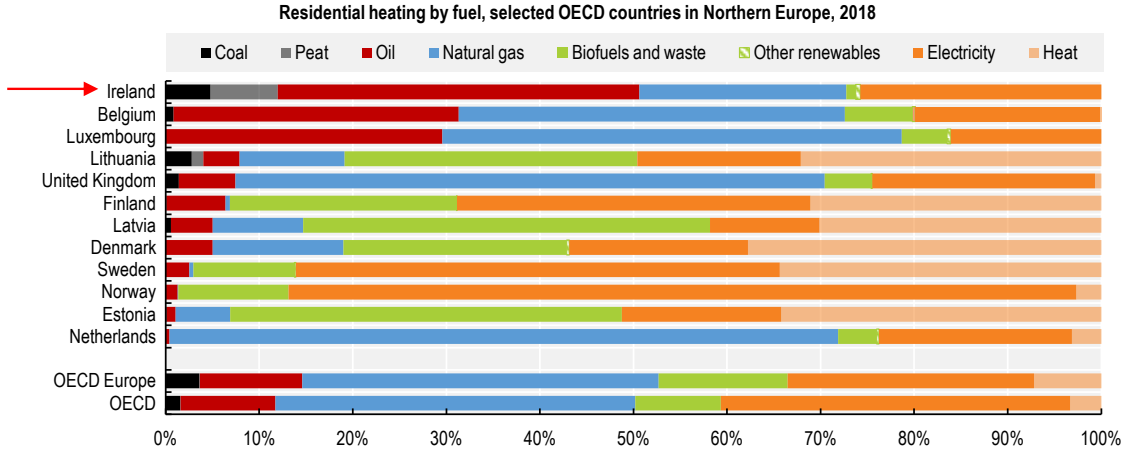
The residential sector accounted for nearly a quarter of energy use in 2018 (Figure 1.8). Several grant schemes have supported energy efficiency improvements in buildings and contributed to reducing energy use from households (Chapter 3). The energy used for residential heating (per unit of floor area) declined by 17% in 2010-17 in Ireland, one of the largest improvements across the European Union. However, in 2017, energy consumption per dwelling (scaled to the EU average climate) was among the ten highest in the European Union (Odysssee-Mure, 2020). Per capita emissions from fuel combustion in the residential sector declined by about 30% in 2010-18. However, at 1.9 tonnes of CO_2 per capita, they were still 52% above the OECD Europe average in 2018.[10] This is because carbon-intensive fossil fuels (coal, peat and oil) still provided about half of home heating in Ireland (Figure 1.9). This is the highest share in OECD Europe.

Figure 1.9. Home heating relies on carbon-intensive fossil fuels



Source: IEA (2020), *IEA World Energy Statistics and Balances* (database).

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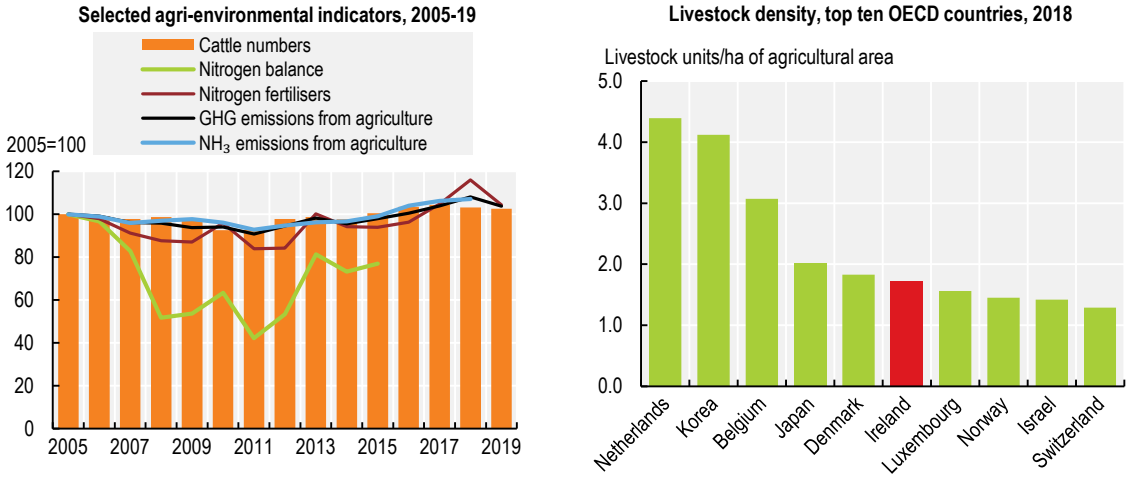
There is evidence of a recent move away from oil boilers in favour of electricity in new residential buildings. Only 4% of new dwellings (built in 2015-20) use oil for heating, compared to more than one-quarter of dwellings built in the previous five years, and 47% have electric heat pumps installed. All houses built in 2015-20 have a high building energy rating (BER), but on average 19% of the audited building stock was in the highest energy-efficient BER categories (A, B1, B2 and B3) in 2020 (CSO, 2020).[11] The near-zero energy building standard for all new buildings was implemented from late 2019. It is expected to improve the energy performance of new dwellings by 25% over the 2011 building regulations requirements and to help phase out the use of oil and gas boilers in new housing constructions.

The Climate Action Plan pledges to retrofit half a million buildings, or a third of the stock, and install 600 000 heat pumps by 2030, of which two-thirds in existing buildings.[12] In addition, the plan commits Ireland to upgrade all public sector buildings to a B BER. It also sets the target to improve energy efficiency in public sector buildings by 50% by 2030. This compares with the target of 33% by 2020; in 2018, the public sector had made 27% energy efficiency gains from the 2009 baseline (SEAI, 2019). EPA (2020c) estimates that full implementation of the energy efficiency measures outlined in the Climate Action Plan will reduce GHG emissions from the residential sectors by 53% and from the commercial/public services sector by 36% in 2018-30.

1.3.4. Reducing GHG emissions from agriculture, forestry and other land use

GHG emissions from agriculture rose by 10% between 2010 and 2019 (Figure 1.4) as the dairy herd and milk production increased following the abolition of the EU milk quotas in 2015. Ireland has one of the highest livestock densities in the OECD (Figure 1.10).

Figure 1.10. Cattle and nitrogen fertilisers are growing sources of environmental pressures



Left panel: Nitrogen balance: difference between the nutrient inputs and the nutrient outputs.
Right panel: Livestock densities are based on livestock units (LSU), where one LSU is the grazing equivalent of one adult dairy cow producing 3 000 kg of milk annually, fed without additional concentrated foodstuffs.
Source: EPA (2020), *Ireland's Provisional Greenhouse Gas Emissions 1990-2019* (website); FAO (2020), "Agri-environmental Indicators", *FAOSTAT* (database); Eurostat (2020), *Consumption of inorganic fertilizers* (database).

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Measures in the Climate Action Plan (including agri-environmental schemes, use of fertilisers with reduced emissions of nitrous oxide, improved animal health and low-emission slurry spreading) are expected to cut GHG emissions from agriculture by 12% in 2018-30. However, a higher than expected increase in dairy herds would lead to steadily increasing emissions (EPA, 2020c), as well as nutrient losses to water bodies

and biodiversity degradation (Sections 1.5 and 1.6). In 2019, the Department of Agriculture, Food and the Marine (DAFM) released a draft roadmap "Ag-Climatise" for consultation. It aims to translate the targets set for the agriculture and land-use sector in the Climate Action Plan into more detailed actions. DAFM expects to finalise the roadmap by end of 2020 or early 2021.

Ireland's approach to managing the carbon footprint and environmental impact of farming (especially of ruminant livestock) has focused on increasing production efficiency. In addition to mandatory requirements, the policy mix relies on agri-environmental support schemes, guidelines and advisory services to encourage famers to improve their technology and practices, as well as the genetics of the herds (Henderson, Frezal and Flynn, 2020). The Green, Low Carbon, Agri-Environment Scheme (GLAS), for example, provides grants for farmers to implement agricultural practices that address GHG emissions, water quality and biodiversity loss. Applicants are required to implement a nutrient management plan as a prerequisite. The Beef Data and Genomics Programme provides per hectare payments to participants to reduce GHG emissions by improving the genetic merits of the beef herd.

However, the steady increase of GHG and ammonia emissions and the degradation of water quality suggest the current policy approach may be insufficient to achieve further environmental improvements while maintaining livestock numbers and expanding production (OECD, 2020e). There are concerns over Ireland's ability to reconcile increased agro-food production and exports with climate, air, water and biodiversity objectives.

Completing the policy mix with pricing instruments could help improve its effectiveness (OECD, 2020f). This would require developing tools such as the Carbon Navigator for modelling and reporting emissions and pollution at farm level. Within the framework of the new EU Common Agricultural Policy, Ireland should further orient income support to farmers towards reducing GHG emissions. This could support actions to reduce herd numbers and/or use land more profitably, as recommended by the Climate Change Advisory Council (CCAC, 2020). Transitionary compensation measures could help maintain income security and well-being of farmers. The Council also recommended setting a separate target for biogenic methane emissions consistent with the carbon neutrality goal.

The LULUCF sector is a net GHG emitter in Ireland. LULUCF emissions have averaged about 7% of total net GHG emissions. Over the same period, the carbon sequestration capacity of forest land increased, although it was partly offset by conversion of grassland and wetlands. The Afforestation Scheme has provided grants to landowners to convert agricultural land to forestry since 1990. Forest cover has increased from 6% to 11% since 1985. The government plans to maintain the scheme to encourage an expansion in forest cover up to 18% by 2050, thereby increasing carbon sequestration capacity. However, uncertainty remains about whether the forestry incentives will be sufficient to overcome both the opportunity costs of afforestation and the cultural preferences for land use by farmers and local communities (Henderson, Frezal and Flynn, 2020). The Climate Action Plan expects additional GHG emission reduction from lowering the management intensity of grasslands on organic soils and the improved management of tilled land, grasslands and non-agricultural wetlands. Overall, actions in the LULUCF sector are expected to provide emissions credits equivalent to 26.8 megatonnes of CO_2 equivalent (Mt CO_2eq) in 2021-30.

1.3.5. Climate change impact and adaptation policy

Ireland's climate has been changing at a scale and rate consistent with regional trends, with more warm days and increasingly intense precipitation. The highest climate-related risks in Ireland are sea-level rise and higher frequency of wind storms and intense precipitation events, with associated flooding and damages to agriculture, the built environment and infrastructure. More than half the population lives near rivers and coasts, where risks are highest. Over 1980-2017, economic losses due to extreme weather and climate-related events were about EUR 1 000 per capita in Ireland, among the highest losses per capita in the European Union (EEA, 2019).[13]

Ireland has made considerable progress in preparing for the impact of climate change. It adopted a National Adaptation Framework in 2018, followed by sectoral and local adaptation plans. In 2020, the EPA and the Centre for Marine and Renewable Energy (MaREI) released the national climate risk assessment, which should be used to review the sectoral and local adaptation plans. The web-based platform "Climate Ireland" provides information and practical guidance to help decision makers, adaptation practitioners and citizens plan for a changing climate and take preventive measures (e.g. flood defence at individual property levels). Ireland could build on these efforts to continue to advance the knowledge base on the impact and risks of climate change, as well as on adaptation options and related investment needs.

The 2018 National Planning Framework aims to integrate climate change considerations into land-use plans at all levels. In 2019, the EPA updated its guidelines on integrating climate factors, including resilience to climate-related risks, into strategic environmental assessment of plans and programmes. The National Development Plan 2018-27 includes public funding for investment in flood defence and enhancement of infrastructure resilience. The private sector needs to be further engaged in climate-proofing investment. The flood insurance market is well-developed in Ireland, but the use of insurance against climate-related risk could be extended. Greater collaboration between the government and insurance companies is needed to quantify climate-related risks and to collect and share information. Ultimately, this would help provide well-targeted insurance schemes and improve insurability of housing and business facilities.

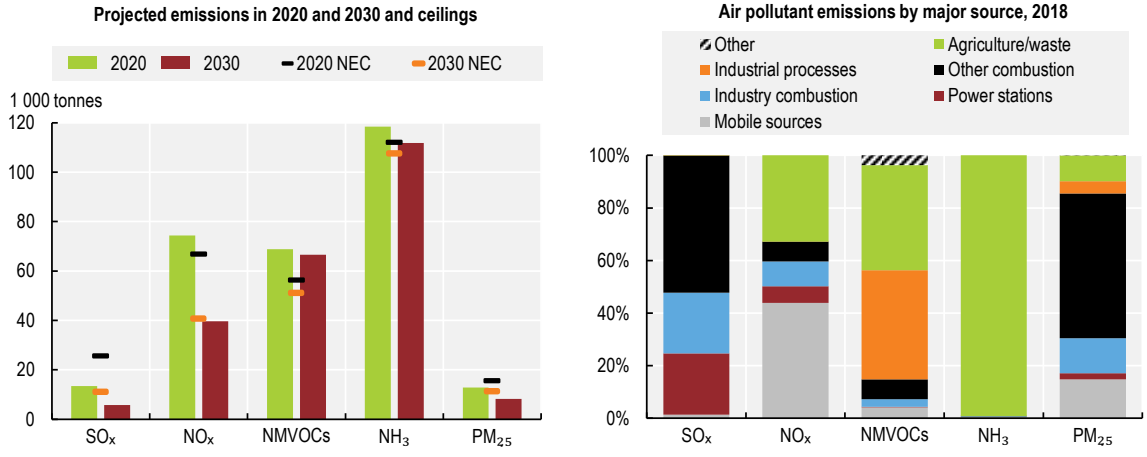
1.4. Improving air quality

1.4.1. Emissions of air pollutants

Emissions of major air pollutants, with the exception of ammonia, have declined since 2010, partly due to the 2008-12 economic recession (Figure 1, Assessment and recommendations). Other contributing factors include the reduced use of coal and peat in power generation and residential heating, the upgrade of power plants and renewal of the car fleet. The 2016 retrofit of the coal-fired Moneypoint power plant helped reduce emissions of nitrogen oxides (NO_x) and sulphur dioxides (SO_2).

Ireland is well on track to meet the 2020 and 2030 targets for emissions of SO_2 and fine particulate matter ($PM_{2.5}$) under the EU National Emissions Ceilings (NEC) Directive (EPA, 2020d) (Figure 1.11). SO_2 emissions more than halved in 2010-18, largely due to the switch to lower sulphur content in fuels in electricity generation and transport.

Figure 1.11. Additional measures are needed to fully comply with the 2030 air emission ceilings



Left panel: Emission projections under the "with additional measures scenario", which considers planned policies and measures beyond 2018 (including the 2019 Climate Action Plan), and reduction targets under the National Emission Ceilings Directive (2016/2284/EC).
Source: Eionet (2020), *National Emission Ceilings Directive Inventory Submission 2020;* EPA (2020), *Ireland Informative Inventory Report 2020*; EPA (2020), *Ireland's Air Pollutant Emissions 1990-2030.*

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$PM_{2.5}$ emissions decreased by 26% between 2010 and 2018, mostly thanks to the reduced use of coal and peat in the residential and service sectors. However, combustion of fossil fuels in these sectors remains a major source of $PM_{2.5}$. It was responsible for around 55% of all national emissions in 2018 (EPA, 2020d). Despite the growing number of vehicles, progress in engine technology and the renewal of the car fleet contributed to reduce $PM_{2.5}$ emissions from road transport by 37% in 2010-18. Transport, mostly from road, accounted for 15% of $PM_{2.5}$ emissions in 2018 (Figure 1.11).

Prior to the COVID-19 crisis, emissions of NO_x and non-methane volatile compounds (NMVOCs) were projected to exceed the 2020 ceilings (EPA, 2020d; Figure 1.11). Emissions of NO_x dropped by about 6% between 2010 and 2013 but have since stabilised. The transport sector, and particularly road transport, contributed nearly half of NO_x emissions in 2018 (Figure 1.11). Reducing NO_x emissions from transport has proven difficult in the last decade. This is because the benefits of improved technology have been offset by the increasing number of vehicles, especially diesel vehicles (Chapter 4). Emissions of NMVOCs rose in the second half of the 2010s, largely due to increasing pressures from agriculture (manure management) and the food and beverages industry (mainly spirit production).

Agriculture is the second largest source of NO_x and NMVOCs emissions and accounts for nearly all ammonia emissions (Figure 1.11). Livestock manure accounts for 90% of ammonia emissions from agriculture, while nitrogen fertilisers are responsible for the remainder. With the increase in both cattle numbers and fertiliser use, ammonia emissions have grown steadily since 2011 (Figure 1.10). Ammonia emissions are projected to continue rising and to exceed the 2020 target (EPA, 2020d; Figure 1.11). The 2019 Code of Good Agricultural Practice for Reducing Ammonia Emissions from Agriculture aims to help farmers reduce emissions linked to fertiliser use, manure management, and animal feeding and housing. The DAFM strategy, Ag-Climatise, is expected to help curb ammonia emissions as well (Section 1.2.4).

The National Air Pollution Control Programme (forthcoming in 2021) will consider the 2019 Climate Action Plan, as many measures outlined in the plan (e.g. in the transport and residential sectors) will help reduce local pollutant emissions as well. Only by fully implementing these measures, especially the shift to electric mobility, will NO_x emissions stay below the 2030 NEC target (Figure 1.11). Compliance with the 2030 ceilings for NMVOCs and ammonia will require new on-farm measure, in addition to those in the 2019 Climate Action Plan (such as protected urea fertilisers and low-emission slurry spreading) (EPA, 2020d). The DAFM's roadmap, Ag-Climatise (Section 1.2.4), is expected to include new measures to address ammonia emissions.

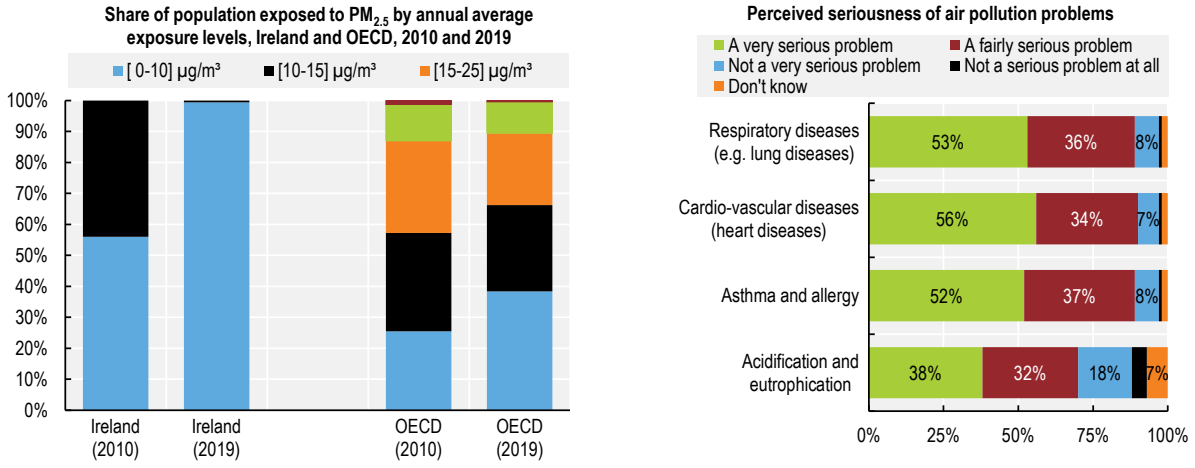
1.4.2. Air quality

Air quality has improved and is generally good. The mean population exposure of Irish citizens to $PM_{2.5}$ decreased by 21% in 2010-19 to 7.8 microgrammes per cubic metre (µg/m³). This is below the guideline value of the World Health Organization (WHO) of 10 µg/m³ and among the lowest in the OECD (OECD, 2020d). Only a minor share of the population was exposed to $PM_{2.5}$ levels above the WHO guideline value in 2019, compared to about 45% in 2010 and over 60% on average in the OECD in 2019 (Figure 1.12).

However, there are episodes of localised air pollution, mostly associated to road transport in urban areas and the burning of solid fuels for home heating. In 2019, due to traffic pollution, the EU annual average limit values for NO_2 were exceeded at one urban monitoring station in Dublin. EPA (2020e) indicates that future exceedances are likely. The restrictions on people's movement to contain the spread of COVID-19 led to less NO_2 pollution in the second quarter of 2020. This is because NO_2 pollution is mostly linked to road transport. NO_2 concentration increased again with the easing of restrictions.

In 2019, concentrations of $PM_{2.5}$ exceeded the WHO guideline value at more than a third of monitoring stations, mostly due to the burning of solid fuels (coal, peat, wood) in cities and towns. For the same reason, concentrations of polycyclic aromatic hydrocarbons or PAHs (a toxic chemical) were above the reference level of the European Environment Agency (EEA) at four monitoring sites (EPA, 2020e).

Figure 1.12. Most people are exposed to low $PM_{2.5}$ levels but consider air pollution of concern



Right panel: Percentage of respondents to the question "Would you say that the following is a very serious problem, a fairly serious problem, not a very serious problem or not a serious problem at all in Ireland?" Survey conducted in September 2019.
Source: EC (2019), "Attitudes of Europeans towards air quality", *Special Eurobarometer* 497; OECD (2020), "Air quality and health: Exposure to $PM_{2.5}$ fine particles - countries and regions", *OECD Environment Statistics* (database).

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The welfare costs of mortality from exposure to $PM_{2.5}$ are among the lowest in the OECD (OECD, 2020d). The EEA estimates that 1 300 premature deaths were attributable to pollution from $PM_{2.5}$ in 2018. Premature deaths due to exposure to $PM_{2.5}$ are lower in Ireland than on average in the OECD (110 per million inhabitants, compared to 275 per million in the OECD in 2019). Nonetheless, most of the Irish population consider air pollution as a serious problem. About 90% of the adults who responded to a special Eurobarometer survey on air quality expressed growing concern for respiratory and cardio-vascular diseases linked to air pollution in the country (Figure 1.12).

A ban on the marketing, sale, distribution and burning of bituminous coal (or "smoky fuel") was first introduced in Dublin in 1990. It was gradually extended to other cities and selected larger cities (so-called Low Smoke Zones or LSZs). The ban has helped reduce pollution from particulates, as well as CO_2 emissions from dwellings (Section 1.2.2). In September 2020, the ban was extended to all cities and towns with a population of more than 10 000, bringing total LSZs to 29 and half of Ireland's population under the scope of the ban. The extension of the ban on bituminous fuels should be accelerated, with a view to establishing a nationwide ban. The scope of the ban could also be extended to other "smoky" fuels (peat and wet wood) in selected locations, while supporting people at risk of fuel poverty in shifting towards cleaner heating fuels (Section 1.2.3).

In 2017, the EPA launched the National Ambient Air Quality Monitoring Programme, bringing the number of monitoring stations in the country to 84. Other stations were upgraded to provide real-time data on fine particles (EPA, 2020e). Modelled and forecasted data supplement the information generated by the monitoring stations. These data have allowed identification of locations with air quality concerns. They have also helped raise public awareness about the impact of people's heating and transport choices on air quality in their communities. These monitoring, information dissemination and awareness-raising efforts should be continued.

1.5. Moving towards a circular economy

1.5.1. The circular economy policy framework

In line with the EU framework, Ireland's policy focus has gradually shifted from waste management to resource efficiency and, most recently, the circular economy. The 2012 waste management policy, "A Resource Opportunity", provided a roadmap to reduce Ireland's dependency on landfill by reducing waste generation and increasing waste recovery. It focused on achieving the EU waste legislation targets. The EPA-led National Waste Prevention Programme (NWPP), launched in 2004, provides tools and information to businesses, households and the public sector to support sustainable consumption and production choices. The NWPP priorities have been revised several times since the programme's inception, shifting from an initial focus on preventing generation of solid waste to averting wasteful use of materials and resources.

The Waste Action Plan for a Circular Economy (WAPCE) 2020-25, adopted in September 2020, supersedes the 2012 national waste policy. It outlines a more consistent approach to a circular economy in Ireland. The WAPCE aims to mainstream the circularity concept in all economic sectors. It includes a wide range of actions to encourage waste prevention, recycling and material recovery along production chains. Among the actions are a ban on single-use items, extended producer responsibility obligation for all packaging producers and deposit-return schemes. The WAPCE foresees the introduction of levies on disposal cups, virgin plastics in packaging and virgin aggregates in construction projects, as well as on incineration and exports of reusable and recyclable waste. Revenue from these levies will be ring-fenced for the Environment Fund to support circular economy projects at all territorial scales. The government also intends to use public procurement as a lever for the circular economy. A whole-of-government circular economy strategy and legislation were under preparation at the time of writing.

1.5.2. Waste and materials management

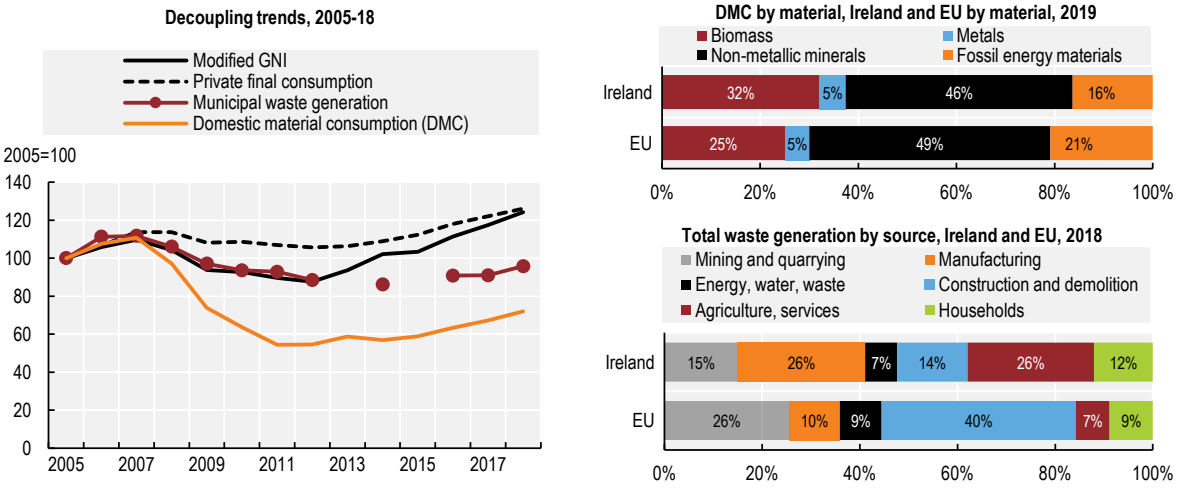
Domestic material consumption and total waste

Domestic material consumption (DMC) has been increasing since 2011. It has grown at a faster pace since 2014 with the rebound of the economy (Figure 1.13). DMC consists mainly of non-metallic materials and biomass, food and feed. This reflects the role of the construction and agriculture sectors in the Irish economy. Material consumption per capita is among the highest in the OECD (OECD, 2020d). In 2019, Ireland's circularity rate, or the share of materials recovered and fed back into the economy, was less than 2% – the lowest in the European Union (the EU average was about 12%). The circularity rate has not improved in the 2010s, and it decreased slightly in 2016-19 (Eurostat, 2020b).[14]

Total waste and municipal waste generation have increased with the rebound of the economy, although not as fast as before the 2007-12 recession (Figure 1.13). The COVID-19 pandemic has led to increased disposal of medical and household waste, including plastic and household items (e.g. from home clear-outs) (DCCAE, 2020).[15]

In 2018, Ireland primary waste was 15% above the 2012 level, although it had declined slightly in 2016-18. Total waste generated per capita was 2.9 tonnes, slightly above half the EU average. The industry sector accounted for about a quarter of total waste generated, the same amount as the agriculture and service sectors combined (Figure 1.13). Industry is the largest source of hazardous waste, which increased by 70% between 2012 and 2018. This increase was mainly linked to increased ash from waste incineration, as well as contaminated soil (EPA, 2020f).

Figure 1.13. Material consumption and waste generation have increased since the mid-2010s



Left panel: Modified GNI: Gross national income in constant prices, excluding highly mobile economic activities that affect the measurement of the Irish economy (retained earnings of re-domiciled companies; depreciation of Irish-based, foreign-owned, intellectual property assets; aircrafts).
Right panel: Domestic material consumption (DMC) equals the sum of domestic extraction of raw materials used by an economy and their physical trade balance (imports minus exports of raw materials and manufactured products). Data for total waste generation exclude secondary waste.
Source: CSO (2020), "National Accounts", *StatBank* (database); Eurostat (2020), "Generation of waste by waste category", *Environment Statistics* (database).

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The EPA estimates that Ireland generated about 1.05 million tonnes of food waste in 2018. Half of this waste, excluding the agricultural residues, is generated by the manufacturing sector. The commercial sector (restaurants/food service and retail/distribution) and households accounted for the remaining half. A significant amount of food waste in Ireland is not properly sorted for separate collection. Food waste makes up over one-third of commercial residual waste bins instead of being discarded in separate bins (EPA, 2020f). The 2019 Climate Action Plans and the WAPCE target a 50% reduction in food waste by 2030.

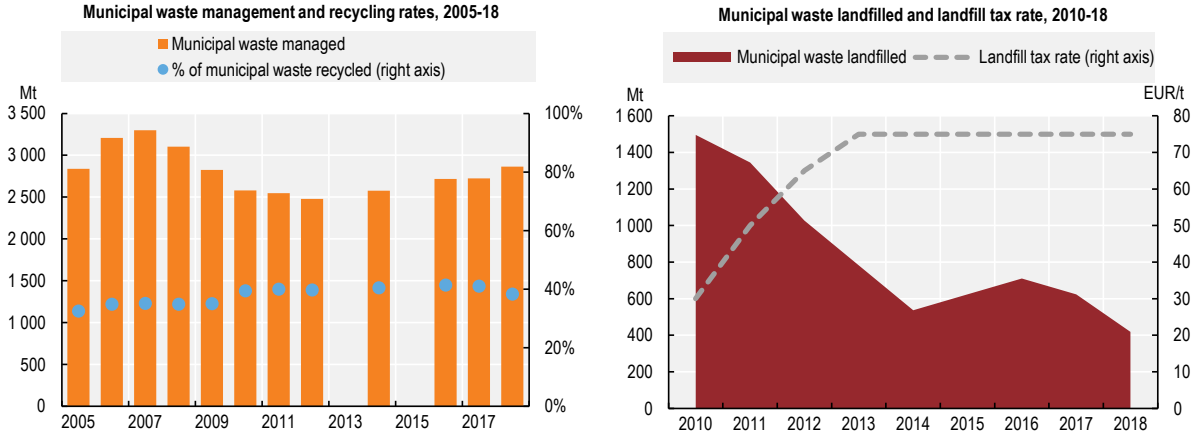
Ireland exports a large part of its (hazardous and non-hazardous) waste for recycling, recovery or disposal due to infrastructure capacity constraints. Exported waste for recycling includes the majority of segregated municipal waste, including plastic packaging. More than 70% of hazardous waste is exported for treatment to other EU countries (EPA, 2020f).

Municipal waste

Municipal waste generation per capita is higher than the OECD average (OECD, 2020d). Municipal waste generation declined during the economic recession in 2008-12, as a result of lower household disposable income and consumption. Generation of municipal solid waste increased by 11% between 2014 and 2018, although less quickly than private final consumption (Figure 1.13). Household waste accounted for half of municipal waste. Plastic waste, particularly packaging, represents an important and increasing waste stream, amounting to about 20% of total household waste (EPA, 2020f).

Ireland introduced a landfill tax in 2002 (Chapter 3). The progressive increase of the landfill tax rate (up to EUR 75/tonne), together with limits on disposal of biodegradable waste, has helped divert waste from landfills (Figure 1.14). In 2018, landfilling accounted for about 15% of treated municipal waste, less than half the OECD average. The number of landfills accepting municipal waste fell from 120 to 4 between 1992 and 2019, and illegal landfills were closed down. Ireland is on track to meet the 2020 EU target on landfilled biodegradable waste, but it may be challenging to achieve further shifts away from landfills. Landfilling has been replaced mostly by waste incineration with energy recovery, which accounted for over 40% of municipal waste treatment in 2018 (Figure 3, Assessment and recommendations).

Figure 1.14. Less municipal waste goes to landfills, but recycling has stagnated



Note: 2013 and 2015 data are not available, the corresponding data presented in the right panel are linear estimates.
Source: EPA (2020), *National Waste Statistics - Report for 2018*.

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Extended producer responsibility programmes have helped increase recycling of several waste streams, including packaging, electrical and electronic equipment, batteries, end-of-life vehicles, farm plastics and tyres. This allowed meeting the related EU recycling targets. Ireland is on track to meet the 2020 targets of the EU Waste Framework Directive on reuse, recycling and recovery (EPA, 2020f). However, municipal waste recycling stagnated for most of the decade, and slightly declined in 2016-18 (Figure 1.14). Increased incineration and composting may discourage recycling and prevent Ireland from meeting the post-2020 recycling targets (EC, 2019). Additional efforts may be needed to achieve the more ambitious recycling targets beyond 2020.

A large share of municipal waste is not properly sorted. Over 20% of material in the household recycling bins should not be there. Less than half of Irish households had a bin for collection of organic waste (brown bin) in 2018. Two-thirds of plastic waste are excluded from Ireland's recycling list (EPA, 2020f). There is scope to improve household sorting behaviour by raising awareness and applying economic incentives.

In 2017/18, Ireland rolled out waste collection fee systems that take the weight or volume of the waste collected into account. This is in line with a recommendation from the 2010 OECD Environmental Performance Review (OECD, 2010). However, not all service providers apply differentiated fees to recycling or organic/food bins.

The transition to a circular economy calls for developing new recycling industries and secondary raw material markets to better use the stock of materials contained in waste. There is potential to better exploit synergies with policies in other sectors, including industrial and innovation policies, education and active labour market policies, and green public procurement (Chapter 3). This is all the more important in response to the disruption of global trade caused by the COVID-19 crisis. A circular economy approach will help increase resilience of supply chains and self-sufficiency. Initiatives such as CirculEire (Chapter 2) and the Green Business Fund (Chapter 3) go in the right direction.

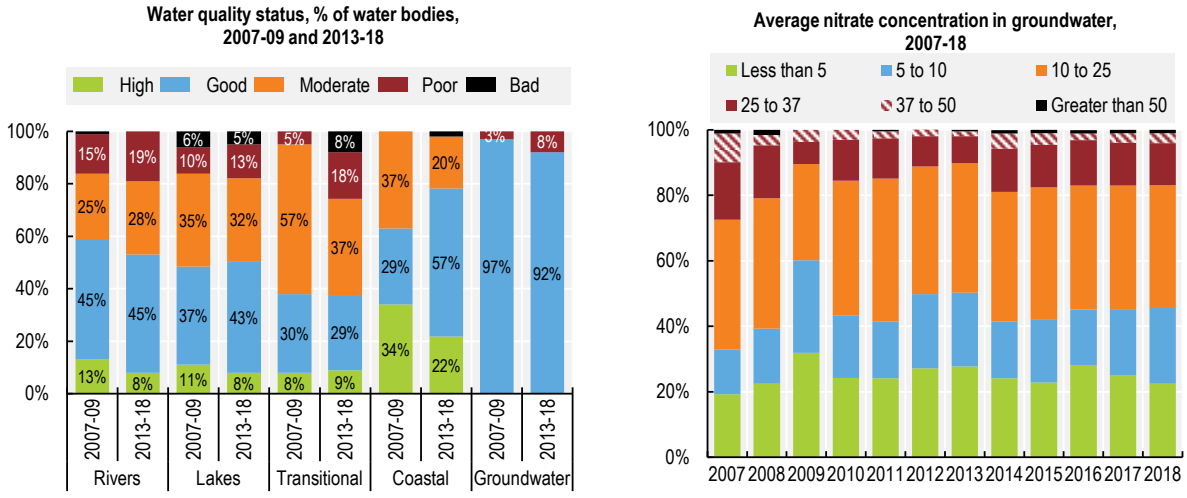
1.6. Improving water resource management

1.6.1. Water quality

The quality of Ireland's abundant water resources has deteriorated since 2010. Ireland did not achieve the water quality improvement objectives set by the River Basin Management Plan (RBMP) 2009-14. Quality

data collected over 2013-18 indicate that 52.8% of surface water bodies are in at least good ecological status, down from 55.4% in 2010-15, the previous assessment period.[16] Between 2007-09 and 2013-18, water quality deteriorated the most in rivers. Nonetheless, the quality of Irish rivers, as measured by the five-day biochemical oxygen demand (BOD5), is among the best in the European Union (Eurostat, 2020a).[17] Most transitional waters (estuaries and lagoons) are in a less-than-good ecological status (Figure 1.15). On the other hand, 80% of coastal waters are in good ecological status and none of them failed to achieve good chemical status.[18] A quarter of surface water bodies have poor chemical status, mostly due to ubiquitous and persistent toxic substances (such as mercury and PAHs). Excluding these substances, 99% of surface water bodies have good chemical status (EPA, 2019).[19]

Figure 1.15. Water quality has declined and more groundwater bodies suffer from nitrate pollution



Right panel: Percentage of monitoring locations with average nitrate concentrations in the ranges indicated (expresssed in mg/l/NO_3).
Source: EPA (2020), *Environmental Indicators* (database); EPA (2019), *Water Quality in Ireland 2013-2018*.

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Groundwater quality (chemical and quantity status) is generally good. However, more groundwater bodies present high nitrate (NO_3) levels. The share of monitoring stations with average concentrations above 25 milligrammes per litre (mg/l) of NO_3 has increased since 2013 (Figure 1.15). Nonetheless, the average nitrate concentration was below the threshold value for the protection of drinking water source (37.5 mg/l NO_3) at the vast majority of groundwater monitoring locations. On average, Irish groundwater bodies have among the lowest nitrate concentrations in the European Union (Eurostat, 2020a).

The main pressure on Ireland's water bodies is nutrient pollution (nitrogen and phosphorus). Agriculture and inadequate wastewater treatment (Section 1.5.2) are the main sources of nutrient losses and, thus, drivers of declining water quality in Ireland. Nitrogen balance has been rising since 2011, together with livestock and nitrogen fertiliser use (Figure 1.10). The intensity of nitrogen fertilisers, measured by the tonnes of fertilisers used per square kilometre (t/km^2) of agricultural land, increased to 8.8 t/km^2 in 2018, much higher than the OECD average (2.6 t/km^2). Discharge of untreated or insufficiently treated wastewater has led to high phosphorus concentrations in many areas of the country (EPA, 2019).

The RBMP 2018-21 identifies 1 460 water bodies at risk of not achieving their water quality objectives and prioritises 190 Areas for Action.[20] The Local Authority Waters Programme (LAWPRO) is a local government shared service that conducts targeted assessments and promotes measures to improve water quality at local level. The Teagasc (Agriculture and Food Development Authority) and the dairy co-operatives operate the Agricultural Sustainability Support and Advisory Programme (ASSAP). The programme provides free and confidential advice to farmers on measures to improve water quality.

Initiatives such the LAWPRO and ASSAP appear to be contributing to some water quality improvement in the selected Areas for Action. Water quality has improved in 16.7% of the water bodies in these areas (EPA, 2019).

However, urgent measures are needed to address the causes of water quality deterioration, and particularly nutrient losses from agriculture. Ireland could consider introducing pricing instruments to address nutrient losses from agriculture (e.g. charges on nutrient losses or water quality trading). Transitionary compensation measures could help maintain income security and well-being of farmers. As part of the national strategic plan under the new EU Common Agriculture Policy, Ireland should shift farmer income support towards agri-environment payments based on environmental outcomes, including reduction of nutrient losses, as well as GHG and ammonia emissions (Sections 1.2.4 and 1.3.1).

1.6.2. Water supply and wastewater management

Ireland has considerably improved the management of water services with the establishment of Irish Water (the national water utility) and the adoption of a water services policy statement and funding framework. The transfer of responsibility over water services from a multitude of local authorities to a single utility aimed to overcome fragmentation and improve efficiency. The new institutional setting has enabled to better identify investment and financing needs in the water sector and to re-launch investment in infrastructure and services (Chapter 3). The water supply and wastewater treatment infrastructure is ageing and needs to be upgraded.

Drinking water supply

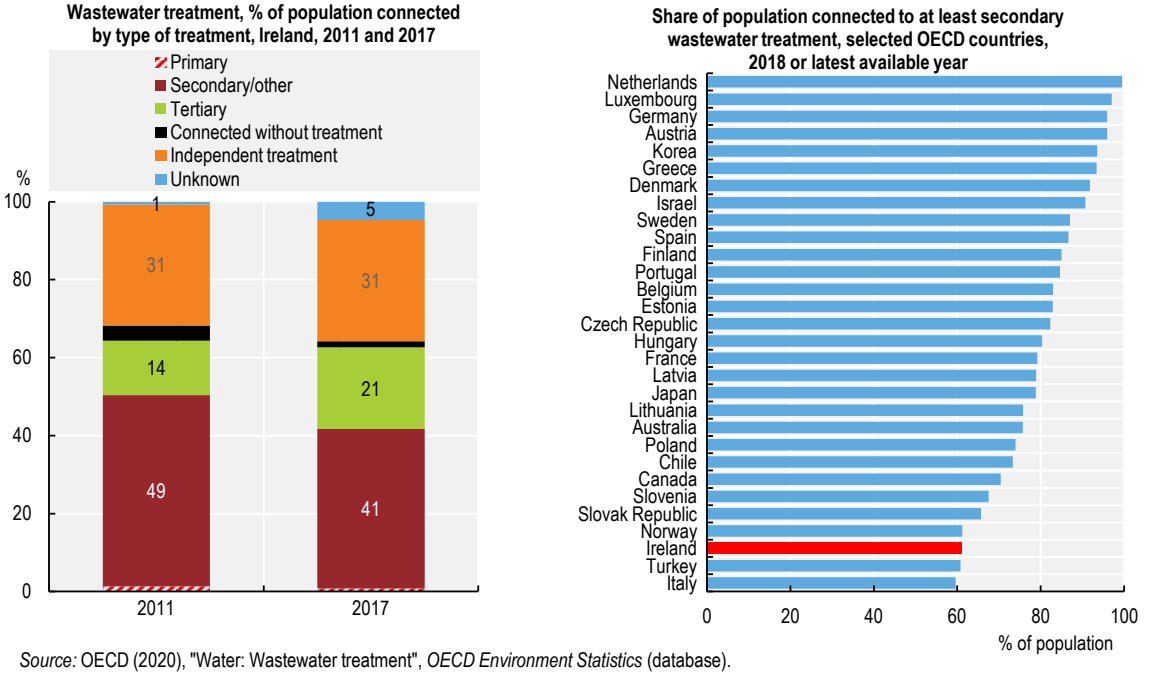
Water losses are high; about 45% of the treated water is unaccounted for. Water losses have resulted in high and increasing water abstraction for public water supply (Figure 1, Assessment and recommendations). For this reason, Ireland has one of the highest levels of freshwater abstraction per capita for public water supply in the OECD (OECD, 2020d). In 2014-17, as part of the water conservation measures, Irish Water implemented a programme to equip 60% of its customers (about 1.5 million households) with water meters. Irish Water also launched a programme to help households identify and fix water pipe leaks. An excessive use charge will be payable starting in 2022 by all domestic customers with water use above a certain allowance (Chapter 3). In many case, excessive water use is attributable to leaks.

There is sporadic non-compliance with drinking water quality parameters, including for pesticides and trihalomethanes. The quality of water supplied from small private supplies is generally poorer than that from public water supplies. Private systems, including household wells, serve 20% of the population. About one-third of private wells are not adequately sealed and are vulnerable to contaminations (e.g. from E. coli and Verocytotoxigenic E. coli, or VTEC). Ireland has the highest incidence of VTEC infection in Europe due to water contamination from cattle slurry (EPA, 2020g).

Wastewater treatment

Less than two-thirds of the population is connected to wastewater treatment systems that provide at least secondary treatment, one of the lowest rates in the OECD (Figure 1.16).[21] Almost a third of the population, mostly living in dispersed settlements in rural areas, relies on independent water treatment systems (i.e. facilities not connected to a wastewater treatment plant through a public sewage network). While the development of sewerage networks in isolated areas may not meet cost-efficiency criteria, there is a need to ensure full compliance of the independent treatment systems (e.g septic tanks). In 2017/18, nearly half of the inspections of independent domestic wastewater treatment systems revealed non-compliance with legal standards. The government provided grants of up to EUR 5 000 per household for improving their facilities.

Figure 1.16. Wastewater treatment needs to be extended and improved



Source: OECD (2020), "Water: Wastewater treatment", *OECD Environment Statistics* (database).

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Ireland has upgraded its wastewater treatment plants. About one-fifth of the population was connected to plants that provide tertiary treatment in 2017, up from 14% in 2011 (Figure 1.16).[22] However, in 2019, treatment in 19 of 172 large urban areas (agglomerations), including Dublin and Cork, still did not conform to the quality requirements of the EU Urban Wastewater Treatment Directive (compliance was required by 2005). These account for 56% of collected wastewater from large urban areas. Some 1.5% of the population lives in 35 smaller town and villages that discharge wastewater without treatment. In many areas, the sewers also collect rainwater run-off from roads and other impermeable surfaces, which can cause stormwater overflows (EPA, 2020h).

Overall, the rate of improvement in wastewater infrastructure has been slow. In 2019, Irish Water completed about half of the infrastructure extension and upgrades that were required by EPA's wastewater discharge licences. It planned to provide all areas connected to the public wastewater network with treatment facilities by 2022. This was postponed to 2024 (EPA, 2020h). The RBMP 2018-21 identifies 57 priority areas where wastewater is the main pressure on water quality. As of 2018, Irish Water had scheduled, started or completed improvement works at 35 of these priority areas (EPA, 2019). Accelerating investment in wastewater infrastructure is needed to reduce water pollution and advance towards the SDG 6 on clean water and sanitation.

1.7. Halting biodiversity loss

1.7.1. The policy framework for biodiversity conservation and sustainable use

Ireland has strengthened its biodiversity policy framework. It adopted the Strategic Plan for Biodiversity 2011-20 and the third National Biodiversity Action Plan 2017-21. Together, the plans aim to mainstream biodiversity across sectors, improve the information base, expand protected areas and improve their management, reinforcing the governance of ecosystem services. Ireland is one of the few EU countries

with a geographic information system service for data on ecosystems and their services. It completed a pilot study on mapping and assessing ecosystem services.

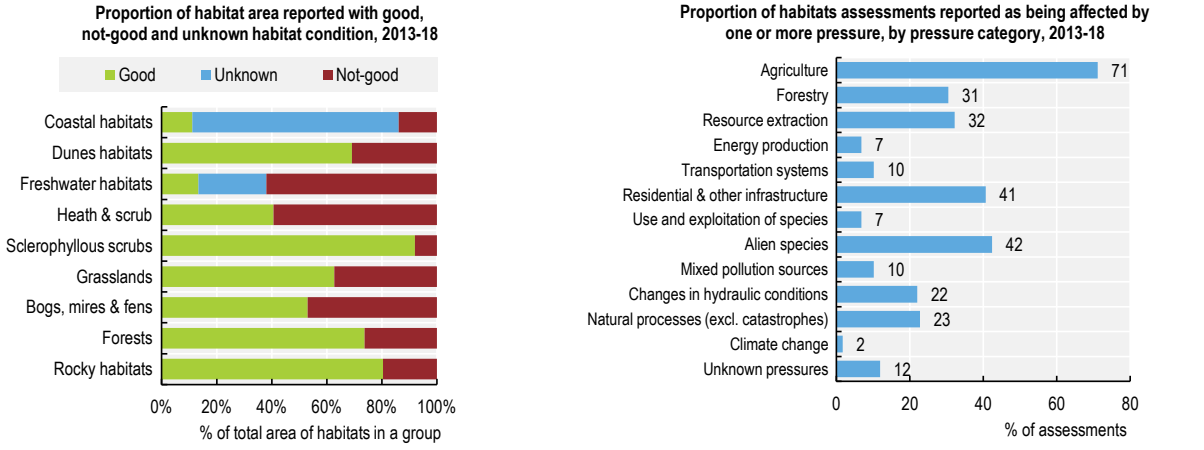
However, more efforts are needed to achieve SDGs 14 and 15 on terrestrial and marine biodiversity. Implementation challenges remain, due to the variety of sectors that impact on biodiversity (e.g. agriculture, fishery, wind energy) and the multitude of actors involved. An assessment of financial needs for biodiversity will be concluded in 2021 by University College Dublin, with the financial support of the Irish Research Council and the National Parks and Wildlife Service (Biodiversity Finance Ireland). This assessment is expected to form the basis for a biodiversity financial plan and a strategy to mobilise private finance for biodiversity. There is a need to extend the whole-of-government approach adopted for climate mitigation to biodiversity policy.

1.7.2. Conservation status of habitats and species

Agricultural land (grassland and cropland) covers three-quarters of Ireland's territory. Grassland covers 67% of the country, by far the largest grassland cover among OECD members (OECD, 2020d). Ireland has abundant freshwater bodies; inland waters and wetland jointly cover about 15% of the country. Peat soils cover 16% of the country, the third largest peatland cover in Europe (after Finland and Estonia). The share of artificial surface (1.3%) is among the lowest in the OECD. Ireland lost only 0.2% of natural and semi-natural vegetated land in 2014-18, the second lowest share among member countries and less than half the average loss in the OECD as a whole (OECD, 2020d).

The quality of key habitats (as defined by the EU Habitats Directive) has deteriorated. Only 15% of habitat assessments in 2013-18 indicated a favourable status, one of the lowest shares in the European Union (EEA, 2020). The remaining assessments indicated habitats in either poor or bad status. Conditions have been deteriorating in almost half of the assessed habitats and improving in just 2% of them (Figure 1.4, Assessment and recommendations). Most freshwater habitat area is in not-good condition (Section 1.5.1). Large areas of scrub, bogs and grasslands habitats are also in not-good condition (Figure 1.17).

Figure 1.17. Habitats are under pressures from agriculture, development and resource extraction



Source: EEA (2020), Member State reported data on conservation status, pressures and threats of habitat types and species (Article 17, Habitats Directive 92/43/EEC).

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There are large knowledge gaps about the conservation status of coastal areas (Figure 1.17). However, there is evidence of pressures from aquaculture, wastewater discharges and marine plastic littering on these habitats. While most coastal waters are in at least good ecological status (Section 1.5.1), the share

of bathing coastal sites with excellent water quality declined from 85% in 2013 to 70% in 2018. This is below the EU average of 88% (Eurostat, 2020a). Fishing is the main driver of over-extraction and abrasion of the seabed. Impacts on the marine environment and wildlife from pressures on coastal habitats, as well as fishing, marine shipping and extractive industry, are becoming more apparent (DCHG, 2020).

Ireland is home to more than 31 000 species (DCHG, 2019). The 2013-18 assessment showed that 57% of assessed species were in favourable status (Figure 4, Assessment and recommendations), the highest share among the EU countries that are also part of the OECD (EEA, 2020). Conditions are stable for most species, although knowledge gaps remain. However, the conditions of species in unfavourable status have not been improving. The bird population of over 40% of the assessed breeding species in Ireland increased in 2007-18. This is the best result in the European Union. However, the population of half of the assessed wintering species declined in the same period (EEA, 2020).

Agriculture, housing and infrastructure development, alien species and resource extraction are among the main pressures on Ireland's biodiversity (Figure 1.17). Agriculture practices have intensified, with a shift from mixed farming with small-scale cereal growing to a specialisation in livestock production, notably dairy farming (DCHG, 2019). Organic-farmed land more than doubled in 2012-18 but accounts for just 2.5% of total agricultural area, among the lowest shares in the European Union. The grass-based nature of the Irish agriculture system, the small average size of farms and the low domestic demand for organic products have slowed the development of organic farming. The June 2020 Programme for Government aims to triple the country's share of organic land to bring it in line with the EU average (7.5%).

Agri-environmental schemes account for most government transfers for biodiversity conservation. The flagship GLAS made up nearly 70% of biodiversity-related government transfers in 2015-18. A minor share of agri-environment scheme funding targets organic farming. Funding directly targeting species and habitat conservation is limited and largely EU-funded. The declining conditions of habitats raise questions about the effectiveness of spending.

Peat extraction exerts major pressures on fragile bog ecosystems, particularly raised bogs and blanket bogs. As of 2018, Ireland had closed 17 of 62 active bogs, in line with the commitment to phase out peat electricity generation by 2028 (Section 1.2.3). There has been some recent progress in conservation and restoration of bogs with the implementation of a national peatland programme. The COVID-19 recovery package, launched in July 2020, and the 2021 Budget both allocated funds to peatland restoration. These moves aim to create jobs that tackle the climate and biodiversity crisis, while improving quality of life for communities dependent on peat extraction in the Midlands (Chapter 3). However, Ireland should ensure that remaining peat harvesting is compatible with the conservation of bog habitats (EC, 2019).

1.7.3. Protected areas

Little progress has been made in extending the protected area network. According to national estimates, nearly 17% of land surface and inland waters are protected in Ireland, in line with the 2020 Aichi target. This percentage may be overestimated, as some terrestrial protected areas include marine and coastal waters. Several sources, including the International Union for Conservation of Nature (IUCN), indicate that about 14% of terrestrial areas are protected, among the lowest shares in the OECD. This share has remained stable in the last decade and the level of protection (according to the IUCN classification) is relatively low (OECD, 2020d). Ireland completed its terrestrial Natura 2000 network under the EU Birds and Habitats directives, but site-specific conservation objectives and measures are lacking for many sites (EC, 2019). The vast majority of sites are privately owned and nearly 60% are farmed. Engaging land owners is, therefore, crucial to implement effective conservation and restoration measures.

The marine Natura 2000 network is incomplete and Ireland has not extended its protected marine areas. These represent less than 2% of the country's exclusive economic zone, far from the Aichi target of 10% by 2020. Little progress has been made in designing and implementing specific measures to achieve good

environmental status of marine waters by 2020 (as required by the EU Marine Strategy Framework Directive) (EC, 2019). The June 2020 Programme of Government pledges to protect 30% of Ireland's marine waters by 2030, as well as to complete a national marine planning framework and an overarching 20-year strategy to manage the country's seas (Project Ireland Marine, 2040).

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Notes

[1] Ireland successfully exited the European Union-International Monetary Fund financial assistance programme in December 2013. The programme was largely based on the 2010 government's National Recovery Plan 2011-14.

[2] Modified gross national income (GNI) adjusts standard GNI for the depreciation of foreign-owned domestic capital assets and the retained earnings of relocated firms, both of which are not considered relevant for explaining the resources available to the domestic population.

[3] The Greater Dublin Area includes Dublin City, Dún Laoghaire-Rathdown, Fingal, Kildare, Meath, South Dublin and Wicklow.

[4] The draft text of the bill was under pre-legislative scrutiny at the time of writing.

[5] Ireland's 2020 target was the most demanding among EU countries. Only Denmark and Luxembourg had the same target. The 2030 targets for all EU countries range from 0% to -40%.

[6] The 2018 EU Effort Sharing Regulation maintains the flexibilities under the EU Effort Sharing Decision (e.g. banking, borrowing and buying and selling between EU member states) and provides two new flexibilities: use of ETS allowances and credits from action undertaken in the LULUCF sector. The LULUCF flexibility amounts to a credit of 26.8 Mt CO_2eq over the compliance period (2021-30). Under the WAM scenario, LULUCF actions would bring non-ETS emissions down by 34% in 2030, compared to their 2005 level, and ensure Ireland's compliance with the target.

[7] EPA (2020a) projected total GHG emissions to decline by 6% by 2030 below 2005 levels, under the with-existing-measures (WEM) scenario, which assumes implementation of policies and measures in place by the end of 2018. Using the LULUCF flexibility would bring emissions down by 12%. Using the ETS flexibility (18.8 Mt CO_2eq over 2021-30) as well would bring emissions 15% below their 2005 level.

[8] Finland and Ireland jointly account for 90% of total peat production in the OECD.

[9] There are two peat-fuelled power plants in operation (West Offaly and Lough Ree), one biomass-peat co-fired plant in Enderry and one coal-fired plant (Moneypoint).

[10] Per capita emissions from fuel combustion in the residential sector with electricity and heat allocated to the consuming sector.

[11] A BER is an indication of the energy performance of a dwelling (represented in units of kWh/m^2/year) on a scale varying from A to G. A BER is based on the characteristics of major components of the dwelling. A BER certificate and advisory report is compulsory for all homes being sold or rented (since 2009), for new dwellings that apply for planning permission (since 2007) and to benefit from the grants under the Better Energy Homes scheme.

[12] The building renovations aim at achieving at least a B2 BER.

[13] Economic losses refer to the estimated monetary value of direct damage to assets, excluding human and ecosystem losses (EEA, 2019).

[14] The Eurostat indicator “circular material use rate”, referred to as the “circularity rate”, measures the contribution of recycled materials towards the overall use of materials. It is the share of material resources used that came from recycled products and recovered materials. The higher the circularity rate, the more secondary materials replace primary raw materials (thereby contributing to reducing the extraction of primary materials) (Eurostat, 2020b).

[15] In normal times, household items from home clear-outs would have been reused or resold through charity shops. However, these shops were closed for several weeks in the second quarter of 2020 due to COVID-19 containment measures.

[16] The ecological status measures the damage to a natural water body caused by pollution or habitat degradation. It is an assessment of the quality of the structure and functioning of surface water ecosystems, based on biological quality elements (e.g. phytoplankton, macroalgae, aquatic plants, macroinvertebrates and fish) and supporting physico-chemical and hydromorphological quality elements.

[17] The BOD5 measures the amount of oxygen that aerobic microorganisms need to decompose organic substances in a water sample over a five-day period in the dark at 20°C. Organic pollution caused by discharges from wastewater treatment plants, industrial effluents and agricultural run-off increase concentrations of this parameter.

[18] The chemical status is assessed against compliance with environmental quality standards for priority substances and priority hazardous substances as listed in the EU Environmental Quality Standards Directive (2008/105/EC) and amended by the Priority Substances Directive (2013/39/EU). These substances include metals, pesticides and various industrial chemicals.

[19] Ubiquitous substances are widely distributed in the environment and tend to persist in the environment for many years since they have been discharged.

[20] The RBMP 2018-21 aims to improve the quality of 726 water bodies in the priority areas, bringing 152 of these water bodies to at least good ecological status.

[21] Secondary treatment is a process generally involving biological treatment with a secondary settlement or other process, which removes organic material and reduces biochemical oxygen demand by at least 70% and chemical oxygen demand by at least 75%.

[22] Tertiary treatment includes the treatment of nitrogen and/or phosphorous and/or any other pollutant affecting the quality or a specific use of water (microbiological pollution, colour, etc.).

2 Environmental governance and management

Ireland is a small unitary state where local authorities play a strong role. The national and local governments use a wide range of good practices in environmental regulation, compliance assurance and promotion of green business practices. However, non-compliance remains a challenge. This chapter analyses the institutional and regulatory framework for environmental management, including horizontal and vertical co-ordination mechanisms. It examines the setting and enforcement of environmental requirements, discussing issues related to environmental impact assessment and land-use planning. Subsequently, it analyses compliance assurance, including inspections, enforcement and liability. Finally, it looks at Ireland's efforts to promote environmental democracy, including mechanisms of public participation in decision making, as well as access to environmental information, education and justice.

Recommendations on environmental governance and management

- Streamline and consolidate national environmental legislation, particularly in the area of water, while expanding the use of *ex post* assessment of laws and regulations.
- Make EIA conclusions, if negative, binding on development consent decisions; continue to improve SEA practices through appropriate consideration of alternatives and monitoring of environmental effects of plans and programmes.
- Reduce the administrative burden on competent authorities and small enterprises by developing activity-specific standard requirements (general binding rules) for more categories of facilities with low environmental impact.
- Introduce variable administrative fines to decriminalise less serious environmental offences; increase the deterrent effect of monetary penalties by assessing and recovering economic benefit of non-compliance.
- Adopt legislation on remediation of contaminated land and establish provisions for cleaning up abandoned industrial sites, including appropriate financing mechanisms.
- Make GPP mandatory for public authorities and implement regular GPP monitoring and reporting.
- Facilitate access to justice by following through with the plan to establish a Planning and Environmental Law Court and providing financial assistance for public litigation on environmental matters.

2.1. Introduction

Ireland is a small unitary state where local governments play a strong role. It has higher regulatory quality, government effectiveness, rule of law and accountability than OECD member countries on average. However, most of these indicators declined slightly between 2008 and 2018 (World Bank, 2019). Over the last decade, the country built on its performance management culture to further strengthen its environmental planning and evaluation tools through better use of higher quality information and indicators.

2.2. Institutional framework for environmental governance

Ireland has two levels of government: the national government and 31 local authorities of counties or municipalities. In 2014, the country undertook a far-reaching reform of local government, reducing the number of local and regional authorities. It also introduced a comprehensive system of local governance, with municipal districts replacing town councils. Three Regional Assemblies co-ordinate and promote strategic planning and sustainable development at the local level, promote effectiveness of local government and public services, and manage the European Union (EU) funding for regional development (Chapter 3). These reforms provided a more holistic approach to local environmental governance by, for example, consolidating waste management planning in line with a recommendation of the 2010 OECD Environmental Performance Review (OECD, 2010).

2.2.1. Central government and horizontal co-ordination

Environmental policy-making responsibilities are divided between two government departments: the Department of the Environment, Climate and Communications (DECC) and the Department of Housing, Local Government and Heritage (DHLGH). The DECC oversees climate action, energy and natural resources, as well as other environmental domains except water resources management; the latter falls under the DHLGH's responsibility. The Department of Transport is under the same minister as the DECC, which indicates the government's high policy priority of climate change and sustainable mobility. Biodiversity conservation is the remit of the National Parks and Wildlife Service under the DHLGH. The Department of Agriculture and the Marine covers the forestry and fisheries sectors. This institutional fragmentation of environmental policy making presents certain co-ordination challenges. However, following the 2020 government reorganisation, ministers and their officials will work more closely in a series of cabinet committees with focused responsibilities. An ambition to work towards an overarching national policy position on the environment was expressed in the 2020 state of the environment report.

Ireland's Environmental Protection Agency (EPA), an independent public body, regulates major industrial installations, most waste facilities (with local authorities also playing an important enforcement role in waste management), greenhouse gas (GHG) emissions under the EU Emissions Trading System and several other sources of environmental pressure. The EPA's staff levels and funding increased over 2015-18 (OECD, 2020), with most of the latter coming from the general budget. This funding is complemented by allocations from the Environment Fund (which collects revenues from the landfill and the plastic bag levies) and revenues from licensing and inspection fees (Sections 2.3.2 and 2.4.1).

To facilitate the EPA's relations with the executive, an Oversight Agreement between the EPA and the predecessor departments of the DECC and DHLGH and the associated Performance Delivery Agreement establish key performance indicators for the EPA.[1] However, these indicators focus on outputs (number of site visits, reports, datasets, etc.) rather than outcomes and effectiveness of performance. This contrasts with performance indicators of environmental regulatory agencies in the United Kingdom. Moreover, the EPA's internal performance management frameworks do not include quantitative targets (OECD, 2020).

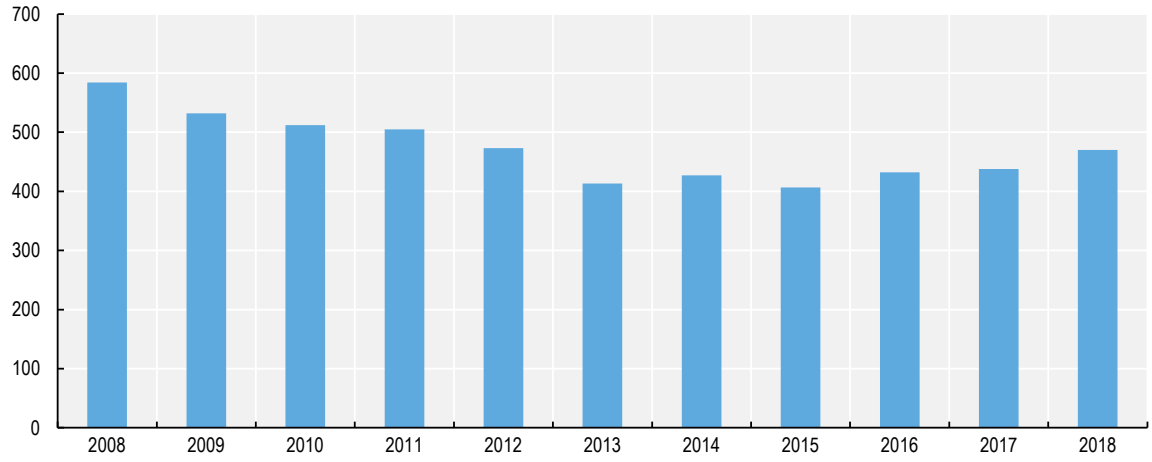
Memoranda of understanding (MoUs) are commonly used as a co-ordination mechanism. The EPA has MoUs with key relevant central government bodies, including the Department of Agriculture and the Marine, Health and Safety Authority; National Directorate for Fire and Emergency Management; Sustainable Energy Authority; Office of Public Works; Planning and Appeal Board (PAB); National Parks and Wildlife Service; and Central Statistics Office. Other environmental policy co-ordination platforms are interagency committees. The Water Policy Advisory Committee brings together national government bodies with responsibilities relevant to water resources management. A special Climate Unit in the Prime Minister's Office co-ordinates implementation of the Climate Action Plan. The Climate Change Advisory Council supports the Minister for the Environment, Climate and Communications in preparing national mitigation and adaptation plans and reports but does not serve as an interdepartmental forum. The Network for Ireland's Environmental Compliance and Enforcement (NIECE, Section 2.4) is another prominent example of co-ordination in policy implementation.

2.2.2. Local government and vertical co-ordination

Local authorities implement over 500 environmental protection obligations arising from more than 100 pieces of legislation and issue a range of permits and licences (Section 2.3.2). Irish Water, a national water utility, was established in 2013 to manage national water and wastewater assets more efficiently. It took over local authorities' responsibility for drinking water supply and sanitation services across the country.

There was a 30% decline in local authority environmental staff over 2008-15. This occurred as a result of budget constraints during the recession and reallocation of water and wastewater services to Irish Water (Figure 2.1). Since 2016, staff numbers have increased moderately, bringing the 2018 environmental staff total across local authorities to 20% below the 2008 level (EPA, 2020a).

Figure 2.1. Local authority environmental staff has declined over the last decade



Source: EPA (2020), *Focus on Local Authority Environmental Enforcement: 2018 Performance Report.*

StatLink https://doi.org/10.1787/888934231668

The co-ordination between the EPA and local authorities is working well and represents a good practice: the EPA provides advice and assistance and evaluates local authorities' environmental performance. Local governments' performance is also assessed through a range of indicators by the National Oversight and Audit Commission. The DHLGH supports local governments in their other functions, such as financial management and social programmes.

Several shared services have been created across local authorities in recent years, representing a good international practice of cost-effective delivery of local services. Different local authorities take the lead in co-ordinating the shared services without significant involvement of the central government. The Local Authority Waters Programme is a shared service that works with individual local authorities, the EPA, the DHLGH and other government bodies to implement the second national River Basin Management Plan (2018-21) adopted in 2018. In 2013, the number of waste management planning regions was reduced from ten to three: Southern, Eastern Midlands and Connacht-Ulster. In each of them, lead local authorities run a regional waste management planning office, co-ordinate implementation of the regional plan and promote waste prevention, reuse, resource efficiency and recycling. The National Waste Collection Permit Office (based in Offaly County) issues waste collection permits centrally on behalf of all local authorities, but these permits are enforced locally.

The central government has signed a Climate Charter with all local authorities, committing them to meaningful climate action in their communities, including low-carbon development, and resilience and adaptation measures. Four Climate Action Regional Offices were created in 2018 to help local governments develop and implement these actions.

2.3. Setting of regulatory requirements

Over the last decade, Ireland has prioritised the timely transposition of, and compliance with, EU directives, as recommended by the 2010 EPR. It has made substantial progress: in 2019, the country had 15 open cases of infringement against EU directives (EC, 2019a) compared to 34 in 2009. Most of the current infringements are in the areas of water management (particularly water quality and wastewater treatment) and biodiversity protection (Chapter 1).

However, the transposition has in many cases led to multiplication of laws and regulations. Their consolidation, recommended by the 2010 EPR, has not progressed. For example, the comprehensive Water Environment Bill aimed at revising and consolidating some decades-old regulations was stalled in 2017 due to other policy priorities. In 2019, Ireland received a second formal notice from the European Commission regarding problems with the transposition of the EU Water Framework Directive (2000/60/EC). It is discussing with the Commission different ways to address these problems through additional legislation. The regulatory consolidation remains a necessity.

2.3.1. Regulatory and policy evaluation

Ireland increasingly practises evidence-based policy making, which improves the soundness of its regulatory and policy proposals and helps generate public support for them. It conducts mandatory regulatory impact assessment (RIA) for all primary laws and major subordinate regulations. The environment is one of seven focus areas, but the assessment is largely qualitative. The Department of Public Expenditure and Reform provides RIA guidance and training. Since 2016, the minister responsible for implementing a law must provide an *ex post* assessment of its functioning within a year (OECD, 2018).

Strategic environmental assessment (SEA) is used mostly to evaluate land-use plans but also water, energy and waste policies, and major development plans. The EPA has produced guidance to help planning authorities to carry out SEAs. For national plans in the field of environment, such as the National Hazardous Waste Management Plan, the EPA conducts SEA itself as a proponent authority. SEA Action Plans for 2012-16 and 2018-20 were implemented to follow recommendations of a first SEA effectiveness review. A second review of SEA implementation noted application of the instrument across a growing range of plans and programmes. Some local authorities have employed environmental assessment officers. SEA is effective in promoting environmentally friendly policy approaches and solutions. However, many SEAs do not include sufficient analysis of alternatives, and environmental effects of the implementation of plans or programmes are seldom monitored (González et al., 2020). This runs contrary to the OECD Council Recommendation on the assessment of projects, plans and programmes with significant impact on the environment. The DHLGH is expected to finalise a new guidance on SEA in 2020 to address these issues.

2.3.2. Environmental impact assessment and licensing

Infrastructure projects with a potential significant impact[2] require an environmental impact assessment (EIA) before a planning authority can grant a development consent (an entitlement that usually does not carry operational requirements). EIA is also a prerequisite for obtaining an integrated pollution control (IPC) or a waste management licence by the EPA. Unlike in many other OECD member countries, most EIAs are carried out in the context of land-use planning (in accordance with the 2001 Planning and Development Regulations) rather than environmental permitting or licensing of individual facilities. The reasons for this are largely historic: both infrastructure and facility projects are subject to a development consent with broad EIA requirements,[3] whereas only facilities with a potentially significant environmental impact need an EIA to obtain a licence.

When an EIA report is submitted with the development consent application, the planning authority (local authority or the PAB for strategic infrastructure) must consult the EPA. While EIA is one input into the planning authority's decision to grant a development consent, a negative assessment, including with regard to siting, does not mean a proposed project will be refused.[4] This may lead to environmentally unfavourable infrastructure investments which, unlike facility projects with a significant impact, do not also require an environmental licence. If an EIA is performed as a prerequisite for an environmental licence, the EPA must consult the Health Services Executive, Health and Safety Authority and relevant local authorities. The EPA considers EIA conclusions in deciding on the licence and its conditions but is not bound by them.

The EPA separates the licensing (permitting) and enforcement functions within the agency. The Office of Environmental Sustainability handles licence applications. Meanwhile, the Office of Environmental Enforcement is in charge of compliance monitoring and non-compliance response. In local authorities as well, the same person never does both environmental permitting and enforcement. This is a good practice to help avoid potential conflicts of interest.

The licence determination process takes on average one and a half years to complete. The EPA wants to shorten the process to nine months to address considerable frustration in the business community (OECD, 2020). Each licence application is posted on line for public comments, which are also displayed on the website. Once the licence is issued, the facility operator is required to submit and publish on line an annual environmental report. The EPA reviews and revises all affected licences when best available techniques are updated. This is another good practice but requires substantial resources. Similar to the United Kingdom, Ireland charges substantial licensing fees that were created with cost recovery in mind. However, they cover only 10-15% of the cost of licensing because they were defined in the legislation in the 1990s and have not been reviewed since.

The EPA maintains a database of all installations it licenses (over 700). Since 2010, the Licensing, Enforcement and Monitoring Application has shifted the licensing process to an electronic format. It has also simplified notification and reporting from licensed facilities, centralised data flows and reduced the administrative burden on both regulated entities and the agency itself.

Local authorities issue development consents for local infrastructure, as well as bespoke air emission, wastewater discharge and waste facility permits to lower-impact facilities.[5] However, facilities handling small amounts of waste need a certificate of registration instead of a permit. Operators that are members of an extended producer responsibility scheme also do not need a waste facility permit. There are no activity-specific general binding rules (GBRs) for other low-impact installations. In several other OECD member countries (e.g. Latvia, Greece), GBRs reduce administrative costs for both regulators and small businesses.

2.3.3. Land-use planning

Ireland has a well-structured spatial planning system integrating environmental considerations, in line with several recommendations of the 2010 EPR. Land-use plans at the national, regional and local levels undergo SEA, as well as strategic flood risk appraisal and appropriate assessment of impact on biodiversity. The “Local Area Plans – Guidelines for Planning Authorities” document, published in 2013, promotes integration of climate change, biodiversity, nature conservation and green infrastructure aspects into local planning. Green infrastructure of open spaces, green corridors and natural areas (Chapter 1) has been included in several strategic plans, including development plans for Dublin City and Fingal County.

The DHLGH adopts a National Spatial Strategy (the latest one covered 2002-20) and issues guidance documents on national planning issues (rural housing, wind energy installations, etc.). The strategy has influenced the National Development Plan, which directs investment into transport, housing, water supply and sanitation services and communications infrastructure. The strategy has now been superseded by the 20-year National Planning Framework (NPF). The government adopted the NPF in 2018 as part of Project Ireland 2040, its high-level strategy for the country’s development. The NPF is a coherent product of a large whole-of-government consultation and consensus. The government is also working on a marine planning framework – an important step in advancing spatial planning for the country’s extensive marine areas.

Regional Spatial and Economic Strategies overseen by the three Regional Assemblies translate national spatial planning objectives into planning guidance for local authorities (OECD, 2017a). The Office of the Planning Regulator (OPR), an independent agency established in 2019, supervises this statutory hierarchy. The OPR ensures that proposed new statutory land-use plans at the regional and local levels

are consistent with the NPF; it also promotes public participation in planning decisions. The OPR conducts reviews of the organisation, systems and procedures used by any planning authority or the PAB in the performance of any of their planning functions.

Local authorities make most planning decisions, preparing Local Economic and Community Plans (LECPs), development plans and local area plans. LECPs are six-year strategic plans to promote social, economic and community development at the local level. In larger urban areas, LECPs are linked to Metropolitan Area Transport Strategies (developed so far for Dublin, Cork, Galway and Kilkenny) that promote sustainable mobility (Chapter 4). County and city development plans are statutory documents that guide land use. They, together with LECPs, are implemented through small-scale local area plans. Every development project requires a planning permission from the local authority unless the project is designated as strategic infrastructure at the national level.

2.4. Compliance assurance

Compliance assurance responsibilities are divided between the EPA and local authorities. The EPA carries out approximately 2 400 inspections per year compared to some 170 000 by local authorities. Since 2014, the EPA has conducted four performance reviews of local authorities with regard to their planning and implementation of compliance monitoring and enforcement. Performance results are generated from 26 environmental enforcement indicators, which are predominantly focused on outputs. These indicators are based on data provided voluntarily by local authorities to the EPA on an annual basis in line with the EU Recommended Minimum Criteria for Environmental Inspections. The EPA plans to review its performance framework in 2020 to improve the link between performance metrics and national enforcement priorities (EPA, 2020a).

NIECE, established in 2004, originally focused on enforcement planning, handling environmental complaints and addressing illegal waste activities. However, it has expanded to other domains, such as wastewater, drinking water and air. It brings together representatives of the EPA (which chairs the Steering Committee and co-ordinates the Network's activities), local authorities, the County and City Managers Association, DECC, DHLGH, the National Bureau for Criminal Investigations, the Director of Public Prosecutions, Inland Fisheries Ireland and the Health Service Executive. Representatives of businesses and non-governmental organisations (NGOs) are invited to participate where relevant. NIECE, which provides a forum for peer learning on compliance assurance practices in key thematic areas, is an internationally acknowledged role model (Nesbit, 2019). Other OECD member countries, such as Australia and Spain, also embrace national compliance and enforcement networks as a good practice.

2.4.1. Environmental inspections

The programme of routine EPA inspections is primarily based on Risk-Based Methodology for Enforcement (RBME), a systematic risk assessment methodology. RBME considers the facility's location, complexity, emissions, operator management (i.e. environmental management certification) and enforcement record. It produces the facility's overall risk class: high (A1 to A3), medium (B1 to B3) and low (C1 and C2). The minimum inspection frequency of A sites is annual; for B sites every two years; and for C sites every three years. This minimum frequency may be adjusted based on additional site-specific issues or sectoral priorities. Local authorities use a simple Excel spreadsheet tool to account for risk factors in their inspection planning.

The EPA's inspection plan defines the geographic jurisdiction of its five regional inspectorates in Wexford (headquarters), Dublin, Cork, Kilkenny and Castlebar. In addition to the regional enforcement teams, thematic teams focus on air, water and waste. Each thematic team has industry experts who focus on key environmental issues in the following sectors: chemicals and pharmaceuticals, cement, and energy and

incineration (for air); food and drink, intensive agriculture, and timber and metals (for water); and landfills, waste transfer stations and composting (for waste). Smaller sectors are also covered by the thematic teams as appropriate. Each year, the thematic teams work with regional enforcement teams to identify the main compliance issues in each sector and put together a sector-specific inspection plan (EPA, 2014). This sectoral focus of compliance assurance contributes to its effectiveness and represents a good international practice.

The harmonisation of waste-related enforcement across local authorities, and between them and the central government, has been a priority supported by targeted funding for local authorities. The National Waste Enforcement Steering Committee determines the enforcement strategy and co-ordinates between relevant actors on this issue. Waste Enforcement Regional Lead Authorities (WERLAs) were created in 2015. They are based in the Dublin City Council, Cork County Council and combined Leitrim and Donegal County Councils, one for each region covered by regional waste management plans. WERLAs co-ordinate waste enforcement actions within the three waste management regions and set priorities and common objectives to ensure consistent waste-related enforcement across the country. They work closely with local authorities that have the role of a “first responder” to waste-related offences. Multi-agency inspections at the local level are an increasingly effective tool in waste enforcement.

The EPA appoints third-party contractors to monitor air emissions. At the local level, the Dublin City Council has been outsourcing inspections of food service establishments (hotels, pubs, restaurants, canteens, etc.). Inspectors verify compliance with trade-effluent licence limits for discharges of fat, oils and grease that block the drainage network. After 2020, this programme may be extended beyond the Greater Dublin area.

The number of inspections by the EPA has remained stable since 2016. About 90% of site visits by the agency in 2019 were planned – a remarkably high ratio among OECD member countries. The same year, 93% of EPA’s site visits were not announced in advance to operators, increasing their effectiveness in detecting violations. During the COVID-19 lockdown, the EPA replaced planned inspections with video meetings with regulated entities, review of documentation and photographic evidence of works being completed. Any site visits that took place responded to incidents, emergencies and complaints.

In 2019, 10% of EPA inspections were related to complaints, whose number has been declining since 2015 (EPA, 2020b). At the local level, approximately 40% of compliance monitoring resources are dedicated to responding to complaints and incidents. These are rising and overwhelmingly related to litter and waste (EPA, 2020a). Complaints are mostly received by phone via the National Environmental Complaints Line but also through e-mail, the innovative “See It, Say It” application and online forms.

The EPA and local authorities charge enforcement fees in addition to licensing fees. Both fees seek to recover costs of environmental regulation. This approach is also used in the United Kingdom but is not common in OECD member countries. EPA enforcement fees, based on the RBME risk factors, recover 85-90% of costs. Local authorities use a simpler methodology that considers the number of inspections, time involved, travel, sampling and report costs, as well as site-specific environmental risk factors.

The EPA Office of Environmental Enforcement posts information on compliance monitoring and enforcement of IPC and waste licences on its Licence Enforcement Access Portal (LEAP), which was established in 2013. This information includes site visit reports, formal enforcement correspondence with operators, as well as annual environmental reports and other environmental performance and self-monitoring reports of licensed facilities. LEAP is accessible to the public in the Wexford, Dublin, Cork and Castlebar offices, which represents another good practice.

2.4.2. Enforcement

More than half of the industrial- and waste-licensed sites had no non-compliance recorded by the EPA over 2015-19. Still, non-compliance levels are relatively high: the EPA recorded 1 620 non-compliances

against 362 individual licensed sites in 2019. The food and drink sector had the most non-compliances recorded (337), followed by non-hazardous waste transfer sites (271) and the chemical sector (193). The number of EPA-detected non-compliances has been stable since 2015. Exceedance of emission limit values prescribed in licences is the main type of violation: it accounted for 29% of all EPA-recorded non-compliances recorded in 2019 (EPA, 2020b).

At the local level, non-compliance is particularly problematic in the waste domain. Enforcement actions by local authorities nearly tripled over 2014-18: roughly from 7 000 to 20 000. This increase is mostly attributed to a growing number of fines for waste-related offences, which represent 85% of the total. Waste offences also account for 93% of environmental prosecutions initiated by local authorities, which rose by almost 75% over 2014-18, reflecting the priority enforcement effort on waste (EPA, 2020a). The compliance rate for first-time inspections by local authorities is only 60% for construction and demolition sites and 56% for waste collection permits. Although the mass of illegally dumped waste has been steadily decreasing over the last decade, unauthorised waste facilities accounted for 6% of the total at the end of 2018 (EPA, 2020a).

The EPA has the power to issue warning letters, enforcement notices and compliance orders. It can revoke or suspend licences, impose fixed penalties (but not variable administrative fines) and enforce civil court orders or injunctions. It can also intervene directly to carry out remediation works and recover their cost from the responsible party. The agency and local authorities also have direct prosecutorial powers: they can take a case to a district court. In cases of more serious offences, they act through the Director of Public Prosecutions. A specialised unit within the prosecution service deals with waste crimes.

With regard to sanctions, the EPA mostly relies on criminal law. This implies a criminal standard of proof, imposing a substantial burden on the regulator (the EPA is represented by two legal firms). According to the EPA's Compliance and Enforcement Policy, enforcement actions are proportionate to the actual damage and potential risk caused by the violation to human health and the environment; they consider the operator's compliance history (EPA, 2019). In practice, this applies only to non-monetary sanctions. An offender's financial gain from non-compliance is a factor in deciding whether to prosecute an offence. However, unlike in the United States,[6] it does not influence the size of a monetary penalty. Criminal environmental penalties are capped at relatively low levels in the legislation (OECD, 2020). For example, waste-related offences can be punished by a maximum fine of EUR 5 000 per offence and/or imprisonment of up to six months.

The EPA and local authorities are working together to improve data collection and methods for sharing information concerning prosecutions. In 2019, for example, the EPA facilitated the development of a register to record convictions achieved by local governments under the Waste Management Act. The EPA's publicly available activity reports contain information about inspected facilities. They single out facilities that were inspected unusually frequently and explain why. They also list operators that were prosecuted, as well as fines levied.

2.4.3. Environmental liability

Ireland transposed the EU Environmental Liability Directive in 2008, making the respective regulations apply to environmental damage as of April 2009. A strict (independent of fault) liability regime covers a wide range of operations with respect to damage to water, land, natural habitats and protected species. Other regulatory regimes, providing for fault-based liability, apply to prior damage and activities not subject to strict liability.

The EPA requires high-risk operators to make adequate financial provisions to cover the full cost of emergency response and remediation measures in case of an incident, as well as the cost of the facility's eventual closure and decommissioning (Box 2.1). In 2014, the agency published Guidance on Assessing and Costing Environmental Liabilities. The guidance sets standards for closure and restoration/aftercare

plans and environmental liability risk assessments. It also helps determine the required amount of financial provisions, which is then agreed between the EPA and the operator. As of March 2020, the EPA had accumulated EUR 746 million in financial provisions.

Box 2.1. Multiple financial instruments are used for environmental liability protection

Financial instruments used to satisfy environmental liability requirements should be secure, sufficient and available when required. Their nature depends on the type of risk covered:

A secured fund or an on-demand performance bond are suitable financial provisions for all liabilities.

Parent company guarantees or a fixed charge on property (i.e. using fixed assets as a collateral) could be used for most liabilities but not closure costs.

Environmental impairment liability insurance is only suitable for potential liability arising from incidents. Environmental liability insurance is readily available in Ireland.

Ireland is one of several OECD member countries that use a variety of financial security instruments to cover environmental emergency response and remediation. For example, New Zealand uses bonds and mitigation trusts in addition to insurance. Korea has an elaborate environmental liability insurance scheme and performance guarantee bonds for post-closure landfill management.

Source: EPA (2015); OECD (2017b, 2017c).

Contaminated sites

The EPA uses a risk-based approach in the assessment and remediation of contaminated land and groundwater at its licensed sites. EPA guidance on contaminated land has been established to assist licensees and hydrogeological consultants to address remediation issues in a consistent manner. The guidance replicated the good practice implemented by the Environment Agency in the United Kingdom. The risk ranking system assigns a severity rating (red, amber and green flags) to contaminated sites using several groundwater quality requirements. A closure and surrender procedure is followed for licensed facilities that cease activity. In line with this procedure, inspectors ensure that operators do any necessary clean-up. Operators must then submit an independent closure audit to demonstrate they have assessed and addressed any on-site contamination. However, the register of environmental damage and liability for it is not publicly available (Nesbit, 2019).

Ireland's regional waste management plans for 2015-21 laid out a roadmap to address the remediation of former landfill sites. The DECC has designated a budget for remediating historic municipal landfill sites that have been identified, risk-assessed and managed by local authorities in accordance with the EPA Codes of Practice on Contaminated Land and for Waste Disposal Sites. Local authorities identified 506 such sites as part of these plans. As of mid-2020, 45 sites had been remediated. Local authorities apply for a licence to carry out remediation works, which is granted and enforced by the EPA. Over 160 landfill remediation projects have received central government funding for a total of EUR 150 million. The DECC and Regional Waste Planning Offices oversee the funding.

However, Ireland does not have specific legislation on contaminated land. For instance, where liable operators cannot be identified, or are insolvent, the EPA (for the sites it regulates) is empowered but not required to take necessary preventive or remedial measures. This causes significant delays in the remediation of abandoned contaminated sites or contaminated land transferred to third parties. The legislative void poses a challenge of assigning financial responsibility for the monitoring and remediation of the site. As a result, many abandoned contaminated industrial sites have been left for years without any

intervention. Work has recently started to develop a multi-agency protocol for remediating such sites with support of appropriate financial provisions (Payá Pérez and Rodríguez Eugenio, 2018).

2.4.4. Promotion of compliance and green practices

The EPA assigns high priority to promoting compliance. For example, it provides information to farmers on best practices in fertiliser use and publishes other sector-specific guidance. The agency has funded research and programmes to use behavioural insights to improve compliance. It has a corporate communication strategy that identifies target audiences, desired behavioural changes, corporate messages, risks and communication channels. In 2017, the EPA adopted a policy of using plain language in its communications.

The EPA maintains a list of worst environmental offenders – National Priority Sites (NPS). This is an effective way of "naming and shaming" industrial and waste management operators with poor environmental performance in order to prompt behavioural change. It also allows the EPA to identify which industrial- and waste-licensed sites should be prioritised for enforcement based on their environmental performance. NPS score-based ranking is a function of four enforcement factors: complaints, incidents, compliance investigations and non-compliance with licence conditions. The NPS scheme was revised in 2019 to reduce the relative weight of complaints (OECD, 2020). The EPA compiles and publishes the NPS list quarterly. In the first quarter of 2020, the list comprised eight industrial sites that exceeded the determined score threshold.

Voluntary business initiatives

In 2017, Ireland published its second national plan on corporate social responsibility (CSR) for 2017-20. The national plan contains 17 actions that have been overseen by the CSR Stakeholder Forum. The Forum, established in 2014, includes representatives of the private sector, government departments, academia and other relevant public bodies. Progress reports – CSR Checks – are produced annually by the Department of Enterprise, Trade and Employment.

One prominent example of a green business partnership is Origin Green. This nationwide food and drink sustainability programme, launched in 2012, brings together government, 53 000 farms and 32 food and drink companies. The programme operates across the full supply chain, from farms to food and drink manufacturers, with independent accreditation and verification built into every stage. This allows the country's food industry to set and achieve measurable sustainability targets. Almost 800 independent farm audits take place each week across the country, focusing on GHG emissions, biodiversity, animal welfare, traceability, water measures, energy efficiency and soil management.

Verified Origin Green members account for 90% of Irish food and drink exports and over 70% of the domestic retail market. To become an Origin Green member, food and drink manufacturers must sign up to the Origin Green Manufacturing Sustainability Charter. Companies formulate medium-term plans with meaningful and measurable sustainability goals across three target areas – raw materials sourcing, manufacturing processes and social sustainability. An international auditing body independently verifies the plans' implementation.

CirculEire – a National Platform for Circular Manufacturing – was launched in February 2020 by Irish Manufacturing Research. It is a cross-sectoral, industry-led, public-private innovation network aimed at enhancing circular economy knowledge and capability of Irish manufacturers and their supply chains. By 2022, CirculEire will provide manufacturers with access to an innovation fund and training opportunities.

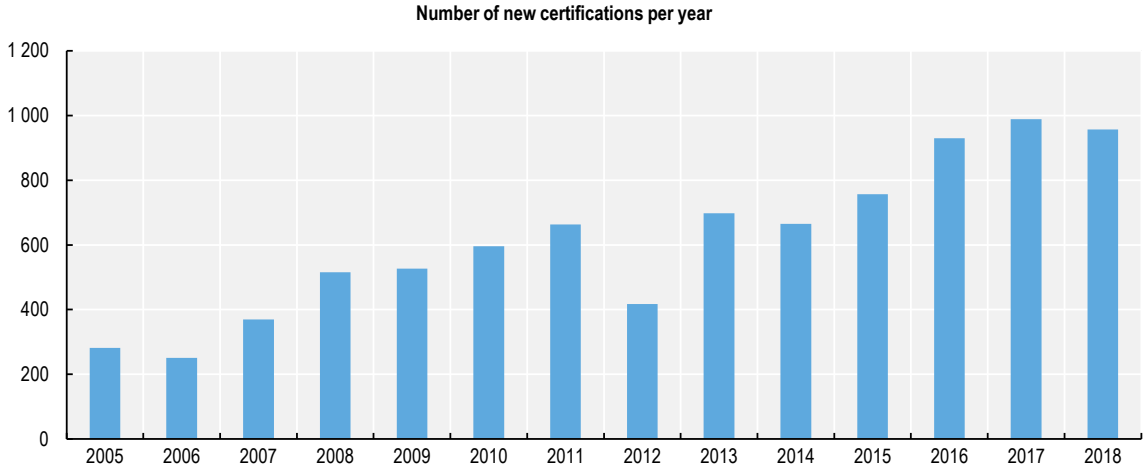
Environmental management system certifications

The number of certifications to the ISO 14001 environmental management system (EMS) standard has been rising almost steadily since 2007 (Figure 2.2). Ireland has only one facility certified to the EU Eco-Management and Audit Scheme (EMAS), although EMAS-certified facilities are eligible for a licensing fee discount. Ireland also established a simplified EMS certification scheme, EcoMerit, in 2009. It targets primarily small and medium-sized enterprises. EcoMerit focuses on organisations' carbon footprint and has much lower certification costs than ISO 14001. As of mid-2020, the scheme had 112 certified members.

Greening public procurement

Over the past decade, public procurement in Ireland has largely emphasised short-term savings rather than strategic purchasing. Green Tenders, the national action plan for green public procurement (GPP), was adopted in 2012. It set a target of 50% share of GPP by value or by volume without an associated target date. To change this orientation, the EPA published guidance in 2014 for GPP in eight sectors: vehicles, energy, construction, food and catering, cleaning, textiles, paper and office IT equipment. The suggested environmental criteria include the supplier's compliance record. This guidance was expected to be updated in 2020, accompanied by training for public procurement officials. Its implementation will require better alignment between general procurement policies of the Office of Government Procurement and the EPA's GPP guidance.

Figure 2.2. The number of ISO 14001 certifications more than doubled in a decade



Source: ISO (2019), *ISO Survey 2018*, International Organization for Standardization.

StatLink https://doi.org/10.1787/888934231687

The Department of Public Expenditure and Reform together with the DECC published a revised circular on green and social procurement in 2019. This updated circular renewed the government's commitment to the use of GPP in achieving environmental and social objectives. Starting in 2020, each central government department must report annually on progress in relation to GPP. A reporting methodology to support this requirement is under development.

The government plans to include green criteria in all procurements using public funds by mid-2023. Priority areas include the acquisition of electric vehicles, green and sustainable criteria in social housing construction and procurement of energy-related investments and services.

2.5. Promoting environmental democracy

Ireland ratified the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters in 2012, as recommended by the 2010 EPR. The ratification completed the harmonisation of the country's legislation in this domain, as much of it, particularly on access to environmental information, had been adopted earlier. The country has also made a multi-stakeholder effort to promote environmental education and awareness.

2.5.1. Public participation in environmental decision making

Stakeholder participation is central to environmental policy making in Ireland. At the highest policy level, the National Economic and Social Council (NESC) advises the prime minister on strategic issues of sustainable economic, social and environmental development. The NESC includes representatives of several government departments, business and farming organisations, trade unions, environmental NGOs and community organisations, and independent experts.

Ireland has chosen to write public participation requirements into many environmental regulations and procedures rather than set out general requirements for public authorities. In 2017, the Department of Public Expenditure and Reform published guidelines for public policy consultation by government departments and local authorities as part of the Open Government Partnership National Action Plan. Recent examples of public consultations on draft policies include the Adaptation Plan, Ammonia Code of Good Practice, and the Climate and Air Roadmap. Public participation in planning decisions is extensive. The PAB has created a website that allows citizens to comment on planning applications and appeals on planning decisions.

Public participation is also a central element of EIA, as well as of the EPA's licence assessment process. In addition to being able to make written submissions, citizens can subscribe to web feeds linked to licence numbers. This allows them to be contacted by e-mail if any new applications or updates are made to a particular facility's licences. The EIA Portal maintained by the DHLGH since 2017 – a central point for notification to the public on all applications for development consent – is an important tool in this regard. However, the statutory minimum level of consultation as part of SEA has been found to be ineffective in engaging the public (González et al., 2020).

The EPA actively engages with civil society, which is consistent with the recommendation of the 2010 OECD Environmental Performance Review to broaden participation by NGOs (OECD, 2010). The EPA meets twice a year with the Irish Environment Network of NGOs. The agency also has an advisory committee, which includes representatives of the private sector, NGOs and academia. Since 2011, the government has provided substantial funding to the Environmental Law Implementation Group (ELIG) – a group of experts appointed jointly by the government and the NGO community. The ELIG works to improve the transposition and implementation of environmental law through enhanced and more effective communication between environmental NGOs and the government.

Citizen engagement in climate action

In 2016, Ireland convened a Citizens' Assembly, a randomly selected but representative group of 99 citizens, to deliberate on a range of issues, including climate change.[7] The assembly resulted in a final report to a parliamentary committee and a series of recommendations on policy tools and options. These have provided a basis for the government's Climate Action Plan released in 2019 (Chapter 1). The EPA continues to co-ordinate the National Dialogue on Climate Action (NDCA) (Box 2.2). This process is similar to those recently used in several other OECD member countries such as Canada and France to define their climate policies.

Work is underway in Dublin City University, funded by the EPA, to develop toolkits, based on the lessons of the Citizens' Assembly, to help deepen public engagement. The outputs in 2019-20 focused on the role of deliberation and communication in engaging the public on the climate crisis. The model shows how Irish citizens can be engaged in policy- and decision-making processes, which enhances the legitimacy and acceptance of climate policy decisions (Government of Ireland, 2019).

The highest percentage of Irish citizens (57%) rate climate change among the top four environmental issues, slightly more than the EU average (EC, 2020b). However, significantly fewer Irish people are taking actions (changing transportation mode, using less energy, etc.) than on average in the European Union. To address this issue, the Climate Action Plan envisages establishing a community outreach programme to drive change at the local level. For example, the Public Participation Network will be leveraged to share information and knowledge, as well as encourage local community groups to get involved in climate action initiatives (Government of Ireland, 2019).

Box 2.2. National Dialogue on Climate Action

The NDCA's objectives are to:

- create awareness, engagement and motivation to act (locally, regionally and nationally) in relation to the challenges presented by climate change
- create structures and information flows to facilitate people gathering to discuss, deliberate and maximise consensus on appropriate responses to these challenges, and to enable and empower appropriate action
- establish, on a long-term basis, appropriate networks for people to meet periodically to consider evidence-based inputs on the economic, social, behavioural, environmental and public aspects of climate and energy policy
- provide regular input into the prioritisation and implementation of climate and energy policies.

The NDCA has hosted a series of regional and local meetings across the country to generate awareness and engagement. The DECC sponsors the Climate Action and Clean Air award in the annual Tidy Towns competition. This award recognises local communities that raise awareness and act to address climate change and improve air quality.

The NDCA also serves as an umbrella for the Climate Ambassador programme – Ireland's first-ever initiative to train and support individuals taking action on climate change. The programme is co-ordinated by the Environmental Education Unit of An Taisce (the National Trust for Ireland) – a prominent environmental NGO.

Source: DCCAE, 2020.

2.5.2. Access to environmental information

Over the last decade, Ireland has improved access to environmental information in line with a recommendation of the 2010 OECD Environmental Performance Review (OECD, 2010). Government authorities are obliged to proactively make environmental information publicly available, as well as to respond to information requests. To support public authorities in meeting the increased level of demand for environmental information, access to information training events have been conducted regularly since 2014. The DECC published revised Ministerial Guidelines on Access to Information on the Environment in mid-2020 to make them more detailed and practical. If an information request is refused or inadequately answered,[8] this decision can be appealed administratively to the Commissioner for Environmental

Information and then, if needed, to the High Court. This ensures a high level of transparency of Ireland's environmental governance system.

Ireland's Environment portal run by the EPA contains a wide range of information, complemented by issue-specific sites such as National Waste Statistics. Environmental information is also found on the Environmental Open Data Portal and the national Open Data Portal. The national Geoportal carries spatial data in implementation of the EU INSPIRE Directive (2007/2/EU). The EPA has been publishing a state of the environment report every four years since 1995. The seventh report came out in November 2020. It also publishes annual reports on drinking water, urban wastewater, bathing water, water quality, air quality, waste and GHG emission inventories and projections. Some data, such as on air quality, are reported in real time. The EPA also maintains an open access, searchable environmental research database (erc.epa.ie/smartsimple). However, the information can be difficult to find and navigate (OECD, 2020).

The EPA established Ireland's Pollutant Release and Transfer Register (PRTR) in 2011. The PRTR contains information about emissions from more than 350 industrial facilities across the country. In 2019, reporting of annual emissions and waste transfers was moved to a new Environmental Performance Reporting online application.

2.5.3. Access to justice

Ireland has an interest-based approach to legal standing on environmental matters: everyone who can demonstrate legitimate interest[9] in the case has a right to sue. NGOs' standing rights are written into law: those that have pursued environmental activities for 12 months are not required to demonstrate sufficient interest in judicial review cases pursuant to planning matters. The High Court conducts judicial review of planning and environmental matters, including the EPA's regulatory decisions. Administrative appeals must in most cases be exhausted before such judicial review.

Several environmental laws (on air and water pollution and waste management) include provisions allowing "any person" to intervene via the courts to ensure enforcement of environmental requirements. This provides a mechanism whereby individuals or NGOs can address a failure to act on the part of enforcement authorities. In these cases, the court may order cessation of the polluting activity and other corrective actions.

The government plans to establish a Planning and Environmental Law Court – a dedicated division of the High Court with specialised judges (modelled after the successful experience with the Commercial Court). This measure would be in line with good practice in several OECD member countries (e.g. Australia, Chile, New Zealand and Sweden). It is expected to speed up consideration of environmental and planning cases, which can now take over a year.

However, high litigation costs are a barrier in access to justice in Ireland. The Court of Justice ruled in 2016 that environment-related litigation should not be prohibitively expensive (EC, 2019b). In civil proceedings brought by the public to ensure compliance with a statutory requirement, a licence or a permit, the government as the defendant must cover its share of the litigation costs irrespective of the court decision. Provisions for financial assistance with court fees are limited, but there are a number of *pro bono* legal advice schemes (European e-Justice Portal, 2020).

The Office of the Ombudsman may investigate any administrative action by a local authority (but not the PAB or EPA) in response to a complaint from an adversely affected individual. Its recommendations are non-binding. The Ombudsman's powers do not, however, cover planning and environmental permitting decisions.

2.5.4. Environmental education

The Department of Education has developed a National Strategy on Education for Sustainable Development in Ireland for 2014-20. In line with the strategy, the National Council for Curriculum and Assessment has conducted a study of integration of sustainable development into childhood, primary and post-primary school curricula, as well as teacher education. The study identified a wide range of good practices and provided several recommendations, including one to integrate environmental and sustainable development content into routine skills assessment (NCCA, 2018). A new course on climate action will be developed for the junior cycle curriculum to complement the ongoing implementation of the strategy. Education and training boards provide a wide range of green economy courses. The Higher Education Authority has identified over 90 courses at the undergraduate and postgraduate levels that consider sustainable development (DES, 2018).

The government is also active in environmental awareness outreach. The EPA maintains a LiveGreen portal with sustainability information (waste prevention, water conservation and energy efficiency) for households. It also runs "citizen science" initiatives to increase awareness and involvement of the public in the areas of clean air, clean water and sustainability. The EPA has also conducted a number of advocacy campaigns as part of the National Waste Prevention Programme.

The Environmental Education Unit of An Taisce (the National Trust of Ireland – an NGO working on environmental and heritage matters) is the national operator for all international environmental education programmes of the Foundation for Environmental Education. These include the Blue Flag Award for Beaches and Marinas and Green Schools, the international environmental education programme in operation across 93% of Irish schools. Green Schools is a student-led programme operated in partnership with local authorities and supported by several government departments. Under the Climate Action Plan, Green Schools will encourage students, teachers and the wider community to talk about climate change and get involved in local climate action. Participating schools will be expected to reduce their carbon footprint through improved transport, energy, waste and water management. Participation in the Climate Action Week, the Climate Action Expo and the Climate Ambassador programme will help educate students (Government of Ireland, 2019).

An Taisce's Environmental Education Unit also operates a number of national programmes:

- National Spring Clean, in operation since 1999, is Ireland's largest and most popular anti-litter initiative. Another anti-litter and waste campaign, Neat Streets, targets secondary schools.
- The Green Campus programme, created in 2007, promotes environmental education and management in higher education institutions. In 2020, 36 campuses were registered with the programme.
- Green Home raises awareness among households by providing information on the main environmental themes of energy, water, waste and transport.

The EPA-funded GLOBE (Global Learning and Observations to Benefit the Environment) programme, part of a larger international science and education initiative, enables students to participate in data collection and scientific analysis. In 2019, 51 Irish schools actively participated in GLOBE air quality campaigns. In addition, initiatives such as the Young Scientist Awards and the Young Environmentalist Awards contribute to citizen-led activism in sustainable development and climate action.

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Notes

[1] The EPA operates in the framework of five-year strategic plans, developed through an internal collaborative process with external consultation.

[2] The EPA has produced draft EIA guidelines promoting a risk-based approach to determining the significance of impacts.

[3] One of Ireland's infringements against EU directives on EIA is its failure to conduct EIA for peat extraction activities. This was subject to the European Commission's letter of formal notice issued in 2020.

[4] In this regard, EIA is different from the "appropriate assessment" process carried out under the EU Habitats and Birds directives, where a negative assessment leads to a refusal of development consent.

[5] Local authorities' planning and permitting decisions can be appealed to the PAB. It is expected that the consideration of appeals against local authority decisions on air pollution licences will be transferred from the PAB to the EPA (European e-Justice Portal, 2020).

[6] The United States EPA has been using a model to calculate and recover financial benefits from non-compliance since 1984.

[7] Ireland is planning to organise another Citizens' Assembly, this time focused on biodiversity.

[8] In 2016, the central government refused 17% of environmental information requests, while local governments refused 30% (Nesbit, 2019).

[9] The requirement to demonstrate "substantial" interest was changed in 2011 to "sufficient" interest.

3 Towards green growth

This chapter reviews Ireland's progress in mainstreaming environmental considerations into economic policy and in promoting sustainable development and green growth. It looks at efforts to ensure a green and inclusive recovery from the COVID-19 crisis and to increase investment in environment-related infrastructure and services. The chapter reviews steps taken to green the tax system, including the use of energy and transport taxes to pursue environmental objectives, and to remove environmentally harmful subsidies. Finally, it discusses the country's eco-innovation performance, as well as opportunities for expanding employment in green sectors as means to ensure a just transition to a green, low-carbon economy.

Recommendations on green growth

Greening the economic recovery

- Maintain the stringency of environmental requirements, including to access financial aid, during the COVID-19 crisis; as the recovery gains ground, consider linking future support for businesses and households to meeting environment- and climate-related requirements.

Promoting low-carbon investment, eco-innovation and green jobs

- Ensure the revised NDP continues to prioritise investment in low-carbon transport infrastructure and energy efficiency, and to promote eco-innovation and reduction of the carbon footprint of agriculture, in line with the goal of a climate-neutral and circular economy; identify evaluation mechanisms and indicators to assess the effectiveness and environmental outcomes of the plan.
- Increase government spending on R&D related to environment, climate and low-carbon energy solutions; extend direct funding instruments to encourage eco-innovation in SMEs; establish a national database of environment- and climate-related research to improve co-ordination and efficiency of public research funding.
- Customise the just transition measures to the local needs by: i) offering targeted skill and entrepreneurship training programmes to affected workers; ii) promoting green business opportunities and supporting SMEs; iii) providing targeted social benefits schemes to vulnerable households (e.g. for switching to cleaner heating fuels); and iv) ensuring widespread access to adequate infrastructure and services.

Greening the tax and subsidy system

- Maintain the commitment to progressively increase the carbon tax rate; continue to provide carefully designed compensation measures targeted at the most vulnerable parts of the population.
- Increase the diesel tax rate gradually so that it at least reaches the petrol tax rate in the medium term; phase out the current price cap for diesel used by road hauliers as soon as possible; assess whether the tax rules on company cars encourage substantial unnecessary driving and, if so, consider correcting the system.
- Consider if the NO_x element in the motor vehicle tax appropriately reflects the social costs of NO_x emissions, especially as regards high-emitting vehicles.
- Prepare to shift the focus of road transport taxation from fuel use to road use over the medium term through road use pricing based on geographic information systems, which consider where and when the driving takes place and the type of vehicle driven.
- Establish a process to systematically screen actual or proposed subsidies and tax provisions to identify those that are not justified on economic, social and environmental grounds; develop a plan to phase out fossil fuel and other environmentally harmful subsidies.
- Remove the VAT exemptions on fertilisers and animal feeds and the tax concession on fuel used for farm operations, while recycling the revenue to support general agricultural services or to individual farmers (on the basis of farm size and type); consider introducing a tax on pesticide based on toxicity of the active ingredient.
- Consider rebranding the fuel allowance and providing it to eligible households during the whole year with a view to fully delinking it from heating fuels.

3.1. Introduction

Ireland is a dynamic and open economy. The COVID-19 pandemic was the second economic and social disruption the country faced in little over a decade. A severe banking and fiscal crisis plunged the economy into a deep recession in 2008. Determined structural reforms and fiscal consolidation helped Ireland start to recover in 2012/13,[1] and subsequently grow faster than on average in the OECD. This helped Ireland make considerable progress towards the Sustainable Development Goals (SDGs) linked to poverty and inequality reduction, economic growth and jobs, education, industry and innovation. However, regional disparities widened, and the speed and scale of recovery came at an environmental cost. Additional effort is required to pursue the SDGs related to climate, energy, water and biodiversity (Chapter 1).

There are concerns over the country's effective capacity to deliver on its ambitious plans for the transition to a climate-neutral, circular and green economy. While Ireland has an extensive suite of policies addressing the SDGs, it needs to strengthen the linkages among these policies to achieve the goals cost-effectively by 2030 (Box 3.1). The scale of the investment needed to catch up and prepare for future demographic pressures on infrastructure and the environment is remarkable. At the same time, additional sizeable fiscal spending is needed to support recovery from the COVID-19 pandemic. Ireland's own history shows that early action is needed to steer the economic recovery towards sustainable consumption and production patterns and avoid a rebound of environmental pressures. This would also make the economy and environment more resilient to future shocks.

3.2. Ensuring a green and inclusive economic recovery from the COVID-19 crisis

Measures to contain the spread of the COVID-19 pandemic resulted in a dramatic drop in domestic demand and economic activity, as well as a rapid rise in unemployment in the first half of 2020.[2] Strong exports mitigated the impact on the economy. As of September 2020, the Central Bank of Ireland forecasted gross domestic product (GDP) to decline by 1.1% in 2020 and by 0.3% in 2021, followed by a recovery in 2022 (+3.4%). This assumed a strong resurgence of the pandemic and the restoration of widespread and stringent containment measures. Unemployment would jump to 12.5% in 2021 from less than 5% in 2019 (CBI, 2020). The increasing public debt and the change in trading arrangements between the European Union (EU) and the United Kingdom as from 2021 also pose risks to the Irish economy (OECD, 2020a).

In the first two months from the onset of the pandemic, the government increased health spending and took measures to cushion households and businesses from the full impact of the shock and reduce the GDP slump. These pre-recovery or damage limitation measures amounted to more than EUR 14 billion (or 4% of 2019 GDP).[3] In addition, the authorities introduced measures to protect households with difficulties paying their mortgage, rents or bills.[4]

3.2.1. Green elements in Ireland's 2020 recovery package

In mid-2020, the government launched the July Stimulus Package as part of its response to the COVID-19 crisis. In addition to supporting employment, the package aimed to prepare for a greener, more sustainable economy, as well as for an economy with more remote working, online trading and digital services (Government of Ireland, 2020a). The package amounted to about EUR 7.4 billion in 2020-21 (or 2.1% of 2019 GDP), including tax measures, direct expenditure, credit guarantees and accelerated capital expenditure.[5]

The July stimulus brought the overall funding available to support business and employment since the outbreak of the pandemic to an unprecedented EUR 24.5 billion in 2020 (7% of 2019 GDP), or nearly eight times the state budget for that year. In line with advice (OECD, 2020b), the stimulus measures were timely, targeted and temporary.

Box 3.1. A coherent framework for achieving the Sustainable Development Goals

Ireland played a significant role in the development and adoption of the 2030 Agenda and the SDGs. It acted as co-facilitator, together with Kenya, for the final phase of intergovernmental negotiations. It has a wide range of policies addressing the 17 SDGs and their associated targets; many of these policies have been developed within the EU context.

Ireland has adopted a whole-of-government approach to implementing the SDGs. The Department of Environment, Climate and Communications has responsibility for ensuring coherent mainstreaming of the SDGs across the government's actions, while each department leads implementation in relation to one or more SDGs. Ireland established an SDG Interdepartmental Working Group, a national SDG Stakeholder Forum and an SDG implementation and reporting framework.

The SDGs National Implementation Plan 2018-20 is the first in a series of plans to integrate the SDGs into national policy. Its strategic priorities are increasing public awareness of the SDGs, providing stakeholders with opportunities to engage with and participate in national implementation, supporting communities to help achieve the SDGs and aligning national policy with the SDGs. The plan includes an "SDG policy map" that identifies the correspondences between national policies, SDGs and associated targets, as well as the interlinkages between national policies that can contribute to achieving more than one SDG at a time. The plan builds on the 2012 National Sustainable Development Strategy "Our Sustainable Future" and announces the preparation of a new sustainable development strategy that more closely encompasses the SDGs.

In 2018, Ireland presented the voluntary review of the implementation of the SDGs to the UN High-level Political Forum on Sustainable Development. The process helped increase the level of engagement with the SDGs across government. It revealed the potential for further breaking policy silos across departments and enhancing policy coherence.

Source: Government of Ireland (2018), Ireland: Voluntary National Review 2018, Report on the Implementation of the 2030 Agenda to the UN High-level Political Forum on Sustainable Development, Government of Ireland, Dublin, https://sustainabledevelopment.un.org/content/documents/19382Ireland_Voluntary_National_Review_2018.pdf.

Some measures of the stimulus package can be considered green (Table 3.1), although it is difficult to quantify the balance between green and non-green spending. The July stimulus foresaw accelerated capital investment of EUR 500 million, about half of which was environment- and climate-related or 3.5% of the recovery package. The recovery package provided funding to advance existing sustainable transport and energy efficiency investment plans that could be delivered quickly, thereby providing job opportunities in the construction sector. This is common to the recovery packages launched by many other OECD member countries (OECD, 2020c). The experience of previous green stimulus packages in the OECD shows that investment in energy-efficient building can help maintain jobs, while contributing to reducing greenhouse gas (GHG) emissions (OECD, 2020b). A multi-year peatland rehabilitation programme also received funding. This aimed to create environment-related jobs in the Midlands, where job losses are expected from the progressive phase-out of peat power generation (Section 3.7).

As a complement to this capital investment, the package provided funding for retrofitting skill training. It also increased the allowable expenditure under the "Cycle to Work" scheme to encourage employees to purchase bicycles.[6] A new Green Enterprise Fund was launched to support green research, development and innovation, capital investment and capacity building in businesses. In line with long-term climate objectives, the July Stimulus Package made no commitment to a bailout of the aviation industry.

The stimulus did not attach green conditionality to the various forms of support. For example, the large Employment Wage Support Scheme provided subsidies to firms in all sectors, without any requirement for

environmental improvements.[7] Similarly, support to farmers has not been made conditional to improved farming practices. On the contrary, Ireland temporarily relaxed conditionality, cross-compliance or green measures and temporarily halted or delayed on-farm compliance inspections (OECD, 2020d). In addition to the July stimulus, the government announced a EUR 2 billion Pandemic Stabilisation and Recovery Fund within the Ireland Strategic Investment Fund (ISIF) to provide loans to medium and large enterprises on commercial terms. However, there will be no need for businesses to align with ISIF's priority themes, including climate change. In accordance with OECD guidance, as the recovery gains ground, environment-related conditions should be introduced when loans and grants to businesses are rolled over (OECD, 2020b).

Table 3.1. Green elements in Ireland's COVID-19 recovery package

	July Stimulus 2020-21 (EUR million)	Percentage of capital expenditure (%)
Sustainable transport, of which:	115	23.0
Walking	40	8.0
Cycling	42	8.4
Rails	21	4.2
Road maintenance and climate adaptation measures	10	2.0
Local bus services	2	0.4
Local link zero-emission vehicles (rural areas)	0.25	0.1
Energy Efficiency National Retrofit Programme	100	20.0
Peatland rehabilitation	15	3.0
Investment in water infrastructure (a)	30	6.0
Fishery projects and on-farm renewable energy	10	2.0
Environment- and climate-related capital expenditure	**270.25**	**54.1**
Total accelerated capital expenditure	**500**	**100.0**
Retrofit skill training (as part of active labour market measures)	n.a.	
Enhanced "Cycle to Work Scheme"	n.a.	
New Green Enterprise Fund	10	
Total July Stimulus Package	**7 400**	

Note: (a) The Additional 2020 COVID-19 Support announced on 13 October 2020, amounting to about EUR 500 million, allocated an additional EUR 44 million to investment in water infrastructure.
Source: OECD Secretariat based on Government of Ireland (2020), July Jobs Stimulus 2020, Department of the Taoiseach, Government of Ireland, Dublin, https://assets.gov.ie/81556/d4fa4cc4-7e9f-4431-8540-a9ecb7126505.pdf; Department of Finance (2020), "July Stimulus" Policy Initiative: Overview of economic support measures, Department of Finance, Dublin, https://assets.gov.ie/81748/0f52c867-06a1-4bb1-b059-7c571ac2a1ee.pdf.

3.2.2. Green elements in Ireland's 2021 state budget

The state budget for 2021 continued to provide fiscal support to the economy. It was the largest state budget in the country's history (more than EUR 17 billion). In line with OECD guidance (OECD, 2020e), the budget put a strong focus on investment for the green and low-carbon transition and increased the carbon tax (Section 3.4). About a third of the EUR 10 billion investment envelope was allocated to, among others, sustainable transport and water infrastructure, energy efficiency and renewables, landfill remediation and peatland rehabilitation. This represented a contribution to the National Development Plan (NDP) 2018-27 (Section 3.3.1). The budget allocated EUR 1.8 billion to investment in public transport and active mobility. While this is higher than the allocation to road investment (EUR 1.3 billion), it does not meet the government's commitment of a two-to-one spending ratio of sustainable transport over roads (Chapter 4).

Fiscal support should remain available while the economy is still recovering. While the government's measures have shielded families from the brunt of the shock, the pandemic could raise inequalities and make disparities between regions grow further (Chapter 1). The government should continue to support the most vulnerable; prepare the workforce for the green and digital transitions; and increase employment opportunities in poorer areas (Section 3.7). It is also essential that the government maintain its commitment to progressively increase the carbon tax rates (Section 3.4). If oil prices remain persistently low due to reduced economic activity, the planned tax hikes could be even accelerated to encourage low-carbon investment during and beyond the fiscal stimulus period (OECD, 2020c).

Work started in 2020 to develop a set of well-being indicators for policy design and evaluation, with a view to capturing all dimensions of the COVID-19 crisis and the recovery. This will enable Ireland to better assess the economic effectiveness and the environmental and social outcomes of the July Stimulus Package and of future recovery and development plans. This, in turn, will allow adjustments in response to changing circumstances or new evidence from data. The OECD selected 13 headline environmental indicators that can help in this respect (OECD, 2020c).

3.3. Investing in environmental and low-carbon infrastructure and services

Public investment has increased since 2014 and is expected to further increase until 2024.[8] Ireland has made progress in facilitating investment related to climate change, energy transition, sustainable transport and water. However, the prolonged period of underinvestment in the aftermath of the global financial crisis affected the quality of infrastructure, especially in the transport and water sectors. It also slowed down progress towards climate, energy and environmental objectives (Chapter 1). Investment needs remain high in various areas to meet the needs of a growing population, while ensuring a transition to a climate-neutral, circular and green economy. This calls for the mobilisation of the private sector, including households and financial markets.

3.3.1. A sound investment framework

Ireland developed a sound multi-annual investment framework as part of the high-level development strategy known as Project Ireland 2040. This policy initiative is a pillar of Ireland's strategy to achieve the SDGs by 2030 (Box 3.1). It aims to provide the country with the additional housing, infrastructure and services needed to accommodate projected demographic changes, with a larger and ageing population and smaller households. Project Ireland 2040 consists of a ten-year investment plan (NDP 2018-27), which is aligned with a spatial strategy (National Planning Framework) that promotes urban compact growth and regional development and accessibility (Chapters 2 and 4).

The NDP 2018-27 sets aside EUR 116 billion for public investment, thereby responding to the significant underinvestment during the economic recession. In line with Project Ireland 2040 priorities,[9] more than a quarter of the NDP outlays target the climate and energy transition. This includes a substantial envelope for sustainable transport and energy efficiency, and investment in water infrastructure. To better align public investment decisions in all sectors with climate policy objectives, the 2019 Public Spending Code revised the shadow costs of GHG and other pollutant emissions to be used in public investment appraisal (Box 3.2).

However, Ireland has not managed to sufficiently mobilise private investment (Section 3.3.2). Public financial support should target investment that would not occur otherwise, with a view to enhancing cost-effectiveness of public spending and leveraging private investment. With this aim, the NDP allocated EUR 4 billion jointly to four funds for rural development, urban regeneration, climate action and innovation over 2018-27. The Climate Action Fund (EUR 0.5 billion) aims to finance projects that contribute to

achieving the climate and energy targets.[10] The first round of applications took place in 2018, but it is too early to assess its environmental outcomes.

Ireland would benefit from assessing the private and public investment needs related to the transition towards a green, climate-neutral economy (EC, 2020a). The announced in-depth review of the NDP, to be completed in 2021, provides an opportunity to further align investment priorities with the goal of a just transition to a climate-neutral economy by 2050. The revised NDP should continue to prioritise investment in low-carbon transport infrastructure and energy efficiency. It should also further promote eco-innovation and the circular economy, which would help improve the resilience of supply chains (OECD, 2020e). Ireland should use the EU Recovery and Resilience Facility in line with these objectives.[11] In addition, the Rural Development Programme to be prepared for 2021-27 should aim at improving the productivity of Ireland's agriculture while reducing its carbon footprint. This would also contribute to enhancing the resilience of the food system (Moore, 2020; OECD, 2020c).[12]

Box 3.2. The shadow price of carbon for the cost-benefit analysis of public investment

The reformed Public Spending Code of 2019 sets the values to monetise emissions of GHGs and other pollutants (particulate matter, nitrogen and sulphur oxides, non-methane volatile organic compounds) in economic appraisal of public investment. The shadow prices of carbon are based on Ireland's estimated marginal abatement cost at the level required to reach the binding mitigation targets. For emissions from the sectors under the EU Emissions Trading System (ETS), the shadow price per tonne of carbon dioxide (CO_2) emissions is based on market projections of the price of ETS allowances; it is EUR 23.6 in 2020, rising to EUR 33.5 in 2030 and EUR 88 in 2050 (at 2013 prices). For emissions from sectors outside the ETS, the shadow price of a tonne of CO_2 is EUR 32 in 2020, rising to EUR 100 in 2030 and EUR 265 in 2050 (at 2014 prices).

Source: DPER (2019), Public Spending Code – Supplementary Guidance: Measuring & Valuing Changes in Greenhouse Gas Emissions in Economic Appraisal, December 2019, Department of Public Expenditure and Reform, Dublin, https://assets.gov.ie/45078/b7dbf515ad694c3e8b2c37f1094b7dca.pdf.

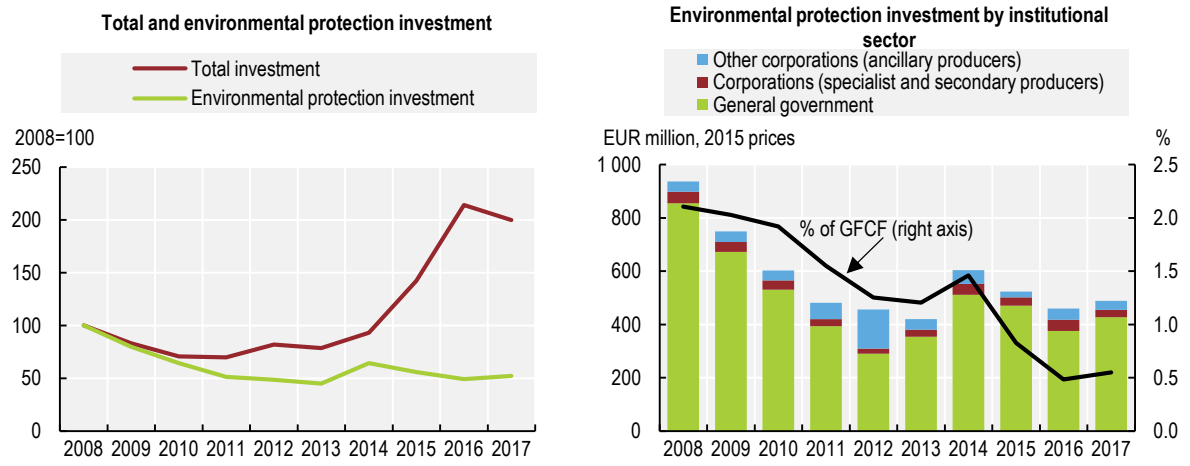
3.3.2. Investment for environmental protection and resource management

Investment in environmental protection services

The recession hit environmental protection investment harder than total investment in the economy.[13] Investment to provide environmental protection services more than halved in 2008-13, from 2% of total investment (gross fixed capital formation) in 2008 to 1.2% in 2013. It subsequently grew, but less quickly than total investment. In 2017, environmental protection investment was nearly EUR 490 million, just above half the pre-crisis level and 0.6% of total investment (Figure 3.1).

The public sector is the main driver and funder of environmental protection investment in Ireland. The share of environmental protection investment in total investment of the public sector is the highest among the OECD countries that are also part of the European Union. It hovered around 8% in 2008-17.[14] The public sector (including the government and non-profit institutions serving households, or NPISHs) accounted for more than 85% of investment in environmental protection in 2017, a share that has remained broadly constant since 2013 (Figure 3.1). Corporations accounted for the remaining 15%.[15] This is in stark contrast with the EU trend, where the public sector provides 40% of environmental protection investment.

Figure 3.1. Environmental protection investment slowly recovered from the 2008-13 austerity



Left panel: Gross fixed capital formation and environmental protection investment of total economy at 2015 prices.
Right panel: General government includes non-profit institutions serving households.
Source: Eurostat (2020), *Environmental Protection Expenditure* (database); OECD (2020), *OECD National Accounts Statistics* (database).

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The strong role of the public sector is linked to the governance of the water sector and the high investment needs to extend and upgrade wastewater treatment systems (Chapter 1). Wastewater management accounted for nearly three-quarters of public environmental protection investment in 2008-17. The Treasury, through local authorities until 2014 and through the national utility Irish Water afterwards, provides most of the funding for this investment (Section 3.3.3).

The share of environmental protection investment in total investment of corporations is low. In 2017, it was less than 0.1%, the lowest in the European Union (EU average was 1.7% in 2017 and 2019). The manufacturing sector has traditionally accounted for most of the business environmental protection investment, i.e. the investment to prevent and/or limit the negative environmental effects of the main production activity. In 2017, manufacturing made up 70% of such investment, compared to about 40% on average in the European Union. Irish businesses invested more in so-called integrated technology than in end-of-pipe technology. Integrated technology accounted for three-quarters of environmental protection investment in 2017. Irish small and medium-sized enterprises (SMEs) have also increasingly undertaken resource efficiency and circular economy measures (EC, 2019).

Public transfers for environmental protection and resource management

In addition to investing directly in environmental protection, the government provides various current and capital environment-related transfers to corporations, households, public bodies and international environmental organisations. As for public investment, government environmentally motivated transfers declined during the economic recession, but have grown again since 2013. In 2018, they were EUR 1.1 billion (2015 prices), a level comparable to that before the crisis (Figure 3.2). However, government climate-related expenditure was estimated to be nearly twice as much in 2020 (Box 3.3).

Box 3.3. Green budgeting in Ireland

Ireland joined the OECD Paris Collaborative on Green Budgeting. Ireland is one of the few EU countries to have started green budgeting practices. It introduced a green budgeting exercise for the 2019 budget, which implied identifying and tagging all climate-related expenditure. The Department of Public Expenditure and Reform (DPER) drew on the definition developed for the Irish sovereign green bonds to define a climate-related expenditure as any expenditure that promotes, in whole or in part and directly or indirectly, Ireland's transition to a low-carbon, climate-resilient and environmentally sustainable economy.

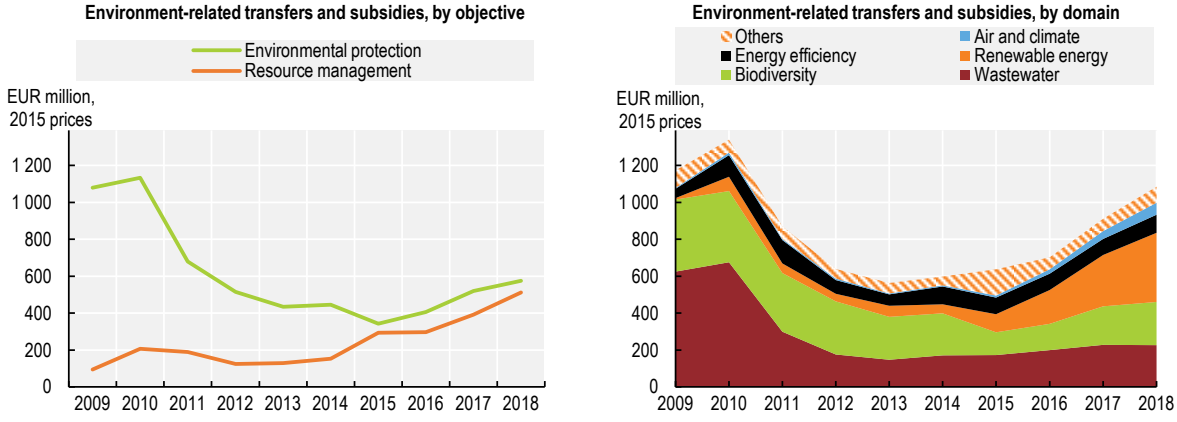
For the first two years of the exercise, the DPER adopted a conservative approach and included only those expenditures that directly contributed to GHG emissions reduction, including funding for energy efficiency. In 2020, the central government climate-related expenditure (including capital and current expenditure) amounted to EUR 2 billion, or 3% of total budget expenditure – a 23% increase from the previous year. The bulk of this expenditure targeted the transport and agriculture sectors.

The DPER acknowledges that the current approach to green budgeting has its limitations and intends to continue developing it within the OECD and EU collaborative frameworks.

Source: Government of Ireland (2020), "The Use of Carbon Tax Funds 2020", Department of Public Expenditure and Reform Staff Paper, Government of Ireland, Dublin, https://igees.gov.ie/wp-content/uploads/2020/01/The-Use-of-Carbon-Tax-Funds-2020.pdf.

After supporting investment to ensure compliance with EU directives, these transfers have moved to finance mainly operating and maintenance expenditure. In 2018, a third of transfers targeted capital investment. In line with a change in policy priority, there has been a marked shift in the allocation of environment-related transfers from the typical environmental protection activities (e.g. biodiversity conservation, waste management and wastewater treatment) to resource management activities. Transfers to resource management (i.e. to reduce over-consumption of natural resources and energy) increased to reach about half of the total transfers in 2018 (Figure 3.2).

Figure 3.2. Environmentally motivated transfers have increasingly targeted resource management



Note: Environmental subsidies and transfers are current or capital transfers according to the SNA 2008 that are intended to support activities that protect the environment (environmental protection) or reduce the use and extraction of natural resources (resource management).
Source: CSO (2020), "Environmental subsidies and similar transfers 2018", *StatBank* (database); OECD (2020), *OECD National Accounts Statistics* (database).

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In 2018, 35% of environmental transfers went to renewable energy production, 22% to biodiversity protection, 21% to wastewater management, 9% to heat and energy-saving measures and 6% to air and climate. The amount of transfers to air and climate grew more than ten-fold in 2009-18. Other environmental protection and resource management activities (including waste and water management, soil and water protection and forest management) accounted for the remaining 8% (Figure 3.2). The largest transfers include those to renewable energy generation funded through the Public Service Obligation (PSO) Levy on electricity consumers (which has increased since 2015; see Section 3.3.4); transfers to local authorities and the Sustainable Energy Authority of Ireland (SEAI) for energy efficiency programmes and to Irish Water for wastewater infrastructure investment; and subsidies under the Green, Low-carbon Agri-environment Scheme.

In the 2010s, three sectors received most of the funding: the energy sector for renewables support; the agriculture, forestry and fishing sector as a result of agri-environment schemes aimed at encouraging biodiversity- and climate-friendly farming; and the public service sector due to its investment in wastewater management infrastructures. Households received increasing subsidies through the energy efficiency retrofitting programmes (Section 3.3.4).

3.3.3. Investment in water supply and wastewater infrastructure and services

The Strategic Funding Plan 2019-24 of Irish Water (the national water utility) outlines a financing requirement in the water sector of EUR 11 billion to 2024, including EUR 6.1 billion for infrastructure investment and the remainder for operating costs.[16] Government capital and current transfers (EUR 8.3 billion) will meet three-quarters of the funding requirement. The remainder is to be financed by a combination of revenue from water charges of non-domestic users, revenue from excess use charges of domestic users and state loans.[17] The 2020 and 2021 state budgets committed about EUR 1.9 billion as a contribution to the Irish Water financial plan.

The NDP allocates about EUR 8.5 billion to investment in public water infrastructure in 2018-27. This commitment appears sufficient to ensure compliance with the EU drinking water and wastewater directives and reduce water losses (Chapter 1). However, meeting the water infrastructure needs of growing population, housing supply and economy will require much higher investment. OECD (2020f) estimates Ireland's financing needs for water supply and sanitation at EUR 20-25 billion to 2030. There is a risk that the current funding model will be unable to keep up with the scale of required investment in the water sector.

The limited use of water charges implies the state budget covers most of the water sector financing needs (including nearly all the cost of services to domestic water users). Households do not pay charges for drinking water and wastewater services, which is uncommon in the OECD (OECD, 2020f). Domestic water charges were introduced in 2015 but were abolished a year later due to strong social opposition. An excessive use charge will be effective from 2022. It is expected to yield EUR 39 billion until 2024, less than 1% of the investment and operating costs of providing services to domestic customers.

The new excessive use charge will apply to households with annual water consumption exceeding a certain threshold.[18] It is estimated that only about 7% of the households will be affected by this charge. These households account for almost 40% of domestic water consumption and their excessive use is supposed to be due to leaks. In 2020, Irish Water started to warn households that were using an amount of water above the threshold. It has provided them with information about how to save water and deal with leaks before households become liable to pay the charge in 2022.[19]

Irish Water plans to cover most of the costs of providing water services to non-domestic customers through charges and connection fees. A new charging framework for non-domestic customers was scheduled to come into effect in 2020 to replace the multitude of charges levied by local authorities.[20] The new tariff structure is to combine two elements – a fixed charge and a volumetric element. Most customers will be

placed in one of four consumption bands. The new charges will apply across the service, industrial and agricultural sectors, as well as to public bodies and social enterprises. National connections charges came into effect in 2019. Customers pay for their direct connection assets (based on pipe diameters), plus an element of downstream infrastructure.

3.3.4. Investment in the energy sector

Renewable energy

The share of renewable sources in the energy mix has more than doubled since 2010, thanks to a rapid expansion of wind power. However, as of 2018, Ireland was not on track to meet its 2020 renewable energy targets (Chapter 1). Three consecutive renewable energy feed-in tariff (REFIT) programmes provide minimum prices for each unit of electricity generated from onshore wind, hydro and biomass technology development for 15 years. The REFIT programmes are funded from a PSO levy charged to electricity users, whose real cost in 2018 was five times higher than in 2010. The REFIT programmes closed to new applications in 2019. A new auction-based renewable electricity support measure, launched in 2020, is expected to continue attracting investment in the sector while reducing the costs of support. In addition, a support system for renewable heat became operational in 2020. It provides an installation grant and operational support for renewable heat generated by non-domestic heat users excluded from the EU ETS (e.g. commercial, industrial, agricultural, district heating, public sector). The government plans to launch a micro-generation support scheme in 2021, based on the pilot scheme implemented for solar photovoltaics. The pilot provided a grant of about 30% of the installation costs for homes.

The 2019 Climate Action Plan aspires to reach 70% of electricity generated from renewables by 2030, nearly double the 2019 share (Chapter 1). Investing in electricity infrastructure (including international interconnectors) is a prerequisite to reaching this target, as is addressing administrative barriers in the consent, planning and grid connection processes (EC, 2020a). The 2014 Offshore Renewable Energy Development Plan aims to exploit the country's vast potential for offshore wind. However, the lack of a planning and development consent framework for offshore facilities hampers development (IEA, 2019). Ireland should also further invest in energy storage facilities and related research and development (R&D) to meet the growing energy needs arising from the planned electrification of heat and transport.

Energy efficiency of buildings

Several grant schemes have supported energy efficiency improvements in buildings and contributed to reducing energy use and related carbon dioxide (CO_2) emissions in the residential sector since 2010 (Chapter 1). The government allocated an average EUR 75 million per year in 2010-18 to building energy renovation. This included grants targeting households at risk of energy poverty and/or with poor health conditions, as well as the housing stock of local authorities (e.g. Greener Homes, Better Energy Homes and Warmer Homes Schemes, Better Energy Communities Programme). However, in 2017, energy consumption per dwelling in Ireland was still well above the EU average (Chapter 1).

Improving energy efficiency of the residential building stock is a pillar of the 2019 Climate Action Plan. The plan foresees to renovate half a million homes (about a third of the housing stock) and to install 400 000 renewable heating systems in existing homes by 2030. In line with this commitment, the 2021 government budget increased the funding for residential and community energy efficiency by over 80% compared to the previous year. This increase permits expansion of existing grant schemes and the launch of new ones. The carbon tax revenue is to be partly used for this purpose (Government of Ireland, 2020b).

Residential energy efficiency support programmes have mostly targeted low-hanging fruit and the simpler and cheaper upgrades, which have already been implemented. Their variety may confuse households and reduce uptake. Ireland should target the available funding to deep renovations of the social housing stock and of the most carbon-intensive residential buildings. A guiding principle for Ireland's building renovation

policy is “fabric first then fuel switching”. This ensures that the benefits of fuel switching are not compromised by insufficient building fabric standards (IEA, 2019). However, fuel switching and the roll out of renewable heating systems need to be accelerated. Residential heating is heavily based on fossil fuels, including peat, coal and oil, which makes Ireland’s dwellings particularly carbon-intensive (Chapter 1). The implementation of the near-zero energy building standard for all new buildings as from late 2019 is expected to help phase out the use of oil and gas boilers in new dwellings. The IEA (2019) recommended the introduction of minimum energy efficiency standards in the rental sector to encourage renovation.

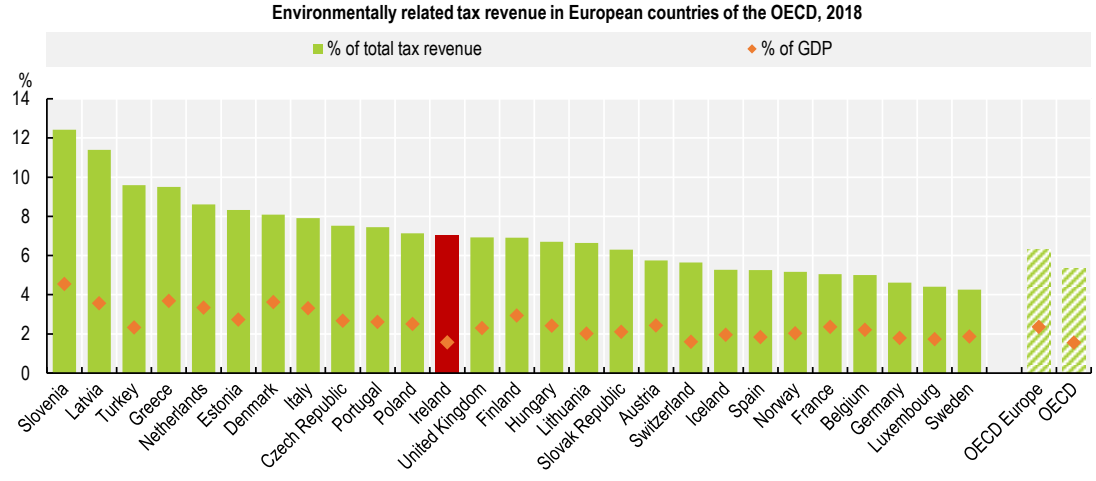
3.4. Greening the tax system

Ireland made progress in following up on the recommendations from the 2010 OECD Environmental Performance Review on greening the fiscal system. The review recommended to replace some taxes with appropriate environmentally related fiscal measures in the framework of a comprehensive environmental tax reform and to introduce a carbon levy on sectors outside the EU ETS. It also recommended to phase out environmentally harmful subsidies (e.g. for electricity generation from peat and for domestic aviation) and tax concessions (e.g. on coal and on fuel oil used by households and farmers) (OECD, 2010).

3.4.1. Environmentally related taxes: An overview

Revenue from environmentally related taxes accounts for a relatively high share of tax revenue in Ireland in international comparison. In 2018, about 7% of Ireland’s tax revenue came from environmentally related taxes, which was in the top half of OECD member countries (Figure 3.3). This is due to Ireland’s low level of total taxation. Total tax revenue in Ireland was about 22% of GDP in 2018, the lowest in the OECD (the OECD average was 34%), mainly as a result of the country’s low corporate taxation policy.

Figure 3.3. Environmentally related taxes made up a relatively high share of tax revenue



Source: OECD (2020), “Environmental policy: Environmental policy instruments”, *OECD Environment Statistics* (database).

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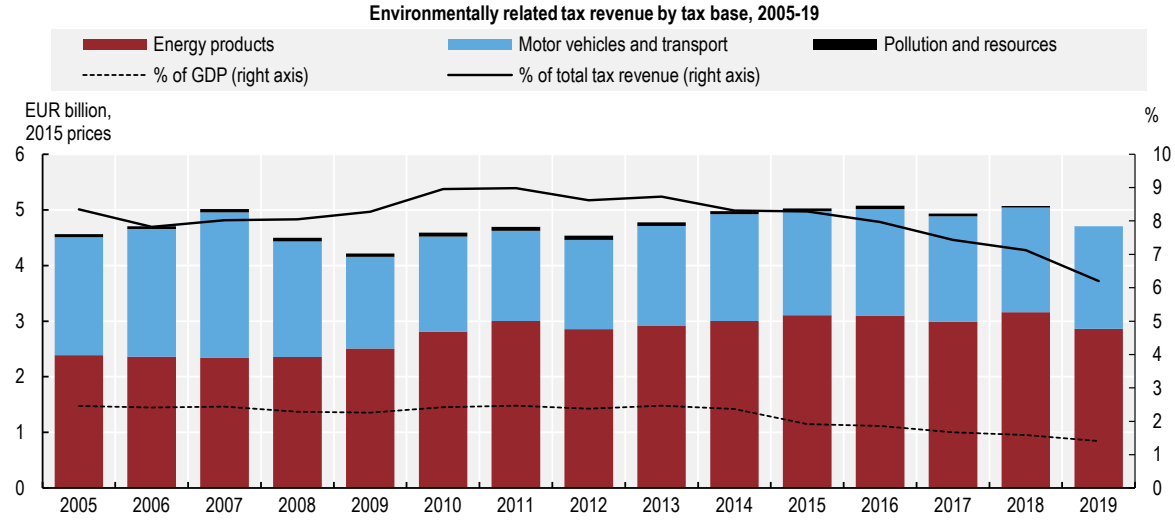
Real revenues from environmentally related taxes (at 2015 prices) increased with the economic recovery in the second half of the 2010s. However, they did not keep pace with the growth of GDP and total tax revenue. Hence, when measured as a share of GDP and total tax revenue, revenue from environmentally related taxes decreased considerably (Figure 3.4).

As in most OECD member countries, revenues raised on energy products in Ireland represent the bulk of the revenues from environmentally related taxes. This was partly due to the introduction of a carbon tax in 2010 and its gradual increase in tax rates and coverage. A significant amount of revenues is also raised on motor vehicles' purchase and use. Taxes on pollution and resource management are applied in the waste management sector but raised only modest amounts of revenue (Figure 3.4).

Figure 3.4. Environmental taxes accounted for a declining share of GDP and total tax revenue



Note: 2019 data are preliminary.
Source: OECD (2020), "Environmental policy instruments", *OECD Environment Statistics* (database).

StatLink https://doi.org/10.1787/888934231763

3.4.2. Taxes on energy use and carbon pricing

Energy taxes in Ireland are levied within the framework of the 2003 EU Energy Tax Directive, which sets minimum rates for the taxation of energy products in EU member states. Box 3.4 lists the main taxes on energy use in Ireland as of October 2020. The tax rates applied are in almost all cases well above the minimum rates of the Energy Tax Directive (EC, 2020b). Taxes on energy products accounted for 60% of revenue from environmentally related taxes in 2019 (Figure 3.4).

The carbon tax

Ireland is one of the 11 European OECD countries that as of 1 July 2018 levied a carbon tax on some or all fossil fuel use (OECD, 2019). The tax was introduced in 2010 in the context of a deep economic recession, rising unemployment and declining wages. "The carbon tax was seen as just a little more noise in a cacophony of bad news" (Convery, Dunne and Joyce, 2013). Combined with a broad understanding that the government needed to raise more revenue, the "noise" contributed to limiting the public's opposition to the carbon tax. The carbon tax initially applied to liquid and gaseous fuels at the rate of EUR 15 per tonne of CO_2. It was extended to solid fuels in 2013 (although initially at a lower rate). There were phased increases of the tax to reach EUR 26 per tonne in 2020. The 2021 government budget further raised the tax to EUR 33.5 per tonne of CO_2 on automotive fuels in October 2020 and on all fuels as of May 2021. As of 2020, the carbon tax applies to all fuels used in sectors not covered by the EU ETS.

The 2021 budget implemented the government commitment to raise the carbon tax by EUR 7.50 per tonne of CO_2 per year over the decade. This would allow the tax rate to reach EUR 100 per tonne of CO_2 by 2030 – a welcome development. A credible future trajectory of carbon prices will provide an incentive for

low-carbon consumption, investment and innovation without immediately imposing the burden on households and firms recovering from the COVID-19 crisis (OECD, 2020b). The carbon tax increase is also in line with the recommendation of the Climate Change Advisory Council (CCAC, 2020).[21] According to the government's programme, the progressive carbon tax increases should help Ireland achieve an average decrease in GHG emissions of 7% per year from 2021 to 2030. However, as indicated by de Bruin, Monaghan and Yakut (2019), increasing the carbon tax alone along the lines announced may be insufficient to achieve Ireland ambitious GHG emission reduction targets.[22] Removing fossil fuel support measures is also necessary, as well as implementing the measures outlined in the 2019 Climate Action Plan (e.g. investing in public transport, electric vehicle charging infrastructures, building retrofitting) (Chapters 1 and 4).

Box 3.4. Taxes on energy products

- The mineral oil tax (MOT) applies to liquid and gaseous fuels, including biofuels and natural gas used for propellant purposes. The MOT is composed of two components:
  - a long-standing non-carbon tax component, which applies to all fuels subject to the MOT except for kerosene and liquified petroleum gas (LNG) used for non-propellant purposes, with varying tax rates across the fuels covered;
  - a carbon tax component, introduced in 2010, which applies to all fuels subject to the MOT, with the exception of bioethanol and biodiesel.
- The natural gas carbon tax (NGCT), introduced in 2010, applies to natural gas when used for non-propellant purposes.
- The solid fuel carbon tax (SFCT), introduced in 2013, applies to coal, coke and peat products.
- The electricity tax, with a rate of EUR 1 per megawatt-hour, applies to electricity consumption.
- EU ETS participants benefit from a partial refund on the SFCT paid on coal and coke products, as well as on the NGCT. EU ETS participants also benefit from a full refund on the SFCT paid on peat products and the carbon component of the MOT paid on fuels. The reason for these exemptions is to avoid "double-pricing" of the emissions of the firms affected via the carbon tax and the price of the EU ETS allowance.[23]

There remain large differences in the effective carbon taxes (including excise taxes applied to fossil fuels and the carbon tax) that are levied on different fuels and uses. As in all countries, the effective carbon tax rates outside the road transport sector were much lower than the rates applied on petrol and diesel (Figure 3.5). The higher rates for petrol and diesel can be justified by the fact that road fuel taxes also put a price on social costs other than those related to climate change (e.g. air pollution, accidents, congestion).

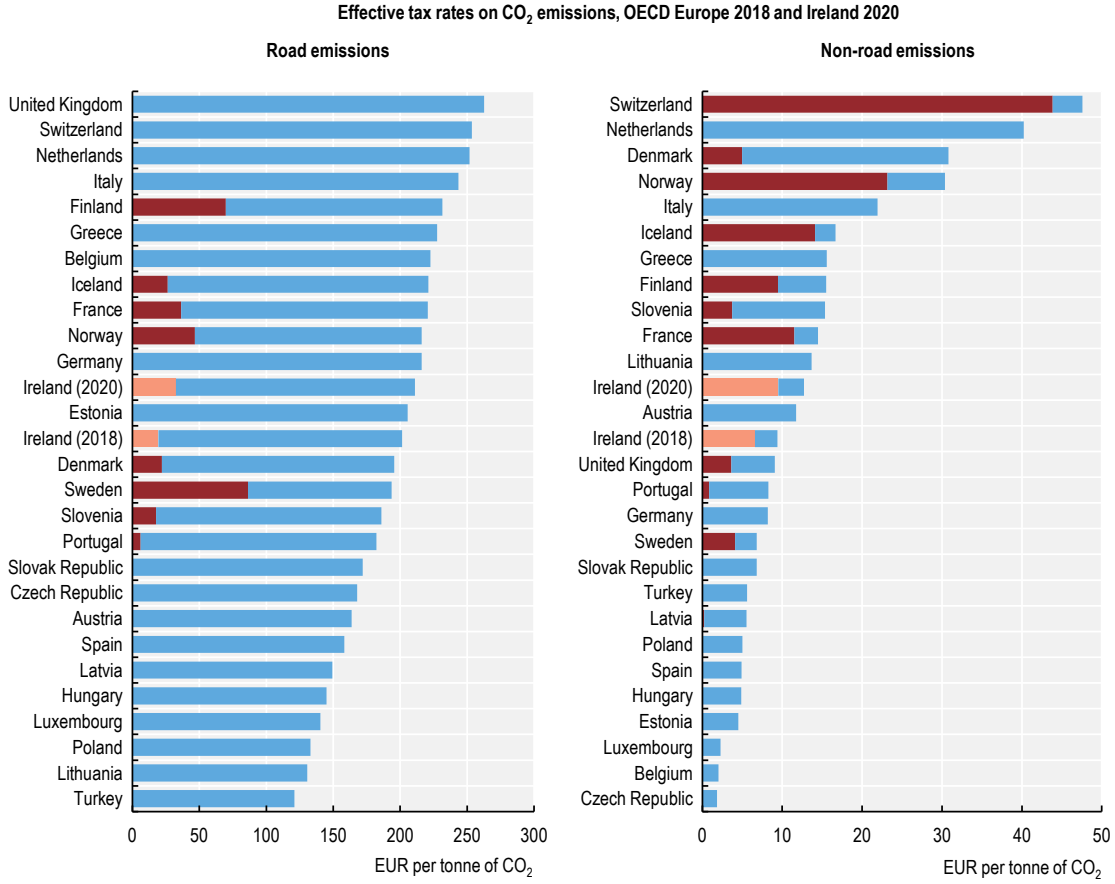
The increase of the nominal carbon tax rate between 2018 and 2020 resulted in a nearly 5% rise in the effective carbon tax rate in the transport sector and a 35% increase in the non-transport sector. This is because some fuels that are not used for transport (natural gas, coal, peat, kerosene, LNG) are subject only to the carbon tax and not to other energy duties. The nominal carbon tax increase brought Ireland's effective carbon tax in the top half of European OECD countries (Figure 3.5). In 2018, prior to the tax hike, Ireland was among the ten OECD members that priced (via carbon and energy tax and the EU ETS) at least half of their energy-related CO_2 emissions at EUR 60 per tonne of CO_2. This is the mid-point estimate of carbon costs in 2020 and a low-end estimate for 2030 (OECD, 2020g). The carbon tax rate increase to EUR 33.5t/CO_2 on all fuels in 2021 will possibly extend the share of emissions facing the EUR 60 benchmark and move Ireland higher among the top OECD performers.

Taxes on transport fuels

The tax rate applied to diesel in Ireland is much lower than the one applied to petrol due to the lower excise duty (non-carbon related part of the MOT).[24] Together with the taxes on motor vehicles (Section 3.4.3), the tax preference given to diesel has contributed to a high share of diesel vehicles in the fleet stock (Chapter 4). This has potentially negative impacts on local air pollution and human health in the parts of the country with the highest population density (Ryan et al., 2019).

Ireland should gradually increase the non-carbon tax component of the MOT on diesel so it reaches the petrol tax rate. Cross-border fuel purchases do not represent a limiting factor for Ireland. Its only neighbour, the United Kingdom, applies a higher tax rate per litre for both petrol and diesel. The cross-border sales go in the opposite direction. It was estimated that in 2015, 2.4% of petrol and 17.1% of diesel sold in Ireland was used in vehicles (including trucks) registered in the United Kingdom and other countries (EPA, 2017). Changes in the exchange rate between EUR and GBP reduced cross-border sales, but an estimated 4.5% of automotive fuels purchased in Ireland were used in the United Kingdom in 2017 (EPA, 2019).

Figure 3.5. Ireland's effective tax rates on CO_2 emissions are in the top half OECD Europe countries



Note: 2020 tax rates as applicable on 15 October 2020 for Ireland only; 2018 tax rates as applicable on 1 July 2018 for all outher countries. CO_2 emissions are calculated based on energy use data for 2018 from IEA (2020), *World Energy Statistics and Balances*. The scale of the horizontal axis differs between the left and right panels.
Source: Calculations of the OECD Centre for Tax Policy and Administration based on OECD (2019), *Taxing Energy Use 2019: Using Taxes for Climate Action*.

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In 2013, Ireland set a ceiling, or refund system, on the diesel prices that qualified road hauliers risked paying (Diesel Rebate Scheme). This ceiling reduces the incentives for the road hauliers to buy fuel-

efficient vehicles, to train the drivers in fuel-efficient driving styles and to develop fuel-efficient logistics systems. The scheme encouraged increased diesel use in 2013-15, which had negative environmental consequences, such as an additional 100 000 tonnes of CO_2 emitted (Morgenroth, Murphy and Moore, 2018). There are no repayments when the price, including value added tax (VAT), is at or below EUR 1.23 per litre. As of September 2020, diesel prices were lower than this ceiling. Therefore, the mechanism was not in operation at the time of writing.[25] Ireland should take advantage of the low oil prices to eliminate this ceiling immediately.

Mitigating the distributional impact of the carbon tax

Ireland's tax and benefit system has been effective in reducing income inequality and mitigating the risk of people falling into poverty (OECD, 2020a). After social transfers, 15% of the population remained at risk of poverty and social exclusion in 2018 compared to 17% in the European Union. The welfare system, including the fuel allowance, has helped reduce fuel poverty. Fewer than 5% of the population were unable to keep their homes adequately warm in 2018, compared to 7.6% in the European Union.

Vulnerable households benefit from a fuel allowance during winter to help with heating expenses. More than 370 000 households are eligible for the allowance because they are considered most at risk of fuel poverty. The fuel allowance is a means-tested lump sum that is not required to be spent on heating. Hence, the allowance does not distort prices and does not encourage excessive energy consumption. In 2020, the fuel allowance was EUR 24.5 per week (increased to EUR 28 from 2021), payable for 28 weeks together with the applicant's primary social welfare payment. However, the allowance tends to support use of fossil fuels, which are the main source of residential heating (Chapter 1). The name of the allowance is unfortunate and may have some undesirable behavioural effects. For example, recipients may be more inclined to spend it on polluting fuels and not encouraged to invest in energy efficiency. Ireland should consider rebranding the fuel allowance and providing it to eligible households during the whole year with a view to fully delinking it from heating fuels.

The government committed to use the revenue from the carbon tax increase until 2030 (EUR 9.5 billion over ten years) to prevent fuel poverty, ensure a just transition for displaced workers and finance climate-related investment. In line with this commitment, the government allocated part of the carbon tax revenue to enhance some social welfare schemes in 2021. This included an increase in the fuel allowance and in benefits for children and people living alone (Government of Ireland, 2020b). This increase is expected to mitigate the impact of the carbon tax on vulnerable households. It may even contribute to reducing poverty, as average weekly disposable income of households would increase as a result of the budget package (O'Malley, Roantree and Curtis, 2020). In addition, EUR 6 million of carbon tax revenue was allocated in both 2020 and 2021 to finance the newly established national Just Transition Fund for the Midlands (Section 3.7). Such earmarking of revenues can help create and maintain political support for the carbon tax increases and climate action more generally. However, it may limit the flexibility of public authorities to adapt public spending to changing needs.

3.4.3. Transport-related taxes

Taxes on motor vehicles accounted for nearly 40% of revenue from environmentally related taxes in 2019, one of the highest shares among European OECD countries. Ireland applies taxes on purchase and use of motor vehicles, and provides tax incentives to encourage the purchase of electric vehicles (EVs).

Vehicle taxes

Ireland applies a vehicle registration tax (VRT), which is calculated as a percentage of the open market selling price and collected as a one-time tax when the car is purchased. There is also an annual motor tax (AMT). Both taxes are linked to the CO_2 emissions of the vehicles. Ireland implemented a stepped transition to CO_2 emissions-based vehicle taxation starting in 2008 (Table 3.2).

Table 3.2. Implementation of the emissions-based vehicle taxation reforms

Policy phase	Effective date	Summary change
Initial policy implementation	1 July 2008	Transitioned from engine capacity to CO2 emissions taxation basis; introduced initial A-G emissions ratings for VRT and AMT
Interim policy change A	1 January 2009	Slight increases (4-5%) in annual motor tax (AMT) amounts; no change to vehicle registration tax (VRT)
Scrappage scheme	1 January 2010-30 June 2011	VRT relief of up to EUR 1 500 for cars aged ten years or older when traded in for an A- or B-rated vehicle
Interim policy change B	1 January 2012	Substantial increases (up to 54%) in AMT amounts; no change to VRT
Final CO_2 policy change	1 January 2013	Introduction of graduated A- and B- ratings (A0, A1, A2, A3, A4, B1, B2); introduction of lower AMT rate for electric vehicles
Introduction of a NO_x element	1 January 2020	Introduction of an NOx element in the VRT

Source: Based on Ryan et al. (2019), An assessment of the social costs and benefits of vehicle tax reform in Ireland, OECD Publishing, Paris, https://dx.doi.org/10.1787/952e7bff-en.

Ryan et al. (2019) suggest that the initial policy change in 2008 reduced the fleet average CO_2 emissions rating of newly registered passenger cars in Ireland by between 8 and 11 grammes of CO_2 per kilometre (gCO_2/km). Some subsequent policy changes (such as the introduction of a motor vehicle scrappage scheme in 2010) have also stimulated the purchase of vehicles with lower CO_2 emissions (Chapter 4). The decline of the average CO_2 emission ratings of newly registered vehicles in Ireland was also influenced by other factors, such as the EU CO_2 emissions regulation for motor vehicles. The decrease in rated CO_2 emissions was driven by a significant shift towards diesel-powered vehicles, which have higher emissions of nitrogen oxide (NO_x) and fine particulate matter ($PM_{2.5}$) per kilometre driven. Ryan et al. (2019) found that the net social costs exceeded the benefits of the vehicle tax reform by more than EUR 750 million in 2009-17. This was mainly due to the potential negative effects of the dieselisation of the fleets on human health in densely populated areas.

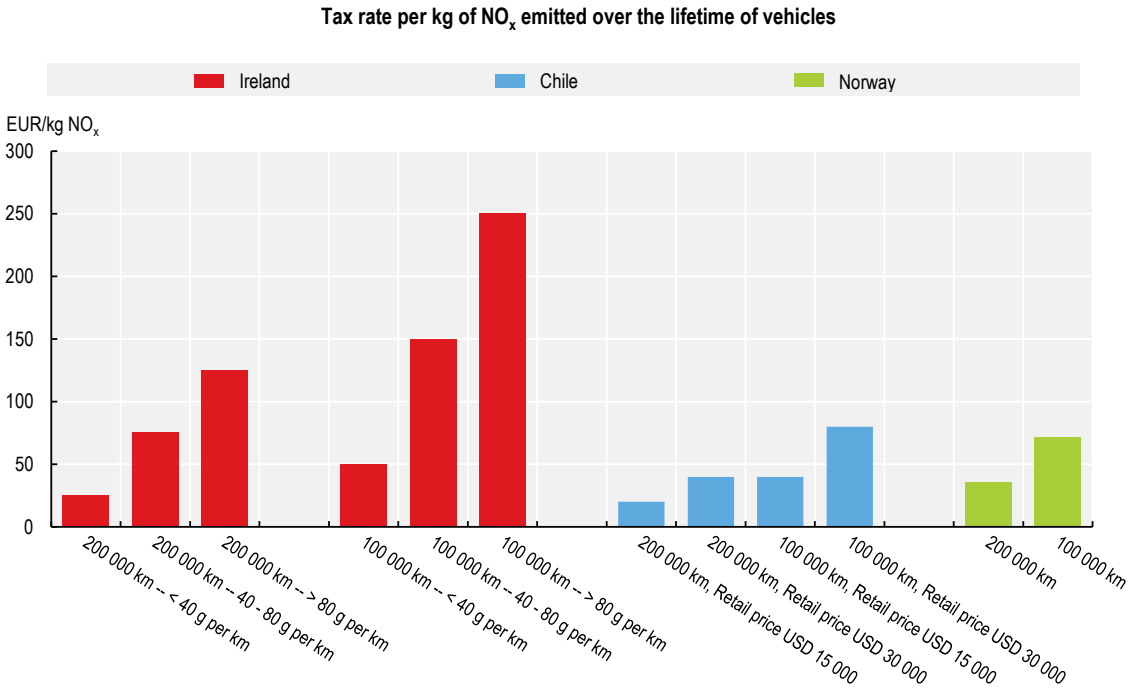
To address the unintended shift towards high-polluting diesel vehicles, a NO_x component was added to the VRT in 2020. The NO_x component applies to all first registrations of motor vehicles in Ireland, including second-hand vehicles, imported most often from the United Kingdom. The emission rates and bands of this NO_x component were tightened as of 2021. The rates vary between EUR 5 and EUR 25 per milligramme of NO_x emitted, depending on the vehicle's NO_x emission levels.[26]

Preliminary indications suggest the addition of the NO_x component to the VRT reduced the share of diesel vehicles in new registrations in 2020, although the COVID-19 pandemic strongly affected vehicle sales in 2020. The share of diesel vehicles decreased from 46.3% to 43.6%; the share of petrol vehicles decreased from 41.2% to 37.5%; and the share of petrol-electric hybrids and EVs increased from 12.5% to 18.5% (Motorstats, 2020). It seems likely that the NO_x component will continue to limit the share of old diesel vehicles in all first registrations. This, in turn, can provide important environmental and human health benefits.

The abatement incentives provided by the NO_x component in the VRT are strong, especially for high-emission vehicles, compared both to abatement incentives in other sectors of the Irish economy and to estimated damage costs of NO_x emissions. The 2019 Public Spending Code presents parameter values for use in financial and economic appraisal in Ireland, including estimated damage costs of air pollutants (Box 3.2). The value set for NO_x is about EUR 5.7 per kg of NO_x emitted. Van Essen et al. (2019) estimate the damage costs of air pollutants (health effects, crop loss, biodiversity loss, material damage) in European countries. The study estimated the costs of NO_x emissions from transport in urban areas in Ireland on average at EUR 17.6 per kg of NO_x in 2016. In rural areas, van Essen at al. (2019) estimated these costs to be EUR 10.1 per kg of NO_x emitted.

Ireland applies a high tax rate to NO_x emissions from motor vehicles compared to the other countries (Chile, Israel and Norway) with a NO_x element in their motor vehicle taxes. Figure 3.6 shows the estimated tax rate per kg of NO_x emitted over the lifetime of the vehicles, assuming they are driven either 200 000 or 100 000 km on the roads of Ireland, Chile and Norway. In Ireland, the tax rate per kilogramme of NO_x emitted increases with the emissions per kilometre driven. This holds true even if the damage caused by a kilogramme of NO_x is the same, regardless of whether it stems from a high-emission or low-emission vehicle.

Figure 3.6. The NO_x element in Ireland's motor vehicle taxes is higher than in other countries



Note: In the calculations, it has been assumed that the vehicles are driven 100 000 or 200 000 km on the roads of the country in question over their lifetime, respectively. In Ireland, the tax rate varies depending on how much the vehicle emits per km driven. In Chile, the tax rate per kg NO_x emitted depends on the retail price of the vehicle. Norway applies a fixed tax rate of EUR 7.15 per mg of NO_x that the vehicle emits per km driven. Israel also takes NO_x emissions into account in its motor vehicle tax, but due to the complexity of Israeli system, the country is not included in this graph. Data for Ireland and Norway are 2021, data for Chile are 2019.
Source: Own calculations based on the OECD *PINE* database.

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The 2019 Climate Action Plan set a target of 840 000 passenger EVs on the road by 2030.[27] As discussed further in Chapter 4, Ireland has provided significant incentives for the purchase of such vehicles, including a purchase grant, a relief from the VRT, reduced rates of the annual motor vehicle tax, reduced road tolls and a grant supporting the installation of chargers for EVs in homes. Kevany (2019) documents that these incentives have come at a major financial cost to the Treasury. However, the number of EVs on Irish roads remains relatively modest compared to the ambitious target. Around 0.7% of the fleet was made up of EVs and plug-in hybrid EVs in 2019 (Table 4.1).

As Kevany (2019) indicates, the progressive EV take-up is expected to significantly reduce revenues from motor and fuel taxation, which could threaten the stability of the state's finances. Van Dender (2019) suggests a gradual shift from an energy-based approach towards distance-based transport taxes could establish a stable tax base in the road transport sector in the long run. A distance-based tax system could apply different tax rates depending on the location and time of the driving and the type of vehicle. This would allow to take into account the different externalities (air pollution, road wear and tear, accidents, etc.)

of driving. Ireland does not have a comprehensive road pricing system in place, but road tolls are levied on 11 selected main roads. These tolls are mostly used as a financing mechanism for major new road developments funded through public-private partnerships (Chapter 4).

Ireland could take short-term action while preparing a comprehensive distance-based charging system. If the introduction of the NO_x component in the registration tax should not sufficiently stimulate the take-up of EVs, Ireland should increase the tax rate on motor vehicle fuels, particularly on diesel. The country could also consider adding a weight element in the annual motor vehicle tax. This could address, albeit imperfectly, some externalities of road transport other than those linked to fossil fuel use. As one advantage, adding this element to the annual vehicle tax (rather than to the VRT) would also affect vehicles currently in the fleet. Based on the experience of countries that are most successful at boosting EV adoption rates, increasing taxation of internal combustion engine vehicles provides an incentive to shift to EVs (Chapter 4). EVs could be exempted from the weight element (to stimulate their uptake). Such an exemption should be temporary, as EVs also contribute to congestion, accidents, road wear and associated particulate pollution. If deemed necessary, such a tax increase could be combined with temporary targeted compensation measures for low-income households living in remote areas. Such households depend strongly on the use of cars for satisfying their mobility needs.

Tax treatment of company cars and commuting allowances

Taxation rules for valuing the benefit-in-kind (BIK) employees receive from the personal use of company cars have implications for tax revenue and for environmental and other social costs, such as congestion. Ireland's tax system captures a larger share of the BIK than in all other EU countries (Princen, 2017). However, it can encourage unnecessary driving.

The income tax treatment of company car BIK in Ireland depends on the distance driven for business purposes per year and on the original market value (OMV) of the vehicle. A share of the OMV of the vehicle is added to the employee's taxable income that year; this share declines with distance driven for business purposes.[28] Exemptions apply to EVs. Electric cars with an OMV of EUR 50 000 or lower are fully exempted; employees are not being taxed for the BIK they receive by having the car at their disposal. For cars with higher OMV, the BIK is taxable only for the part exceeding EUR 50 000 of the OMV.

A reform of the regime for company car BIK taxation will enter into force in 2023. The new system will consider both the distance driven for business purposes and the CO_2 emissions of the vehicle. The percentage of the vehicle's OMV added to the employee's income increases with the CO_2 emission level of the car, but it declines with distance driven for business purposes.[29]

Both the current and new systems can encourage unnecessary driving "for business purposes", with the aim of reducing the BIK tax rate that will be applied. This driving causes more emissions of CO_2 and local air pollutants, as well as other negative transport-related externalities. In addition, the income taxation of the employees does not increase if the employer covers the operating costs (fuel, insurance, maintenance, etc.) of the vehicles. If the employer covers these costs, the employees will hardly have any economic incentive to limit their private use of the vehicles. The employer can require employees to cover some operating costs, but employees can deduct these amounts from the BIK that gets added to their income for taxation purposes.

The new BIK taxation system will provide an incentive to buy company cars with low CO_2 emissions. Other elements in the Irish tax system encourage the purchase of company cars with low CO_2 emissions. The capital allowance on cars declines with the CO_2 emission levels of the vehicles.[30] In addition, a 20% VAT rebate is possible on the purchase of company cars if they emit fewer than 141 gCO_2/km.

The focus on CO_2 emissions in these tax provisions entails the risk of stimulating the purchase of diesel vehicles, with related negative impacts on air pollution and human health. The introduction of the NO_x component in the VRT will help counteract these incentives. However, Ireland should consider additional

measures to avoid the purchase of diesel vehicles for business uses, such as an additional tax on such vehicles. A tax on diesel vehicles for company uses would also stimulate the penetration of EVs in this market segment.

3.4.4. Taxes on pollution and resource use

Taxes on pollution and resources accounted for 0.5% of revenue from environmentally related taxes in 2019. Such taxes apply in the waste management sector. Their revenue declined in 2010-19, due to the decrease in the tax base.

Landfill tax

Ireland introduced a landfill levy in 2002 whose revenues go to the Environment Fund. The tax rate increased from EUR 30 per tonne of landfilled waste in 2010 to EUR 75 per tonne in 2013, but has remained unchanged since. The Environment Fund finances, among others, schemes to prevent or reduce waste amounts; waste recovery activities; and R&D regarding waste management. At the same time, it funds production, distribution or sale of products deemed to be less harmful to the environment than other similar products. The landfill tax revenue fluctuated between EUR 30 million and EUR 50 million in 2010-17. It decreased to less than EUR 20 million in 2018, due to the effectiveness of the tax in reducing the amount of municipal waste being landfilled. In 2018, landfilling accounted for 14% of treated municipal waste (Chapter 1). Ireland could increase the landfill tax rate. At the same time, it could introduce a levy on the incineration and exports of reusable and recyclable waste, as foreseen by the Waste and Circular Economy Action Plan 2020-25. This would help further reduce the recourse to landfills, while avoiding the problem that increased waste incineration and exports discourage recycling (EC, 2019).

Plastic bag levy

Ireland introduced a levy on plastic bags in 2002, one of the first countries to do so (Convery, McDonnell and Ferreira, 2007). The tax, originally set at EUR 0.15 per bag, triggered a decrease in plastic bag usage from an estimated 328 bags per capita to an estimated 14 bags per capita in 2014. This, in turn, resulted in a strong reduction of littering. The tax rate was increased to EUR 0.22 per bag in 2007 but has not been changed since. Similar to the landfill tax, revenues from the tax collected go to the Environment Fund. The amount collected decreased from more than EUR 17 million in 2010 to EUR 5 million in 2019, due to less use of single-use plastic bags.

3.5. Removing potentially harmful subsidies

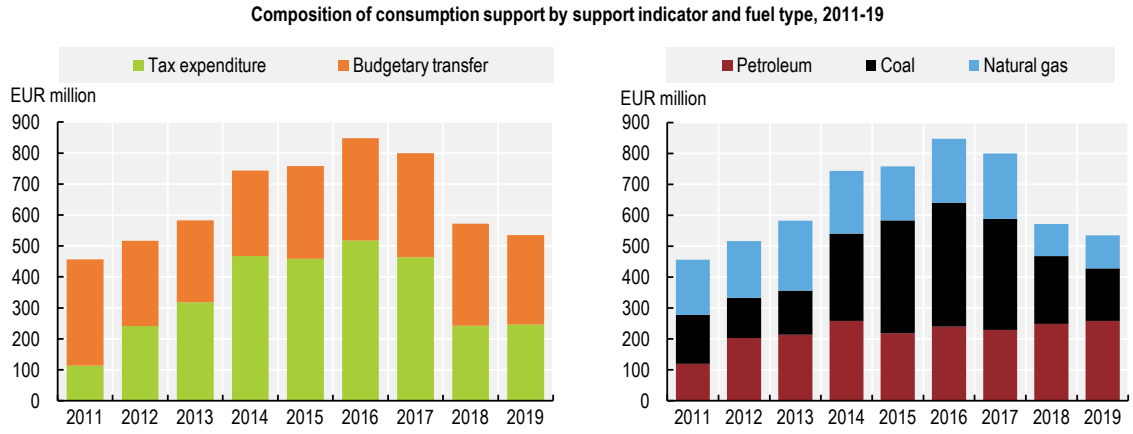
CSO (2019) estimated the amount of potentially environmentally damaging support measures in Ireland in 2012-16; CSO (2020) estimated the amount of fossil fuel subsidies in 2000-18. While fossil fuel support increased over the period, total potentially damaging support was relatively stable. Agriculture and food support declined, but transport support increased significantly, although it is a minor share of overall support. Ireland should build on this exercise to regularly produce statistics on potentially environmentally damaging subsidies. It should also establish a process to systematically screen actual or proposed subsidies and tax provisions to identify and remove those that are not justified on economic, social and environmental grounds.

3.5.1. Fossil fuel support

Ireland made progress in phasing out fossil fuel subsidies and tax concessions that create economic distortions and social inequity, as recommended by the 2010 OECD Environmental Performance Review (OECD, 2010). There was a strong increase in the support levels to fossil fuels up to 2016, including an

important increase until 2017 in direct transfers under the peat-related part of the PSO Levy scheme (Figure 3.7). The PSO is a levy charged on final electricity consumers to finance purchases of power generated from renewable sources and peat. Revenue from the levy is distributed to energy producers to subsidise any shortfall in the price that is charged to consumers and the international market price of energy. About half of the revenue from the PSO Levy has been used to subsidise peat-fired power production. [31] Support to peat-fired power plants decreased significantly in 2018-19. It was discontinued as from 2020 in line with Ireland's commitment to phase out peat electricity generation by 2028.

Figure 3.7. Support to fossil fuels started to decline after a peak in 2016



Note: Data need to be interpreted with caution. Fossil fuel subsidy data may be partial. Tax expenditure data are estimates of revenue forgone due to a particular feature of the tax system that reduces or postpones taxes relative to a jurisdiction's benchmark tax system, to the benefit of fossil fuels. Hence, tax expenditure estimates could increase due either to greater concessions, relative to the benchmark treatment, or to a raise in the benchmark itself. 2019 data are preliminary.
Source: OECD (2020), *OECD Inventory of Support Measures for Fossil Fuels* (database).

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Ireland extended the carbon tax to coal and peat in 2013, but tax exemptions and rebates continue to apply to fuels used in agriculture, fishery, freight transport and power generation. These include the Diesel Rebate Scheme for road hauliers (Section 3.4.2). Coal and coke products, and natural gas and used in chemical reduction, electrolytic and metallurgical processes also benefit from a full carbon tax relief. The same is true for the portion of fuel used to generate electricity in high-efficiency combined heat and power cogeneration plants (OECD, 2019).

De Bruin, Monaghan and Yakut (2019) estimate the removal of fossil fuel support measures would reduce economy-wide CO_2 emissions by 20% by 2030 and non-ETS emission by 11.7%, compared to a business-as-usual scenario. The removal of these subsidies would adversely affect the output of air and land transport, electricity and peat production sectors, agriculture and construction sectors. It would also affect low-income households. Target welfare payments, including an increase in the fuel allowance, would offset the impact on vulnerable households of both the subsidy removal and the increase of the carbon tax (de Bruin, Monaghan and Yakut, 2019; O'Malley, Roantree and Curtis, 2020).

In designing fossil fuel subsidy reforms, Ireland would benefit from a sequential approach. This approach implies: first, identifying the fossil fuel support measures and their policy objectives; second, evaluating the economic, social and environmental effects of the identified measures; third, on the basis of this evaluation, prioritising the support measures that need reform; fourth, assessing the distributional implications of the reform and identifying the winners and losers of the policy change; finally, designing alternative policies to achieve the same objectives more cost-effectively and with better environmental or social outcomes. Such an approach would help minimise adverse impacts of fossil fuel subsidy reform and, in turn, reduce the risk of political backlash and backtracking (Elgouacem, 2020).

3.5.2. Potentially harmful support to farming

Ireland's support to agriculture follows the EU framework. As in all EU countries, agricultural support is largely decoupled from production or input use. Several agri-environmental schemes are in place to encourage agricultural practices that are beneficial in terms of climate change and the environment. However, some agricultural inputs benefit from favourable tax treatment, which can encourage their inefficient use. A tax relief has been available to farmers for the increase in carbon tax on farm diesel since May 2012. This is in addition to the income tax deductibility of costs of agricultural diesel as business expenses, and results in a double tax deduction (OECD, 2020h).

A reduced VAT of 4.8% applies to livestock (excluding chickens). Fertilisers and animal feeds are exempt from the VAT. Removing the VAT exemptions on animal feeds could encourage a decrease in ruminant numbers, which would reduce methane emissions. Removing the VAT exemption on fertilisers would help reduce fertiliser use, with benefits in terms of reduced GHG and ammonia emissions, as well as better water quality (Chapter 1). However, the tax would disproportionately affect small farmers, who are probably low-intensity users of fertilisers. To mitigate this impact, the VAT revenue could be refunded to farmers on the basis of farm size and type (Morgenroth, Murphy and Moore, 2018). Alternatively, revenue could be used to support general agricultural services, including R&D, to benefit the whole sector.

3.6. Fostering eco-innovation and expanding green markets

Ireland is a highly competitive economy, a strong innovator and one of the most attractive European destinations for foreign direct investment. It has a sound innovation system and highly educated human resources. In 2019, Ireland had the highest proportion of high-tech goods exports of any European economy (OECD, 2020a). However, some weaknesses persist, including low R&D funding, unbalanced public support for business R&D and insufficient co-operation between firms and research bodies (EC, 2020a).

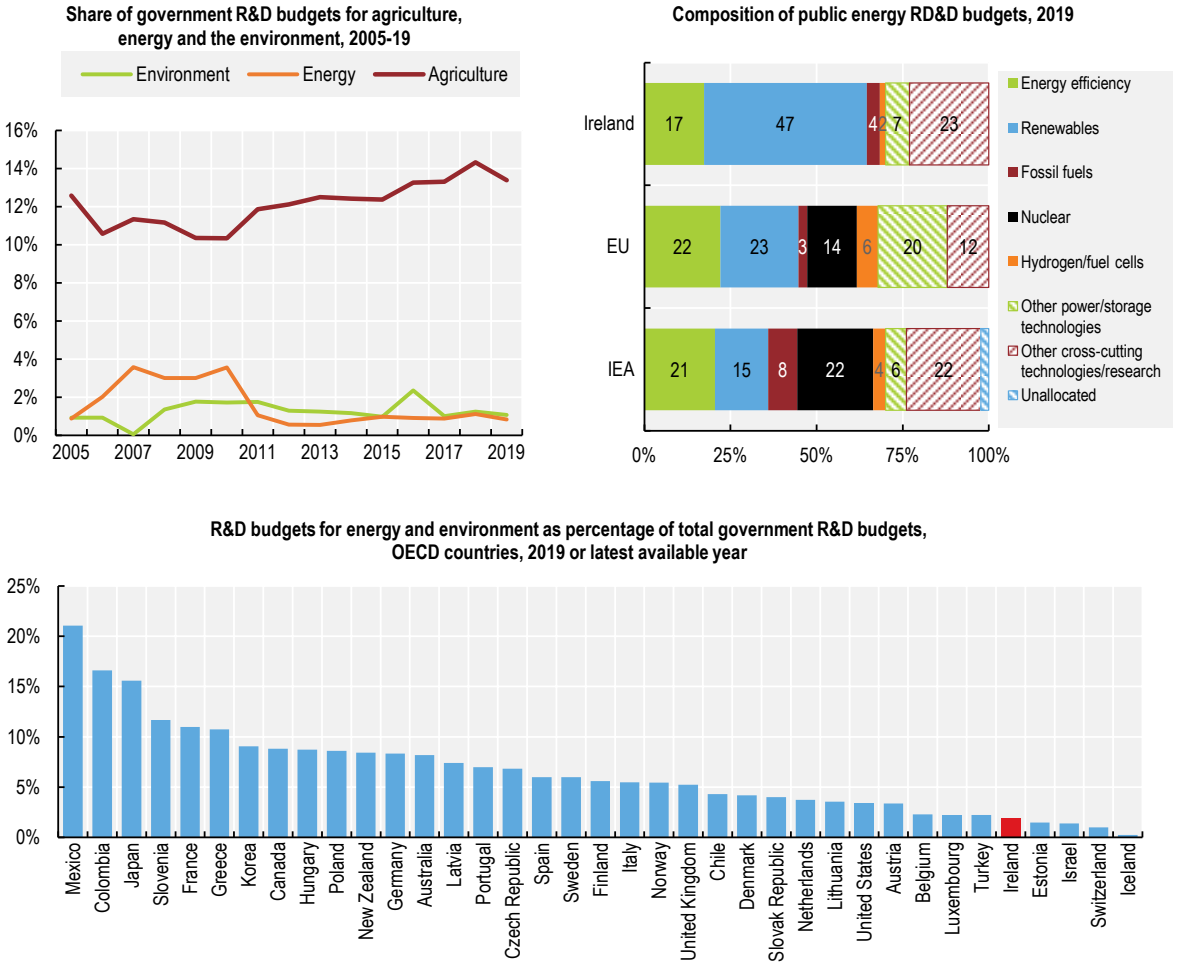
Both the government and businesses spend relatively little on R&D. Although it increased, gross domestic expenditure on R&D was 1.1% of GDP in 2018, or half the EU average. However, this indicator is affected by the disproportionate weight of multinational capital stock on Ireland GDP (Chapter 1). Public R&D expenditure, while increasing, has not yet reached the pre-crisis level.

There is a sizeable disparity in innovation capacity and activity between multinational enterprises and domestic SMEs, and between regions. In 2017, foreign-owned companies accounted for nearly 70% of all R&D expenditure. Large enterprises manage to claim most of the public R&D support, which is primarily channelled through tax credit. The areas around Cork and Dublin, the location of highly competitive multinational companies, offer favourable business and innovation environments. Predominantly rural and remote areas in the Northern and Western regions increasingly lag behind, with lower quality infrastructure (Figure 1.2). All this calls for more diffusion of innovation from foreign multinational companies to local ones. More priority for direct funding instruments could help stimulate research and innovation and improve productivity of Irish firms, especially SMEs (EC, 2020a). This is especially true for investment in environmental and low-carbon technology and innovation, which can pose a higher financial burden on SMEs.

Higher investment is needed to spur climate- and environment-related innovation. The share of government R&D budget for environmental and energy research declined in the 2010s. Less than 2% of government R&D outlays targeted environmental and energy research in 2019, among the lowest shares in the OECD (Figure 3.8). By comparison, the share of government R&D outlays focusing on agriculture increased to reach 13% in 2019, which may include research projects to improve the environmental performance of the sector. This R&D effort should be further channelled towards the decarbonisation of agriculture.

Ireland has prioritised research on renewables and energy efficiency. On average, half of the energy public R&D budget focused on renewable sources in the second half of the 2010s, with a strong focus on ocean technology. The SEAI, which is the main organisation disbursing public energy R&D funds, has been actively engaged in the development of Ireland's offshore renewable energy potential. In 2019, renewables and energy efficiency absorbed about two-thirds of the energy public R&D allocations in Ireland. This compares to 45% in the European Union and 36% in the member countries of the International Energy Agency (Figure 3.8).

Figure 3.8. The limited public R&D budget for environment and energy focused on clean energy



Top left and bottom panels: Data on government budget allocations for R&D by socio-economic objective according to the NABS 2007 classification.
Top right panel: Public energy technology budgets for research, development and demonstration (RD&D). Data reported for the European Union refer to projects and programmes directly funded by the European Union and complementary to national budgets.
Source: IEA (2020), *Energy technology RD&D budgets* (database); OECD (2020), "Research and Development Statistics: Government budget appropriations or outlays for RD"; *OECD Science, Technology and R&D Statistics* (database).

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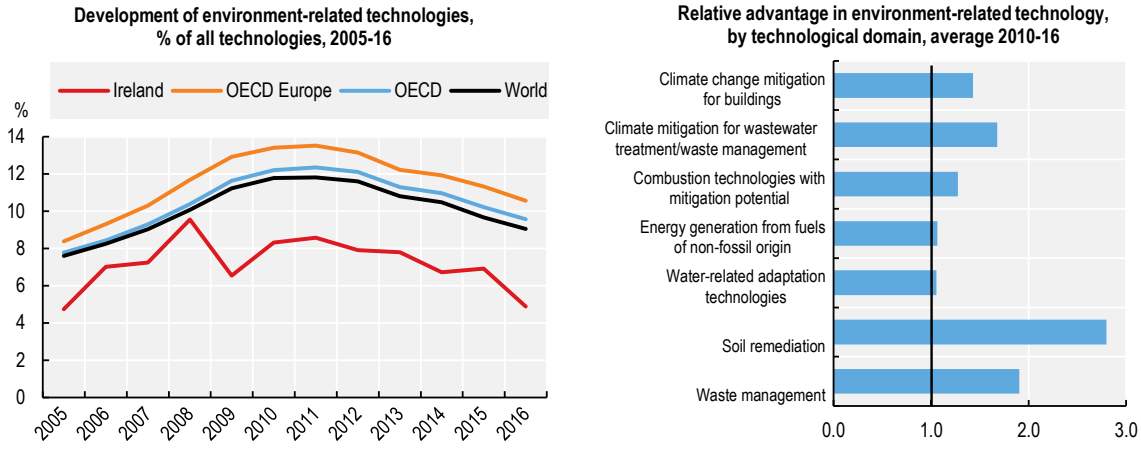
Several organisations provide funding for climate-related research in Ireland, including the SEAI, the Environmental Protection Agency (EPA), the government departments in charge of environment, climate or agriculture, and the European Union. A multitude of climate-related projects has been conducted in the last decade. The Climate Research Coordination Group aims to improve co-ordination between relevant funding organisations and to offer a platform to exchange knowledge and disseminate research findings. As recommended by Curtin (2017), the establishment of a national database of environment- and climate-

related research could help further improve co-ordination and efficiency of public research funding. The SEAI maintains a national database of energy research, which includes many climate-related projects.

Low environment-related R&D spending has translated into a relatively low number of patents in environment-related technologies. After a growth over 2005-08, patent applications dropped sharply with the global financial crisis. The share of environment-related patent applications in all technologies followed the world and OECD trend, growing at the beginning of the decade and declining afterwards. However, the decline in Ireland was more rapid than in the OECD; the country's share of environment-related patent applications in all technologies remained steadily below the OECD average (Figure 3.9). Nevertheless, Ireland has specialised in some environmental management and climate-related technologies. In particular, in 2010-16, the country maintained a relative advantage in technologies related to waste management, soil remediation and climate change mitigation for buildings (Figure 3.9).[32]

The government acknowledged there is scope to enhance co-operation between firms (especially SMEs) and research organisations to develop and deploy environment-related technologies and applications on a commercial basis. The national strategy for science and technology, Innovation 2020, and the 2019 Future Jobs Ireland strategy aim to support innovation and technological change, improve SME productivity, enhance skills and smooth the transition to a low-carbon economy. Science Foundation Ireland provides funding to 16 thematic research centres, including the MaREI Centre for Energy, Climate and Marine Research and Innovation, and the BEACON Bioeconomy Research Centre.

Figure 3.9. Ireland developed a specialisation in some environment-related technologies



Note: Patent statistics are taken from the Worldwide Patent Statistical Database (PATSTAT) of the European Patent Office (EPO), with algorithms developed by the OECD. Data refer to patent applications filed in the inventor's country of residence according to the priority date and apply solely to inventions of high potential commercial value for which protection has been sought in at least two jurisdictions. Environment-related technologies cover all the domains related to environmental management, water-related adaptation and climate change mitigation. The relative advantage in environment-related technologies is an index of the specialisation in environmental innovation of a given country relative to the world average. An index equal to one means that a country innovates as much in "green" technologies as the world average; an index above one indicates a relative technological advantage or specialisation in environment-related technologies compared to the world average.
Source: OECD (2020), "Patents", *OECD Environment Statistics* (database).

StatLink https://doi.org/10.1787/888934231858

The Disruptive Technology Innovation Fund (EUR 500 million in 2018-27) is one of the four headline funds in the NDP (Section 3.3.1). It aims to support development of innovative technologies and applications with strong commercialisation potential. The fund is aligned with the Research Priority Areas 2018-23, which include "energy, climate action and sustainability" and "smart and sustainable food production and processing". Three calls for projects were launched in 2018-20. The government expects that projects approved under the fund will be well-placed to leverage EU research funding. The EPA manages a Green

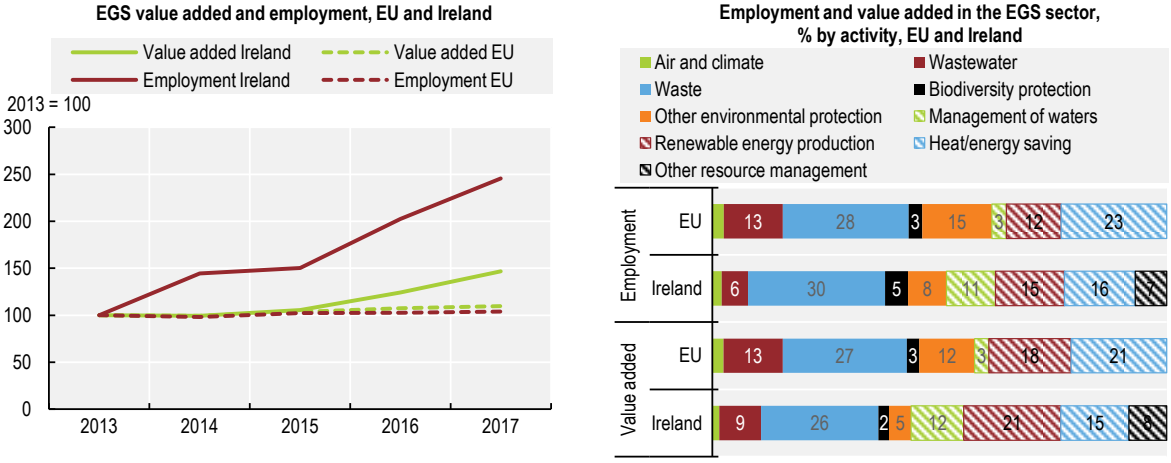
Enterprise Fund to support SMEs undertaking innovative initiatives related to circular economy and resource efficiency.

3.7. Expanding job opportunities from the green transition

Ireland's environmental goods and services (EGS) sector grew faster than on average in the European Union in 2013-17 (Figure 3.10). In 2017, the EGS sector grew faster than the economy; its contribution to GDP increased by 16% from the previous year. However, it still contributed less than 1% to GDP and exports – among the lowest shares in the European Union. EGS employment more than doubled, to reach nearly 40 000 full-time equivalent (or some 2% of total employment).

Resource management activities accounted for a larger share of the EGS value added and employment than on average in the European Union (Figure 3.10). As in the European Union, waste management, renewable energy and energy efficiency dominate the EGS sector in Ireland. This reflects the policy emphasis of these sectors at both domestic and EU levels. These are also the EGS activities with the highest employment.

Figure 3.10. Ireland's green industry grew, driven by waste and energy resources management



Note: Environmental goods and services (EGS) are those produced for the purpose of environmental protection (i.e. preventing, reducing and eliminating pollution and any other degradation of the environment) as well as resource management (i.e. preserving and maintaining the stock of natural resources and hence safeguarding against depletion). Other environmental protection: protection against radiation; environmental research and development; other environmental protection activities.
Source: Eurostat (2020), *Environmental goods and services sector* (database).

StatLink https://doi.org/10.1787/888934231877

The development of the bioeconomy[33] and the circular economy provides considerable opportunities for Ireland's businesses. Ireland has some comparative advantages in relation to the bioeconomy, including the large domestic agro-food sector, one of the largest seabed territories in Europe (with a reservoir of biomass) and an established bio-pharmaceutical sector. With 80% of the agri-food sector based in rural Ireland, there is also potential for the bioeconomy and circular economy to boost employment in peripheral regions (DBEI, 2019). Some estimates indicate that 5 000 new jobs could emerge in Ireland through recycling materials (from sorting recyclables to eco-design), with a potential added GDP value of EUR 1.65 billion (O'Rafferty, 2017). Energy efficiency can also greatly contribute to job creation. The SEAI estimates that energy efficiency schemes support 17 direct and indirect jobs in Ireland per every EUR 1 million invested (Government of Ireland, 2020b). The additional funding for building retrofitting in the July Stimulus Package was estimated to create 3 200 direct and indirect jobs.

The transition to a low-carbon economy over the next decade is expected to have a modest negative impact on employment in Ireland. However, the impact will be concentrated in small areas and communities. There is also uncertainty about the combined effect of the low-carbon and digital transitions on some sectors (NESC, 2020). This will likely exacerbate regional disparities and affordability issues. Where appropriate, compensatory measures can contribute to a socially fair transition. Benefits for low-income households could incite a switch to cleaner heating fuels.

The most immediate impact arises from the commitment to phase out peat harvesting and peat-generated electricity in the Midlands by 2028 (NESC, 2020). As of end of 2020, about a third of active peat bogs had been closed to extraction. According to 2019 estimates, moving away from peat will potentially affect around 4 000 jobs of a total of 110 000 people employed in the region. In addition, the scheduled closure of the Moneypoint coal-fired power plant by end-2025 will affect around 750 jobs in the area (EC, 2020a).

While job opportunities can emerge in green sectors, the challenge is to ensure these new jobs are created in the same regions facing the risk of job losses. This would help avoid a relocation of workers with potentially negative consequences on family life and communities (OECD, 2020i). In 2020, the government launched a building retrofitting scheme in the Midlands, which will potentially benefit 750 homes and create 400 new direct and indirect jobs. The July Stimulus Package and the 2021 government budget re-financed a multi-year peatland rehabilitation programme. This could generate jobs and attract tourists, while delivering benefits for climate mitigation, adaptation and biodiversity (Section 3.2). For example, the Bord na Mona Rehabilitation Scheme (announced in November 2020) aims to restore 33 000 hectares of Bord na Mona lands previously harvested for peat used for power generation; it is expected to create 310 jobs.

The Just Transition Fund for the Midlands (EUR 11 million in 2020, with projects funded until 2023) provides financial support for retraining workers and for business projects that can generate sustainable jobs in the region (e.g. building retrofitting, peatland rehabilitation, tourism projects and development).[34] The fund is partially fed by carbon tax receipts. Ireland is expected to prepare a territorial Just Transition plan consistent with its National Energy and Climate Plan to benefit from EUR 176 million under the EU Just Transition Fund.

Workers in affected areas will need re-skilling and up-skilling, and new green jobs may require skills not yet fully available. This would require investing more in education and training, as well as better guiding job seekers through available training programmes. Entrepreneurship training programmes could help affected workers start their own businesses. More generally, well-targeted support measures for SMEs can help them improve their productivity, innovate and provide job opportunities in cleaner sectors (OECD, 2020i; see Section 3.6). It is essential that Ireland continues to assess and anticipate future skill needs, including those associated with the green transition.

Systematic dialogue with affected communities and active engagement of local governments would help customise the just transition measures to local needs and build consensus. This is even more important in the context of a post COVID-19 recovery (Moore, 2020). The 2019 appointment of a Just Transition Commissioner is, therefore, welcome. The Commissioner has the mandate to engage with relevant stakeholders in the Midlands region and advise the government on possible policy measures.

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Notes

[1] Ireland successfully exited the European Union-International Monetary Fund financial assistance programme in December 2013. The programme was largely based on the 2010 Irish government's National Recovery Plan 2011-14.

[2] Ireland endured a strict lockdown for more than seven weeks between March and May 2020. Another one was enforced in October the same year.

[3] Various forms of income support were provided to workers whose employment had been affected. These included the Temporary Wage Subsidy to employers to pay part of the salary of their employees, the Enhanced Illness Benefit to support quarantined workers who cannot work from home and the Pandemic Unemployment Payment for workers who lost their jobs due to the crisis. Measures to support businesses included a wide range of loan schemes and deferrals of tax payments to allow viable businesses to maintain liquidity and retain employment.

[4] The Commission for Regulation of Utilities issued a moratorium on disconnections of domestic customers for non-payment to gas and electricity suppliers. The Fuel Allowance season, due to finish on 10 April, was extended for four weeks to allow disadvantaged households to cover additional heating needs as people were asked to stay home.

[5] The July Stimulus Package included EUR 1 billion of tax measures, EUR 4 billion of direct expenditure, EUR 2 billion of credit guarantees and EUR 0.5 billion in accelerated capital expenditure.

[6] The Cycle to Work Scheme allows employers to pay for bicycles and related equipment for their employees (up to a certain amount). Employees pay back this amount through a gross salary sacrifice arrangement of up to 12 months. The scheme provides income tax and social contributions savings for employees. The Recovery Package increased the allowable expenditure under the "Cycle to Work Scheme" from EUR 1 000 to EUR 1 500 for electric bikes and to EUR 1 250 for other bicycles.

[7] The Employment Wage Support Scheme was allocated EUR 1.9 billion. Under the scheme, employers whose turnover had fallen by 30% due to COVID-19 were eligible to receive a flat-rate subsidy of up to EUR 203 per week per employee to pay their employees until April 2021.

[8] Capital expenditure is expected to increase at an average annual rate of 5.8% until 2024, and a ratio of 4.3% of modified gross national income to be maintained in the medium term (EC, 2020a).

[9] Among the ten priorities of Project Ireland 2040 are the transition to a low-carbon and climate-resilient society and the sustainable management of water and other environmental resources.

[10] The fund is to be financed from part of the petroleum products' levy revenue (previously fully used to finance the National Oil Reserves Agency). The first call for applications, in 2018, led to award EUR 77 million to seven projects leveraging a total investment of EUR 300 million.

[11] Ireland will benefit from nearly EUR 1.3 billion grants in 2021-23 from the EU Recovery and Resilience Facility and EUR 176 million under the Just Transition Fund, in addition to more than EUR 1 billion for

cohesion policy in 2021-27. The Recovery and Resilience Plan needs to be submitted to the European Commission by the end of April 2021.

[12] In 2021-27, Ireland will receive EUR 2.2 billion from the European Agricultural Fund for Rural Development, in addition to over EUR 8 billion of direct payments to farmers as part of the Common Agricultural Policy.

[13] Environmental protection investment includes investment devoted to activities to prevent, reduce and eliminate pollution and degradation of the environment, e.g. pollution abatement (air, water, soil and noise), waste and wastewater management, protection of biodiversity, as well as R&D, education and training.

[14] As a comparison, the share of environmental protection investment in total investment of the public sector declined in the European Union as a whole and was 4.9% in 2019.

[15] Corporations include the specialist providers of environmental protection services (e.g. waste collection operators and water utilities), as well as other businesses that purchase technologies and equipment to manage the environmental impact arising from their (non-environment related) activity.

[16] The investment plan aims to support the operation, maintenance and upgrade of the water and wastewater infrastructure to meet the needs of a growing population and housing supply, as well as to protect water bodies and adapt to climate change.

[17] The water sector funding model is based on the 2017 recommendations of Joint Oireachtas (Parliamentary) Committee on the Future Funding of Domestic Water Services and the Water Services Act.

[18] The excess usage charge is set at EUR 3.70 for each cubic metre (m^3) above the threshold, to cover combined water and wastewater services. Households in receipt of only one of these services will pay half of this amount. Annual water bills will be capped at EUR 500. The free water allowance is 213 000 litre per year per household or 1.7 times the current average annual household water consumption. Households with more than four occupants will be entitled to an additional free allowance of 25 000 per person.

[19] Under the so-called First Fix Free Scheme, Irish Water offer customers with a suspected leak on their external supply pipe a free investigation on the pipe and a free repair of identified leaks.

[20] There used to be 500 charging rates billed in 44 separate areas.

[21] The Climate Change Advisory Council is an independent advisory body tasked with reviewing national climate policy, progress on the achievement of the national transition objective and progress towards international targets.

[22] De Bruin, Monaghan and Yakut (2019) simulated an annual carbon tax increase of EUR 6 per tonne of CO_2 starting from 2020, with the tax rate reaching a level of EUR 80 in 2029. This tax increase scenario was added to another scenario, where all existing fossil fuel support measures were eliminated. The analysis indicated that the removal of fossil fuel support measures would reduce economy-wide CO_2 emissions by 20% by 2030 and non-ETS emission by 11.7%, compared to a business-as-usual scenario. The carbon tax increase would make total CO_2 emissions decrease further by 31% by 2013 (and non-ETS emissions by 18.4%). However, the level of non-ETS emissions would be higher than Ireland's binding target of reducing non-ETS emissions targets by 30% by 2030 from the 2005 level.

[23] Applying carbon taxes to the emissions of the sources covered by the EU ETS would tend to free up emission allowances and hence reduce the allowance prices. The reduced allowance prices would tend to

reduce the abatement efforts by someone else covered by the ETS. Thus, taxing such sources would have a limited impact on Europe-wide CO_2 emissions.

[24] As of October 2020, the excise tax rate on diesel was EUR 0.426 per litre and the carbon tax rate was EUR 0.09 per litre; in total EUR 0.515 per litre. For petrol, the excise tax rate was EUR 0.542 per litre and the carbon tax rate was EUR 0.077 per litre (a total of EUR 0.619 per litre).

[25] The Diesel Rebate Scheme for qualifying hauliers came into effect on 1 July 2013. Under the scheme, the tax authority repays some of the mineral oil tax paid by a qualifying road transport operator under three conditions: the diesel must be purchased by a business within the state, used in the course of business transport activities and used in qualifying vehicles. The quarterly diesel repayment rate is calculated using the national average purchase price. The repayment rate is calculated on a sliding scale basis: i) there is no repayment when the price, including VAT, is at or below EUR 1.23 per litre; ii) the maximum amount repayable was 7.5 cents per litre when the price, including VAT, was EUR 1.54 per litre or over until 31 December 2019; iii) from 1 January 2020, the maximum amount repayable is 7.5 cents per litre when the price, including VAT, is EUR 1.43 per litre or over.

[26] For vehicles that emit up to 40 mg of NO_x/km driven, the tax rate is EUR 5 per mg emitted. For any emissions between 40 and 80 mg/km, the tax rate is EUR 15 per mg emitted, and for any emissions above 80 mg/km, the tax rate is EUR 25 per mg of NO_x emitted. If satisfactory evidence of organis emissions of the vehicle cannot be provided, a maximum tax rate of EUR 4 850 applies to diesel vehicles, and one of EUR 600 applies to other vehicles.

[27] The plan also set a target of 95 000 electric vans and 1 200 electric buses on Irish roads by 2030.

[28] If the vehicle is driven for business purposes fewer than 24 000 km in the year, 30% of the OMV of the vehicles is added to the employee's taxable income. If the vehicle is driven more than 48 000 km, 6% of the OMV is added to the employee's taxable income.

[29] For example, if the vehicle is driven fewer than 26 000 km for business purposes in a given year, and if the vehicle emits between 100 and 139 g of CO_2 per km, 30% of the vehicle's OMV will be added to the employee's income. If the vehicle instead emits 180 gCO_2/km or more, 37.5% of the vehicle's OMV will be added to the employee's income. However, if the high-emitting vehicle is driven more than 52 000 km per year, 15% of the vehicle's OMV will be added to the employee's income.

[30] Companies may claim up to EUR 24 000 in capital allowances on their cars if the cars fall into the lower CO_2 threshold (140 gCO_2/km from 2021), up to EUR 12 000 if they fall into the mid-CO_2 threshold, and zero if they fall into the upper-CO_2 threshold (155 gCO_2/km from 2021).

[31] The amount of revenue raised by this levy increased steadily from EUR 242 million in 2014 to EUR 406 million in 2018. Small funding disbursements are anticipated to be made for 2020 (at EUR 25.5 million compared to EUR 65.5 million in 2019).

[32] The relative advantage in environment-related technologies is an index of the specialisation in environmental innovation of a given country relative to the world average. An index equal to one means that a country innovates as much in green technologies as the world average; an index above one indicates a relative technological advantage or specialisation in environment-related technologies compared to the world average.

[33] The European Commission describes a bioeconomy as involving "the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy".

[34] Eight counties are eligible for support: East Galway, Kildare, Laois, Longford, North Tipperary, Offaly, Roscommon and Westmeath.

Part II. Progress towards selected environmental objectives

4 Sustainable mobility and freight

This chapter reviews the progress in promoting sustainable mobility in Ireland. It discusses mobility trends in freight and passenger transport, examining their impact on air pollution, greenhouse gas emissions, noise, congestion and traffic safety. It also assesses the impact of the COVID-19 pandemic on the use of both public and private transport. The chapter provides an overview of the country's various policy visions for sustainable mobility, including their social and environmental impacts, as well as governance arrangements. Finally, it assesses the policy instruments in place to promote sustainable mobility and examines their performance in achieving the country's objectives.

Recommendations on sustainable mobility and freight

Prioritising public transport and active mobility

- Ensure that national investment programmes prioritise sustainable mobility; follow through on the commitment to two-to-one spending on public transport over roads and an allocation of 20% of the total transport capital budget for cycling and pedestrian infrastructure projects.
- Use road space allocation to proactively manage traffic by changing the road layouts, giving more space to cyclists, pedestrians and public transport; put in place significant investment and timetabled targets to support implementation.
- Enforce planning regulations systematically and thoroughly at the local level to ensure that all developments promote compact settlements with easy access to transport links and include a network of safe walking and cycling routes.

Managing travel demand

- Consider introducing policy instruments such as congestion charges to better manage travel demand in urban areas and curb increasing congestion, particularly in the Greater Dublin Area; consider a pilot implementation and clearly communicate the public benefits of any reform to increase social acceptability; assess potential distributional impacts of the introduced measures and mitigate them by providing direct support to the most affected and vulnerable households.
- Address availability of parking, including by phasing out parking subsidy in the form of free parking at a workplace and encouraging employers to provide parking cash-outs in lieu of a parking space; make public transport and emerging transport services (such as bike sharing) eligible for commuter benefits; consider allowing employers to make tax-free payments to employees who walk or bike to work.

Promoting the uptake of electric vehicles

- Increase the taxation of purchases and use of ICEVs, with a view to equalising the difference in purchase price or lifetime cost between EVs and ICEVs; continue to extend the charging points across the road network.

Shifting to low-carbon freight transport

- Develop a coherent strategy for the low-carbon transition of the haulage sector, focusing on integrating road freight, rail and shipping and rebalancing economic incentives in favour of rail freight; in the road sector, improve efficiencies of logistics operations and introduce sectoral standards, such as mandatory eco-driving training.
- Assess the economic efficiency and environmental effectiveness of the policy promoting CNG technology to reduce environmental impacts of road freight transport.

Improving climate resilience of transport infrastructure

- Fill the information gap about exposure and vulnerabilities of transport infrastructure to climate hazards and assess the social, economic and environmental functions performed by all transport infrastructure assets; based on these data, conduct a full priority impact assessment to identify critical national assets and costs of adaptation actions to justify investments in improved resilience.

4.1. Introduction

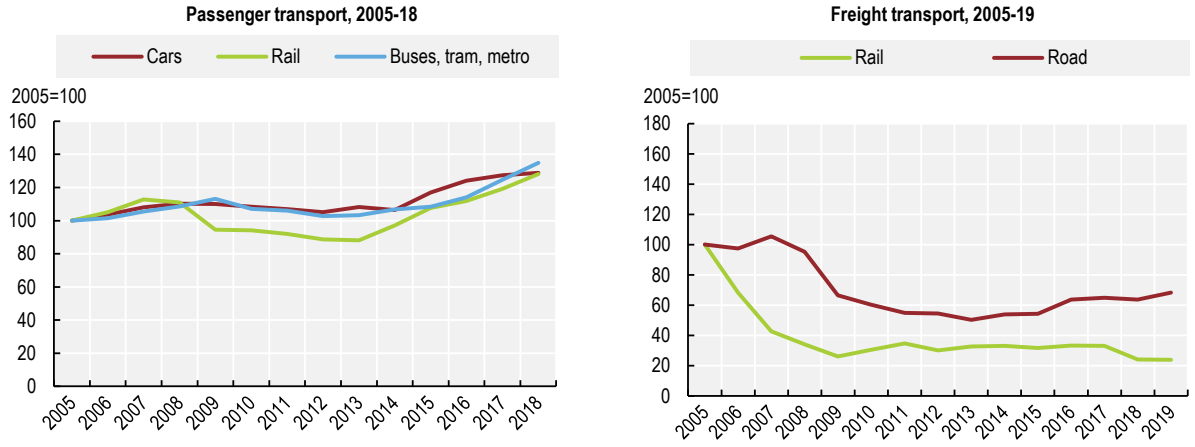
Sustainable transport is essential for curbing greenhouse gas (GHG) emissions, air pollution and environmental damage. The benefits of sustainable transport extend beyond environmental considerations, delivering improvements in congestion, productivity, health and overall well-being. Advancing sustainable mobility implies a shift in approach from accommodating traffic growth to reversing car dependence and encouraging alternative, less damaging forms of movement. This means generating adequate and more equitable access to goods, jobs and opportunities through public transport, walking and cycling.

In Ireland, changing the trajectory of both urban development and transport will require a wide range of policies for ensuring the socio-economic benefits of transport and accessibility, while reducing environmental impacts. This means combining policies effectively to achieve two aims. First, trips should shift to less carbon- and space-intensive modes (e.g. rail, buses, walking and cycling). Second, unnecessary trips and excessively large distances should be avoided by closer matching of origins and destinations. Measures for improving vehicle technologies also remain an important lever. Such measures can reduce fuel consumption and related GHG emissions by improving vehicle fuel efficiency and expanding the feasibility of moving to electric-based fleets.

4.2. Key trends in mobility and freight transport

The transport sector tends to grow or reduce sharply in response to economic growth or contraction. This has been evident in Ireland over the past three decades. Following the 2008-13 economic downturn, the decline in car and public transport passenger journeys had halted as the economy began to stabilise. Since 2013, the use of passenger transport – both car and public transport – has been gradually growing across Ireland. Similarly, freight activity has been following the economic cycle, with substantial decline following the economic downturn in 2008, and slow recovery starting in 2013. Figure 4.1 illustrates these trends. Both passenger and freight transport activity declined in 2020 due to measures taken to contain the COVID-19 pandemic.

Figure 4.1. Passenger and freight transport have increased with economic recovery



Note: Based on data expressed in passenger-kilometre and tonne-kilometre.
Source: EC (2020), *EU Transport in Figures - Statistical Pocketbook 2020*; OECD-ITF (2020), *Transport Statistics* (database).

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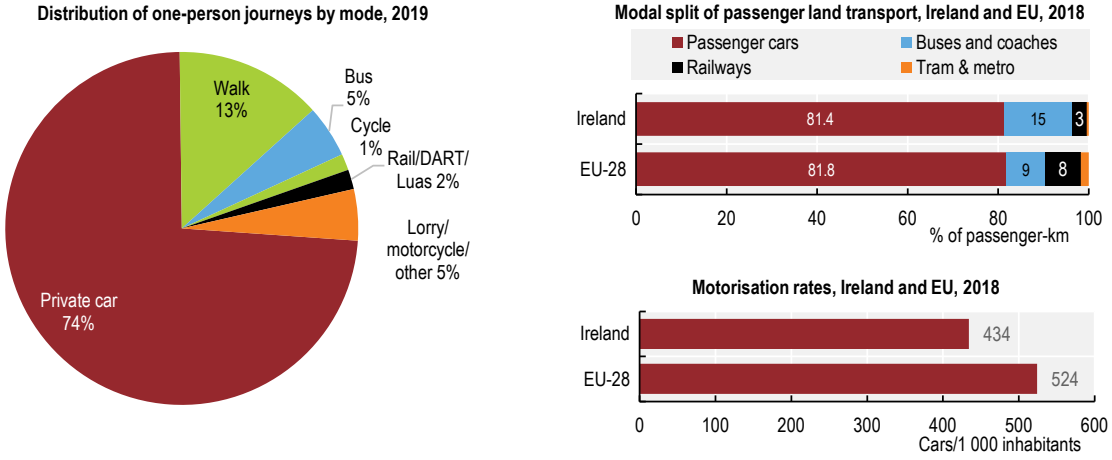
4.2.1. Trends in passenger transport

Private car is the dominant mode of transport in Ireland. In 2019, almost three-quarters of journeys (74%) were made by car, either as driver or passenger (Figure 4.2). The share of car trips is larger outside the Greater Dublin Area with 78.5% compared to 62% within Dublin (CSO, 2019). In 2018, car use in Ireland was in line with the average of other European Union (EU) member states. The modal share of rail in Ireland is less than half the EU average, but the share of passenger-kilometre travelled by bus is well above the EU average (Figure 4.2).

Figure 4.2. Ireland is car-dependent but in line with the European average



Source: CSO (2020), *National Travel Survey 2019*; EC (2020), *EU Transport in Figures - Statistical Pocketbook 2020*.

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With about 430 cars for every 1 000 inhabitants, Ireland's motorisation rate is well below the EU average (Figure 4.2). However, car ownership among households has been showing an upward trend (DTTAS, 2020). While the amount of new cars in the market has stabilised, used car imports have more than doubled since 2015. This suggests that Irish consumers are taking advantage of a weaker pound sterling and the larger used vehicle market in the United Kingdom (IEA, 2019). Over 50% of used cars are three-five years-old and another almost 30% are over six-years-old. Increasing the share of imported older cars has obvious environmental implications, as older cars tend to have poorer fuel economy and higher emissions.

In 2019, petrol passenger cars accounted for 40% of all registered cars, while diesel cars accounted for 57%. The number of passenger diesel cars in the fleet increased by 60% in 2014-19; the number of petrol cars decreased by 25% in the same period (Table 4.1). Since 2017, the new car market has started to shift away from diesel. In the imported used car market, however, the number of diesels continued to increase (by 4% in 2017-18), counteracting the trend. Preliminary indications suggest the addition of a nitrogen oxide (NO_X) component to the vehicle registration tax (VRT) in 2020 reduced the share of diesel vehicles in new registrations (Chapter 3). Hybrid, electric and plug-in hybrid electric cars accounted for less than 3% of the fleet in 2019 (Table 4.1; see Section 4.7).

The growing share of diesel vehicles has been largely the result of historically lower tax rates on diesel than on petrol, as well as the shift from engine-based vehicle taxation to one based on carbon dioxide (CO_2) in 2008 (Chapter 3). Overall, the increasing preference towards diesel cars has helped improve fuel efficiency and reduce average CO_2 emissions from newly registered passenger cars to about 113 grammes (g) of CO_2/kilometre (km) in 2018, one of the lowest levels among EU member states (the 2021 EU target is 95 g CO_2/km) (Figure 4.3). However, as in many other European countries, this shift has

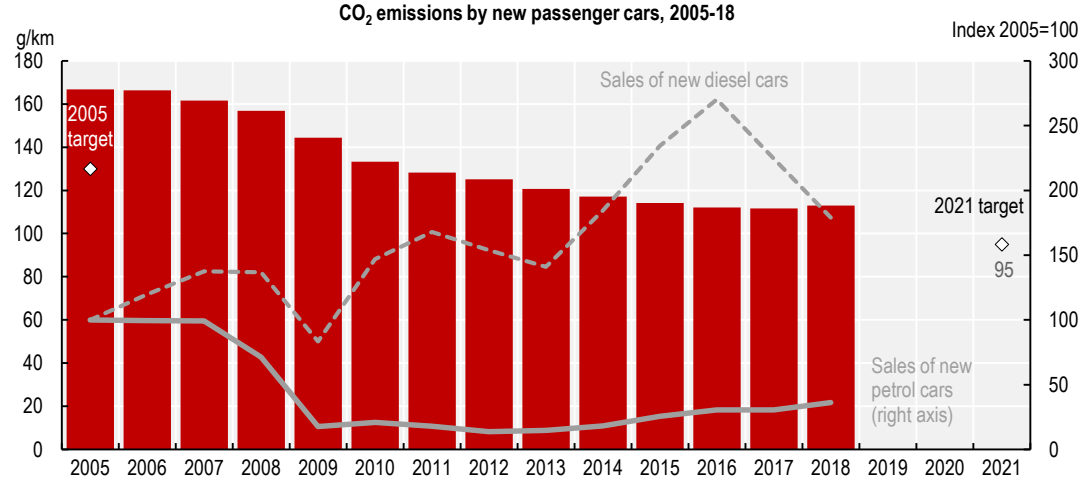
raised concerns over increasing urban air pollution. Diesel vehicles also tend to be larger and heavier than petrol-equivalent. Hence this shift towards diesel vehicles also increased the land take and intensified the question of space consumption, which is particularly scarce in urban areas.

Table 4.1. Number of passenger cars by fuel type, 2007, 2014 and 2019

	2007		2014		2019	
	Number	Percentage	Number	Percentage	Number	Percentage
Petrol	1 541 852	81.9	1 148 911	59.1	870 657	40.0
Diesel	337 880	17.9	776 440	39.9	1 235 902	56.8
Petrol and ethanol		0.0	9 293	0.5	8 192	0.4
Hybrid		0.0	8 607	0.4	45 167	2.1
Electric		0.0	529	0.0	8 473	0.4
Plug-in hybrid electric		0.0		0.0	6 305	0.3
Other	3 169	0.2	88	0.0	83	0.0
Total	1 882 901	100.0	1 943 868	100.0	2 174 779	100.0

Source: DTTAS (2008), Irish Bulletin of Vehicle and Driver Statistics 2007; DTTAS (2015), Irish Bulletin of Vehicle and Driver Statistics 2014; DTTAS (2020), Irish Bulletin of Vehicle and Driver Statistics 2019.

Figure 4.3. CO_2 emissions from new cars have declined with the shift to diesel cars



Note: Average CO_2 emissions per kilometre by new passenger cars in a given year. The European Union sets mandatory emission reduction targets for new cars of 130 grammes of CO_2 per kilometre in 2015 and 95 grammes of CO_2 per kilometre in 2021 (Regulation EC 433/2009). These targets apply to a manufacturer's overall fleet, meaning that heavier cars with emissions above the limit value are still allowed but must be offset by the production of lighter cars to preserve the overall fleet average.
Source: CSO (2020), "Transport Statistics", *StatBank* (database); Eurostat (2020), *Monitoring of CO_2 Emissions from Passenger Cars* (database).

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Car use across Ireland showed an upward trend, increasing by 27% between 2005-17. In 2018, the total number of kilometres driven by private cars did not increase from the previous year but was still 51% higher than in 2000 (DTTAS, 2019a). In particular, the number of vehicle-kilometres by diesel cars increased by 170% (SEAI, 2020). While car traffic declined abruptly with the COVID-19 containment measures in March-May 2020, it returned to nearly business-as-usual levels in the subsequent months. As of June 2020, Dublin traffic had returned to 75% of the pre-lockdown levels (Kelly, 2020).

Recent years have seen increases in the use of public transport, especially in urban areas. Passenger journeys facilitated by the four main public transport operators (Dublin Bus, Bus Éireann, Irish Rail and the Luas) increased by 9% in 2019, the largest annual increase in public transport users (NTA, 2018a). While economic growth was a significant element in the gradual increase of passenger journeys in the second half of the 2010s, the ongoing redesign of the bus networks, particularly in the cities of Dublin, Cork, Galway and Limerick, contributed as well. Although this has been a positive trend, prior to the COVID-19 crisis, public transport operated at full capacity, leading to peak-time crowding on some routes.

COVID-19 has had adverse effects on public transport use with passenger numbers falling from 1 million to under 100 000 between the end of March and into May 2020. Rail has been the worst affected of domestic transport: Intercity, Dublin Area Rapid Transit (DART) and Luas services were down by more than 60% between March and August. As of September 2020, the number of bus journeys outside of Dublin stood at 54.6% of pre-COVID-19 levels. The corresponding level for bus journeys within Dublin was at 50% (CSO, 2020a).

Since 2010, the use of active modes (cycling and walking) has been growing. The number of cyclists entering the Dublin City Centre[1] more than doubled in eight years and the number of pedestrians increased by 39% (NTA, 2018b). However, the growth in cycling has been slow; in terms of mode split, Irish cities still have a low cycling base. The National Cycling Policy framework published in 2009 provided that 10% of all commuting journeys would be made by bike by 2020. Yet the percentage of commutes made by cycling, walking or taking the bus has decreased and is nowhere near the target. Around 3% of commuting trips were made by bike in 2018 (DTTAS, 2019a).

4.2.2. Trends in freight transport

Road freight has long had the overwhelming share of inland freight movements within Ireland and abroad. In 2019, approximately 73% of all goods were moved by road, with 26.5% transported by water, 0.3% by rail and a mere 0.1% by air (CSO, 2020b).

The road haulage industry is highly competitive and fragmented, with no single company holding a market share greater than 5%. Total road freight tonne-kilometres grew by 27% with the recovery of the Irish economy between 2014 and 2019. Volumes of freight moved on the road network increased by 42%, although in 2019 it was less than half the pre-crisis peak of 2007 (CSO, 2020b). Road freight activity started to decline in the first quarter of 2020, with the inception of the COVID-19 containment measures in March (Table 4.2). Modelling indicates that the transport and logistic sector (including aviation) was the most negatively affected by the COVID-19 crisis (de Bruin, Monaghan and Yakut, 2020).

Table 4.2. Indicators of road freight activity in Ireland

	2014	2019	Percentage change 2014-19	Percentage change Q1 2019-20
Tonne-kilometre (million)	9 772	12 403	+26.9	-0.6
Tonnes carried (thousand)	112 499	159 414	+41.7	0.0
Vehicle-kilometres (million)	1 307	1 734	+32.6	-3.1
Laden journeys	10 094	14 480	+43.3	-6.7

Source: CSO (2020), "Road Freight Transport Survey".

Due to the composition of the rail network and its small market, Ireland has limited capacity and usage of rail for freight transport. Over 2005-08, rail freight (in tonne-kilometres) significantly declined and has remained at about the same level since (Figure 4.1), but it continues to play a role for specialised movements. The volume of freight (in tonnes) moved by heavy rail fell by 6.4% between 2016 and 2017.

This was equivalent to just 0.9% of total tonne-kilometres of the land freight sector in Ireland (DTTAS, 2019a).

The volume of freight shipped through Irish ports rose 3% in 2018 to 55 million tonnes, with Dublin Port handling nearly half of that. Trade with the United Kingdom comprised 40% of the total (DTTAS, 2019a).

4.3. Environmental and social impacts of mobility

More car ownership and use, along with growing road freight activity, gives rise to obvious negative effects on the environment (GHG emissions, air pollution and noise), as well as congestion and safety externalities. In Ireland, emissions have risen since the 2008-13 economic recession and are projected to rise steeply until the end of this decade. More car use has inevitably exacerbated congestion in urban areas, undermining productivity and overall well-being. Ireland is not on a pathway consistent with the long-term decarbonisation envisaged in its 2019 Climate Action Plan.

4.3.1. Greenhouse gas emissions

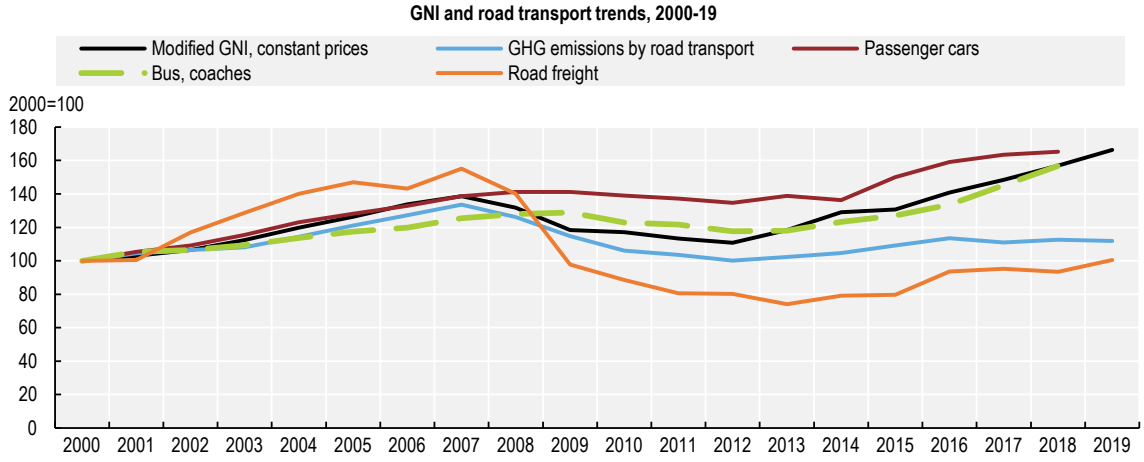
Transport accounts for 20% of Ireland's direct GHG emissions, making this sector the second largest emitter after agriculture (Figure 1.4). Road transport accounts for most CO_2 emissions from the sector (DTTAS, 2019a). Within this, private car use accounted for 52% in 2017, while heavy and light goods vehicles accounted for 27%. Public transport (jointly buses, taxis and rail) accounted for approximately 4.5% of emissions. Fuel tourism is another substantial contributor to sectoral CO_2 emissions. In 2015, it generated nearly 2% of Ireland's total GHG emissions that year (Kennedy et al., 2018). Fuel tourism declined considerably between 2016 and 2017 as a result of converging fuel prices with the United Kingdom (EPA, 2018).

GHG emissions from the transport sector have been only relatively decoupled from the economic cycle. Overall, GHGs from transport were 12% above their 2000 level in 2019, with emissions from road transport driving this growth (Figure 4.4). After strong growth between 2000-07, Ireland's transport GHG emissions drop by 25% until 2012. This decrease was due largely to the economic downturn and the dieselisation of the car fleet (as discussed in Section 4.2). Starting in 2012, the strong economic recovery has resulted in increased freight transport, as well as growing private car ownership and use. As a result, GHG emissions from road transport increased by 12% between 2012-19, driving up emissions of the whole transport sector (Figure 4.4). In 2017, emissions decreased slightly, the first year of decline following four consecutive years of GHG growth in the sector. This decrease was driven primarily by less fuel tourism and was not the result of policies or deliberate action to promote lower-carbon transport (EPA, 2018).

Under the Effort Sharing Regulation (2018/842), Ireland is required to cut emissions outside the EU Emissions Trading System (ETS) by 30% by 2030 relative to 2005 levels of emissions. As transport GHG emissions account for more than a quarter of Ireland's non-ETS emissions, the sector plays a key role in meeting the target.

According to the 2020 Environmental Protection Agency (EPA) projections (which do not consider the COVID-19 crisis), transport GHG emissions are expected to stabilise between 2021 and 2024 and then start declining. By 2030, GHG emissions from transport are expected to be 14% below their 2005 level under the "existing measures"[2] scenario and 42% below this level under the "additional measures" scenario (EPA, 2020). The latter assumes full implementation of the transport measures foreseen by the 2019 Climate Action Plan (Section 4.5). Timely and full implementation of the plan's measures in all non-ETS sectors would decrease Ireland's non-ETS emissions by 29% in 2030 compared to 2005 (Chapter 1).

Figure 4.4. GHG emissions from road transport have increased with economic recovery



Note: Based on data expressed in passenger-kilometre (passenger cars, bus, coaches) and tonne-kilometre (road freight).
Modified GNI: Gross national income in constant prices, excluding highly mobile economic activities that affect the measurement of the Irish economy (retained earnings of re-domiciled companies; depreciation of Irish-based, foreign-owned, intellectual property assets; aircrafts).
Source: CSO (2020), "National Income and Expenditure Annual Results 2019", *StatBank* (database); EC (2020), *EU Transport in Figures - Statistical Pocketbook 2020;* EPA (2020), *Ireland's Provisional Greenhouse Gas Emissions 1990-2019* (website); OECD-ITF (2020), *Transport Statistics* (database).

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The COVID-19 crisis is estimated to have reduced transport CO_2 emissions by more than 20% in 2020 compared to a business-as-usual scenario. The medium- and long-term effect of the COVID-19 crisis on GHG emissions is uncertain. This is especially true for transport, given the potential impact of the pandemic on mobility patterns. Nonetheless, simulations indicate that low energy prices and economic recovery are expected to drive Ireland's emissions up in the medium term. This trend would reduce 2030 emissions only slightly compared to a business-as-usual scenario (de Bruin, Monaghan and Yakut, 2020).

4.3.2. Air pollution

The transport sector is a major source of air pollutant emissions, especially in cities. It accounted for nearly half of NO_X emissions and 18% of fine particulate matter ($PM_{2.5}$) in 2018 (Figure 1.11). On average, levels of nitrogen dioxide (NO_2) and $PM_{2.5}$ are within EU limits in many residential areas. However, in Dublin and other major urban areas, concentrations of $PM_{2.5}$, partially caused by traffic, exceed World Health Organization guidelines, posing a risk to health. In urban areas, transport-related emissions of NO_2 have increased. In 2019, Ireland exceeded the EU annual legal limit value for NO_2 of 40 microgrammes per cubic metre ($\mu g/m^3$) (Chapter 1).

4.3.3. Noise

The biggest sources of environmental noise pollution in Irish cities are from traffic (road, rail and air) and large industrial activities. Following the 2006 Environmental Noise Regulations, local authorities across Dublin have been obliged to produce maps of noise from major industry and transport. The 2017 Noise Map Report found local traffic, rather than motorways or rail services, was the main cause of noise pollution. Mainline rail, DART and Luas services contributed only minimally to noise pollution in the city.

In 2012, most of the Dublin population (53%) was exposed to sound levels from traffic below 55 decibel(A) (dB[A]), which is the sound level set by the Dublin Noise Action as "desirable". In 2017, this dropped to 49%. In 2017, 5% of people were above the "undesirable" daytime level of 70 dB(A), the same as in 2012. In 2017, over 68% of the population were exposed to night-time levels below 50 dB(A). Meanwhile, about 22% were exposed to undesirable night-time sound levels of greater than 55 dB(A) (DCC, 2017).

4.3.4. Congestion

Traffic congestion, already a major problem in urban areas, is likely to worsen, undermining both productivity and well-being. Congestion in Dublin has increased by 3% since 2018, resulting in a 48% congestion level in 2019 (TomTom, 2019). This means that on average a 30-minute trip will take 48% longer than during baseline uncongested conditions. In all counties in Greater Dublin, more than half of the population spends longer than 30 minutes commuting. The 2016 census indicates that over 20% of the population spent more than an hour commuting to work (CSO, 2016a).

Long commutes have real economic and social costs. Analysis for the Department of Transport (DoT) estimates the cost of time lost due to aggravated congestion was EUR 358 million in the base year (2012). In the absence of mitigating measures, this cost is forecast to rise to EUR 2.08 billion per year by 2033. These costs, however, are likely to be considerably underestimated. The estimates only consider value of time lost due to congestion (DTTAS, 2017). They do not account for impacts on journey quality or travelling via more crowded public transport, increased fuel consumption and other vehicle operating costs, increases in vehicle emissions or other intangible factors that arise from making an area generally less desirable. All things being equal, high levels of congestion will increase fuel consumption, GHG and air pollutant emissions, and noise, while reducing the attractiveness of locations to work and live in.

4.3.5. Traffic safety

Traffic safety across Ireland has been improving. Ireland has seen a reduction of over 30% in road deaths since 2010, ranking as the second safest EU member state. The number of road fatalities fell to 142 in 2018, the lowest since records began. However, pedestrian deaths increased by 36% to 42 over 2017-18. Deaths among cyclists and motorcyclists due to traffic fell to 9 and 15, respectively, in 2018 (RSA, 2019).

Studies have shown a direct link between road safety and the environment (i.e. aggressive driving behaviour is linked to higher transport emissions). New vehicle safety features and reduced emissions have raised the overall standard of vehicles in circulation on Irish roads in the past decade, helping to provide a safer and cleaner environment.

4.4. Institutional arrangements and governance of sustainable mobility

The DoT – known as the Department of Transport, Tourism and Sport (DTTAS) until September 2020 – manages national transport policy. The department has responsibility over aviation, road, rail, maritime, freight, passenger, walking and cycling categories. The myriad of transport modes complicates the institutional governance landscape. In so doing, it creates inertia when attempting to gain consensus to decarbonise the entire transport system. This may often result in limited funding and support for low-carbon transport options (e.g. walking and cycling) after other (often more carbon-intensive) transport modes receive priority.

Traditionally, one department led by a single minister has handled climate and environmental policy, while another has been in charge of transport policy. Since June 2020, one minister leads both policy areas, although the departments remain separate (DoT and the Department of the Environment, Climate and Communications, or DECC). This signals the government's priority of better aligning transport and climate objectives, recognising the key role of the transport sector in achieving national reduction targets for GHG emissions. This has been reflected in a new programme for government, including a massive shift in funding to walking, cycling and public transport (Section 4.6.5).

The DoT recognises the need for enhanced collaboration, both internally and externally, with other government departments, agencies and stakeholders. This is especially the case when it comes to locations of basic services, such as health and education facilities. Decisions of the Department of Health

and Education often prioritised access to low-cost sites at the expense of any low-carbon concerns or consideration for environmental or transport impacts. This has led to a proliferation of new schools, for example, on the outskirts of town, increasing dependency on the private car, congestion and emissions for these journeys (Devaney and Torney, 2019).

The National Transport Authority (NTA) is a transport authority for the Greater Dublin Area and the public transport licensing agency for Ireland operating under the DoT.[3] At national level, the NTA secures provision of public passenger transport services and regulates taxi and limousine services. It implements integrated ticketing, fares and information systems, regulates public transport fares and collects statistical transport data. Most recently, the authority has sought to develop and implement a single public transport brand for Ireland. This effort has culminated in the Transport for Ireland app and related services. For the Greater Dublin Area, the NTA is additionally responsible for an integrated 20-year transportation strategy, as well as a 6-year integrated implementation plan and strategic traffic management plan. The NTA ensures that implementing agencies, such as local authorities and Transport Infrastructure Ireland (TII), support the strategy, allocate finance to these agencies and undertake works when considered more effective or economical.

TII is a state agency responsible for development and operation of the national road network and light rail infrastructure (motorways, national roads and the Luas in Dublin). TII aims to provide an integrated approach to transport infrastructure across road and rail. In 2018, it developed an internal sustainability statement. It is embedding the sustainability objective into its projects, programmes and operations.

State funding for transport is channelled through the DoT and set out in the annual Estimates of Expenditure. This funding mainly flows to the NTA for infrastructure investment and organisation of public transport services, including procurement. The DTTAS also provides direct funding to Iarnród Éireann for the maintenance of the heavy rail network under the Infra Manager Multi-Annual Contract. Funding for roads, including investment in maintaining and upgrading the national road infrastructure, flows directly to TII and relevant local authorities. At the same time, TII's public and private sector concession toll roads provide additional funding.

4.5. Objectives and key policy documents for sustainable mobility

Successive governments have put forward several policy documents for sustainable mobility over the last ten years. The past decade in particular has seen an increase in the number of policies, laws and guidelines aimed at enhancing sustainable transport, reducing transport-related GHG emissions, encouraging active travel, and creating urban and rural places that are compact and well-connected.

"Project Ireland 2040" is the government's long-term overarching strategy for future development of the country (Chapter 3). Project Ireland 2040 comprises the National Planning Framework (NPF) to 2040 and the National Development Plan (NDP) 2018-27. The NPF sets out the spatial strategy for Ireland to accommodate, in a sustainable and balanced way, the projected demographic change. The NDP sets out the infrastructure investment priorities that will underpin implementation of the NPF over the next ten years. The NDP is prioritising investment of EUR 8.6 billion to sustainable mobility nationally over 2018-27.

The NPF includes a range of objectives to improve the sustainability of transport and mobility, including the following:

- Deliver the key public transport objectives of the NTA's Transport Strategy for the Greater Dublin Area 2016-35 such as MetroLink (high capacity metro light rail), DART Expansion Programme (heavy rail electrification, rolling stock and an interconnector tunnel under central Dublin) and BusConnects (redesigned bus networks and infrastructure).
- Provide public transport infrastructure and services to meet the need of smaller urban centres and rural areas.

- Develop a comprehensive network of safe cycling routes in metropolitan areas to address travel needs and to provide similar facilities in towns and villages where appropriate.
- Enable more effective traffic management within and around cities and reallocation of inner city road space in favour of bus-based public transport services and walking/cycling facilities.
- Provide a quality nationwide community-based public transport system in rural Ireland, which responds to local needs under the Rural Transport Network and similar initiatives.

The Programme for Government released in June 2020 foresees a review of the NDP before 2022, including detailed plans up to 2031 that reflect new commitments. These include a continued investment programme in public transport to improve bus, light rail, commuter and inter-city rail network (including projects identified in the NPF). The programme will prioritise public transport projects that enhance regional and rural connectivity. For the first time, the government is proposing to adhere to a two-to-one ratio of expenditure between new public transport infrastructure and new roads.

The 2019 Climate Action Plan targets reducing GHG emissions from the transport sector by 35-40% by 2030 compared to 2017 levels. This amounts to between Mt 7 megatonnes (Mt) and 8 Mt carbon dioxide equivalent (CO_2-eq). This would contribute to Ireland achieving its 30% GHG emission reduction targets in the non-ETS sectors by 2030 (Section 4.3.1). The plan identifies policy actions for addressing emissions growth in the transport sector. These actions include increasing the share of electric vehicles (EVs) in the passenger and light commercial vehicle stock; expanding the use of alternative fuels and technologies; and encouraging modal shifting via targeting an additional 500 000 public transport and active travel journeys daily by 2035. The plan acknowledges that policy tools such as vehicle and fuel taxation measures, and a strong carbon tax trajectory, need to underpin these changes. Despite technological advances and notwithstanding the uncertainties on the impacts of COVID-19, the growing transport sector will likely continue to present challenges to the achievement of climate-related targets (Section 4.3.1). To meet both national and EU targets, Ireland will need to move at a faster pace with full implementation of all measures identified in the Climate Action Plan, plus consider additional policy measures in future plans.

Project Ireland 2040 and the 2019 Climate Action Plan have correctly identified the main priorities for advancing sustainable low-carbon transport. However, previous experience has shown a gap between elaboration of plans and frameworks and time-bound implementation of specific measures and continuous monitoring of progress. For example, the 2009 “Smarter Travel – A New Transport Policy for Ireland” set out that commuting journeys by car should drop from 65% to 45% by 2020. Meanwhile, commuter journeys by walking, cycling and public transport should increase to 55%. Central Statistics Office (CSO) data, however, have revealed that workplace travel figures have actually worsened over the last decade: the share of car journeys to work have surpassed the Smarter Travel baseline of 65% rather than declining to 45% as per the target.

Lack of effective implementation structure led to the failure to achieve the modal shift envisioned in Smarter Travel and a suite of other transport-related policy documents. Actions required to meet the targets were not put in place and there was no co-ordination with relevant government departments to implement Smarter Travel. Key departments include the Department of Housing, Planning and Local Government (DHPLG), TII and the state planning body An Bord Pleanála. As the body that should have led implementation of the Smarter Travel targets, the NTA had neither legal power nor sufficient financial resources to advance the plan (Devaney and Torney, 2019). TII and local authorities have been continuously advancing construction and planning of new motorways and dual carriageways, increasing car use and dependence across wider areas without clear mitigation strategies. This illustrates the importance to adopt a clear implementation plan, with intermediate and final targets, budget and responsibilities, as well as ensure that all governmental bodies apply the policy consistently to achieve the targets.

4.6. Promoting sustainable mobility

In the past decade, Ireland has taken many positive steps towards reducing environmental damage from mobility. To accelerate penetration of fuel-efficient vehicles, Ireland taxes fuels (diesel and petrol); it has also implemented a progressive CO_2-based vehicle taxation policy (Chapter 3). Ireland introduced Biofuels Obligation Scheme in 2010 to increase the share of renewable energy in the transport sector. Since 2019, the Biofuels Obligation Scheme requires that 10% (by volume) of the motor fuels, typically diesel and petrol, placed on the Irish market had to be produced from renewable sources (e.g. ethanol and biodiesel). To increase the pace of EV uptake, Ireland has put in place some of the most generous supports in the world for EV purchase (Table 4.3). At the same time, it plans major investments in urban areas to support the progression of infrastructural projects, increased capacity on rail services and phased transition of the public transport fleet to lower emission fuel types (Section 4.6.5). Recent national, regional and urban transport strategies have committed to road and parking space reallocation, including proposals for bus, cycling and walking priority measures. Irish cities also have a progressive parking policy, with high rates for curbside parking, which has been an important measure to discourage car trips to specific destinations. In parallel, Ireland is increasingly moving towards co-ordinating land-use and transport planning more effectively to maximise efficiency of the urban transport systems and promote compact growth.

However, there have been many limitations to the implementation of sustainable transport policies. These include the coupling of car use with economic growth, allegiance to traditional political practices and a general failure to curtail car use. The following section discusses different policy options for advancing the sustainable mobility agenda in Ireland.

Table 4.3. Main economic instruments for addressing externalities from road transport used in Ireland

Policy instrument	Cars	Trucks	Main external costs targeted (depending on scheme design)
Gasoline excise tax	Yes	Yes	CO_2 emissions; air pollution
Diesel excise tax	Yes	Diesel rebate scheme	CO_2 emissions; air pollution
Taxes/subsidies for other fuels	No	n/a	CO_2 emissions; air pollution
Vehicle purchase and ownership taxes	Yes	n/a	CO_2 emissions; air pollution
Subsidies for fuel-efficient vehicles and EVs	Grants and subsidies for EVs	CNG grants for commercial vehicles (trucks, buses and vans)	CO_2 emissions
Parking charges	In most cities	n/a	Congestion; CO_2 emissions; air pollution
Distance charging	11 tolled roads	11 tolled roads	Road wear and tear; congestion; CO_2 emissions; air pollution
Road pricing by time and place/congestion charging	No (except Dublin Tunnel with variable rates)	No	Congestion, road wear, CO_2 emissions, air pollution

Note: EVs = electric vehicles. CNG = compressed natural gas.

4.6.1. Travel demand management to address congestion in urban areas

As discussed in Section 4.3.4, traffic congestion is a major problem in urban areas. Ireland has not introduced any form of road use charges to reduce congestion and address associated environmental impacts (such as local air pollution and noise). However, several relevant policies and strategies have put forward this option. The DoT is exploring the introduction of congestion charges along with other instruments, such as low-emission zones (LEZs), to provide incentives for reducing congestion on the roads in urban areas.[4]

Irish authorities have indicated the limited availability of public transport in the short to medium term as a constraint to the introduction of road use charges. Indeed, public transport in urban areas is insufficient, limited to buses with only a few dedicated lanes, light rail and a suburban rail network. In this context, the availability and quality of public transport is being increased to tackle the problem (see Sections 4.6.4 and 4.6.5). Near-term improvements in public transport, such as more frequent and better buses – the main public transport service – are important to provide congestion relief. However, it will take time to reap the full benefits of investing in public transport.

Public transport capacity constraints do not invalidate the case for managing traffic through different demand management instruments. LEZs or licence plate restrictions can play an important role in vehicle retrofit, emissions reduction and air quality improvement, but they do not affect the distances people travel and/or the number of trips undertaken on the long term. Congestion charging remains one of the most efficient demand-side instruments to curb peak-time congestion. It also has potential to reduce environmental externalities from private passenger transport (ITF, 2018). Congestion charges reflect the cost that drivers impose on other road users. Charges increase trip costs and therefore reduce traffic, eliminating trips that are less necessary or that can be made at less congested periods. Peak-hour car users can modify travel times, carpool, forgo car trips or pay the charge and enjoy improved travel conditions. Accompanying investments in improved public transport are, nevertheless, necessary to provide good alternatives to travel by car. As public transport becomes more attractive, some can switch to this means of transport. Ultimately, the road system functions more smoothly and efficiently for all modes, significantly reducing excess travel time and improving travel time reliability.

The National Travel Survey suggests that one-third of car traffic in Dublin is for purposes other than commuting (CSO, 2019). In Dublin, 22% of all car trips are made for shopping and 9% are for leisure; 29% of car trips are for a distance of less than 2 km. While non-commuting trips can also be subject to time constraints, many drivers may be able to adapt their schedules and reprogramme their trips.

COVID-19 had a disruptive impact on mobility patterns, and long-term implications of behavioural changes are not yet clear. Preliminary indications suggest that urban traffic in Ireland has returned to nearly business-as-usual level (Section 4.2.1). Thus, congestion is likely to continue being an acute problem. In this context, managing travel demand remains as important as policies that increase trust in the safety of sustainable transport options.

Cities with some form of road pricing, such as London, Stockholm, Milan and Singapore, have been successful in reducing congestion, GHG emissions and local air pollutants (ITF, 2018). Table 4.4 summarises the different options for road pricing.

The most efficient approaches charge according to distance driven (as opposed to charging only when a cordon is crossed) with rates that vary depending on levels of congestion at different times and in different places (i.e. distance and place-based charging). Such systems have been successfully applied in Singapore (Box 4.1). Differentiation according to vehicles' emission profiles (including air pollution) can additionally strengthen incentives to use more fuel-efficient or alternative fuel vehicles.

Addressing potential distributional effects of road pricing

Congestion charges have often been criticised for causing distortions and unwanted redistributive impacts. Distance-based charges are to some extent regressive, consuming a greater proportion of the disposable income of low-income car drivers than those with high income. Yet the impact is no more than the fuel tax and less significant than generalised consumption taxes such as VAT. This is because a large proportion of low-income people have no access to cars regardless of whether use is subject to road pricing.

Table 4.4. Types of road pricing

Option	Characteristics	Coverage	Objective	Example of city
Fixed cordon charging	Charge for each crossing of a cordon delimiting the charging zone in a city	Urban areas	Reduce congestion in urban areas by shifting vehicle traffic to other routes and modes	Planned in New York, Singapore city centre
Fixed area charging	Daily charge for driving into or within a defined area with no additional charge for crossing cordon more than once	Urban areas	Reduce congestion in urban areas by shifting vehicle traffic to other routes and modes	London – a daily fee for any vehicle driving within the congestion charge zone, regardless of how many times the user crosses the cordon
Time-variable congestion charging	A fee that is higher under congested conditions than uncongested conditions, intended to shift some vehicle traffic to other routes, times and modes	Urban areas	Reduce congestion by shifting vehicle traffic to other routes, times and modes	Stockholm – a time-based congestion fee every time a user crosses the cordon area
Road toll (fixed rates)	A fixed fee for driving on a particular road/section of a motorway/bridge/tunnel	Local, regional, national (dependent on toll network)	Raise revenue (to recover road wear and tear)	Many European countries
Variable tolls	Peak charges for already tolled highways and bridges	Local, regional, national (dependent on toll network)	Raise revenue and reduce congestion via shifting vehicle traffic to other times	Many European countries
High Occupancy Toll Lanes	A High Occupancy Vehicle (HOV) lane that accommodates a limited number of lower-occupant vehicles for a fee	Local, regional, national (dependent on toll network)	To favour HOVs compared with a general-purpose lane, and to raise revenues compared with an HOV lane	Many US cities
Distance-based fees (electronic time, distance and place-based charging)	Uses transponders to enable charging of any use of the entire road network or a specified part of the network – a vehicle-use fee based on number of kilometres driven.	Local, regional, national, specifically congested routes.	Raise revenues and reduce various traffic problems.	Singapore – the charge is based on a pay-as-you-use principle, and rates are set based on traffic conditions at the pricing points and reviewed quarterly.

Source: ITF (2018), Social Impacts of Road Pricing: Summary and Conclusions, ITF Roundtable Reports, No. 170, OECD Publishing, Paris, https://doi.org/10.1787/d6d56d2d-en.

In Ireland, concern over distributional effects is clearly legitimate. Given the nature of urban sprawl, many households lack access to quality public transport and depend on cars. Transport is a major component of consumer spending, costing the average Irish household EUR 2 500 in 2016. This is 25% higher than the EU average of EUR 2 000 annually (DTTAS, 2019b). Across Ireland, low-income or vulnerable groups (like people with disabilities, young adults, elderly, etc.), as well as car-dependent households, could be affected more than others by the charges. However, income support to vulnerable households – car-dependent or otherwise – is much more effective and efficient at addressing this problem than forgoing the overall benefits of charging reform.

A significant factor in how congestion charging affects equity overall is use of revenues (Jonas and Lars-Goran, 2006). Eliasson (2017) argues that congestion pricing is fair if it intends to correct prices and allocate scarce resources more efficiently. The slight regressivity of pricing systems only becomes a problem if the charging system simply aims to generate revenues. Earmarking revenues to improvements in public transport can reverse regressiveness if most vulnerable low-income households depend on public transport. This is the case in London, where revenues from congestion charging are invested in transport – in particular, buses, the metro system, walking and cycling infrastructure, as well as road maintenance.

Box 4.1. Singapore: An integrated strategy for managing car use and ownership

Singapore has applied area-wide cordon charges since 1975 in the central part of the city. It replaced the original paper licensing method with an electronic road pricing system. Cars entering the city centre are charged automatically as they pass beneath gantries. From 1998, tolling was gradually extended along the main highways outside of the city. The charges in Singapore vary by vehicle size, gantry location, day of the week and by half-hour period during peak periods.[5] The system is designed to optimise the use of urban space and infrastructure rather than increase speeds. That is why rates are reviewed and adjusted quarterly to maintain speeds of 20-30 km/h on arterial roads and 45-65 km/h on expressways.

Before introduction of the first cordon charge for the city centre in 1975, Singapore was lacking efficient public transport, and the metro system was in the planning phase. In fact, heavy congestion generated by privately owned cars was identified as a major factor behind the poor performance of public transport services.

Policy makers first drew public attention to the limited road capacity and land constraints of the island. To that end, they highlighted the risk of unconstrained vehicle growth through examples of traffic congestion both domestically and in comparable cities worldwide. In so doing, they convinced the public that some restraints on vehicle ownership and use were necessary. Hence, in addition to implementing road pricing to limit vehicle use, Singapore authorities limited car ownership through permits to own a vehicle that are auctioned periodically. Land-use and transport planning is integrated: approvals for all new developments are contingent on satisfactory accessibility. Extensions to public transport networks are decided in concert with major housing and commercial development projects.

Source: ITF (2018), Social Impacts of Road Pricing: Summary and Conclusions, ITF Roundtable Reports, No. 170, OECD Publishing, Paris, https://doi.org/10.1787/d6d56d2d-en.

A disaggregated spatial analysis can help design road pricing that will reduce the number of vulnerable households affected. It could also help indicate where investments in public transport can most effectively provide an alternative to car use. Such analysis should consider cost burden[6] and accessibility of the alternative modes. This type of analysis is important to ensure that design is adequate and incorporates compensation for any vulnerable groups that bear a disproportionate burden.

Increasing public acceptability

Despite the success of road pricing to manage travel demand and its theoretical potential, new road user charges are always controversial. Reticence arises mostly because it is seen as a monetary penalty with potential distributional impacts, with a political cost for local authorities. This could be an important issue in Dublin as just under half of workers in Dublin City and suburbs travel to work by car (CSO, 2019).

Public scepticism can be overcome. The mayor's effective communication strategy, for example, eased introduction of London's congestion charge. For its part, Stockholm's referendum approved reinstatement of the city's charging trial, based on experience of its benefits and cost in practice. In Stockholm, the congestion charge was first implemented as a pilot project to gain the population's confidence and showcase its benefits. The positive effects of the trial on traffic volumes (notably a reduction of 20-25% during the trial) led to general support in a referendum for making the charge permanent.

Investment in a comprehensive and sustained public communications strategy will be required to gain support and increase acceptability. Importantly, the strategy should communicate that the main objective

is not raising revenues but rather solving the acute policy problems of relieving traffic congestion and reducing CO_2 emissions and air pollution (ITF, 2017).

Exceptions of various kinds and discounts can also enhance acceptance of road pricing, but the implications need to be carefully assessed prior to implementation. The example of Gothenburg shows that exception of company cars drastically changed the distributional profile of congestion pricing. In Gothenburg, according to Swedish tax law, company car users either do not pay the charge or deduct it from their before-tax salary. Given that high-income groups have access to company cars to a much larger extent, this exemption significantly reduced average toll payment from the highest income groups. This, in turn, increased the regressiveness of congestion pricing (Jonas and Lars-Goran, 2006; ITF, 2018, 2017).

4.6.2. Distance-based charges to maintain revenue from transport-related taxes in the long run

Tax revenue from diesel and gasoline use in private cars is likely to decline substantially in the coming decades as the decarbonisation of road transport progresses and vehicles become increasingly fuel-efficient or entirely electric. In this context, moving away from fuel and vehicle taxes as the core of road transport taxation will be essential in the long term to sustain a viable tax base (van Dender, 2019). For example, in Slovenia, fuel tax revenues from passenger cars are expected to decline by 56% by 2050 compared to 2017 levels (OECD/ITF 2019).

In Ireland, with more movement towards low-emitting cars with low rates of taxation, the state is already concerned about the stability of VRT and motor tax as a source of revenue. The projections of tax revenue by the Parliamentary Budget Office from 2008 to 2023 show a downward trajectory of income for the Exchequer from motor tax, highlighting the increased erosion in the motor tax base. Revenue from motor tax decreased from EUR 843 million in 2014 to EUR 714 million in 2018. It is expected to decrease further to EUR 687 million by 2023 (PBO, 2019). With the projected fall in revenues, Ireland should consider comprehensive transport tax reform to protect revenues. This means finding the right mix of taxing distances driven, vehicles and fuels (Chapter 3).

Currently, 11 roads are tolled for drivers of motorcycles, cars, buses and trucks. Charges apply to some sections of main motorways, tunnels and bridges. These are set to recover infrastructure costs rather than acting as a fiscal measure to encourage more sustainable travel. Dublin Tunnel is the exception, with variable charges applying to peak hours. For all other vehicles through the tunnel, the toll is EUR 10 at peak times and peak directions or EUR 3 at off-peak times and directions. The policy aims to manage demand through the tunnel and give priority to heavy goods vehicles (HGVs). To that end, there is no toll for commercial vehicles with a gross vehicle weight over 3 500 kg, for buses with at least 25 seats or for exemption card holders.

A country-wide electronic, or global positioning system of charging distances by the kilometre can be a promising long-term strategy to collect stable revenues. Differentiating distance-based charges along several dimensions may be desirable to promote the efficiency of road tax systems. First, a differentiation according to vehicles' emission profiles (including air pollution) can strengthen incentives to use more fuel-efficient or alternative fuel vehicles. Second, tax levels may also reflect an area's population density, thereby accounting for exposure to emission and noise (van Dender, 2019). The charge could be increased gradually to enhance its political acceptability. However, planning for the electronic charge solution and procurement of the operating system should start in the short term. The equity concerns of a charging system can be addressed by targeted subsidies and/or cross-subsidies within the system.

4.6.3. Parking policy

Parking management and pricing policies ideally complement congestion charges. Both are necessary to reduce in-vehicle time losses and ensure the efficient use of road and curbside space. In the absence of

congestion charges, parking pricing remains a second-best policy option for managing travel demand. Parking pricing particularly can be used to discourage car trips to specific destinations. However, parking tariffs account for neither the distance driven nor for the route taken to reach a given destination.

Parking availability and regulation

Policies encouraging parking space oversupply often result in the environmental problems and welfare losses (Russo, Ommeren and Dimitropoulos, 2019). Determining how much parking space is useful starts with an inventory of on- and off-street parking. Cities in Ireland, however, lack comprehensive parking data. This means that local authorities have been prescribing parking as part of new construction for decades without first diagnosing the nearby parking supply. Without basic knowledge of parking availability, authorities have no reliable basis for decisions on future supply and parking regulations (Franco, 2020).

Excessive off-street parking spaces are largely an artefact of regulation and serve as a powerful subsidy to cars and car trips. Until recent years, cities in Ireland have been following minimum parking requirements (MPRs). This means mandating the number of parking spaces in a development, which has likely contributed to urban sprawl across Ireland. MPRs tend to prevent private developers from responding to market conditions and lessen their interest in developing sites that are accessible without driving, especially in central areas. In another problem, regulations that set minimum required provision of parking space bundle the cost of unnecessary new parking with new housing and commercial developments.[7]

Since 2017, however, Ireland has taken positive steps towards reducing excessive parking requirements for new developments. The Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities, published by the DHPLG in 2018, stipulate elimination of requirements for car parking in certain areas. The guidelines state that "the default policy is for car parking provision to be minimised, substantially reduced or wholly eliminated in certain circumstances". They also state that this policy "would be particularly applicable in highly accessible areas such as in or adjoining city cores or at a confluence of public transport located in close proximity". Enforcing the practice of granting planning permission by local authorities will be central for moving towards more sustainable and compact urban development.

Eliminating MPRs can reduce motorists' convenience (i.e. fewer free spaces) and cause spill-over problems (motorists parking in undesirable locations), which requires more enforcement. Thus, elimination of MPRs needs to be accompanied by management strategies and enforcement programmes to address any potential spill-over problems.

Ensuring that regulations and building codes also require to provide an electrical charging point can help facilitate the uptake of EVs. Provision of EV charging points is already a requirement of the 2018 Energy Performance of Buildings Directive.[8] Similarly in London, the spatial development strategy for Greater London stipulates that all developments must ensure that one in five spaces provide an electrical charging point.

Parking pricing

Irish cities have a progressive parking policy, with high rates for curbside parking, which has been important to discourage car trips to specific destinations. Parking pricing has also become an important revenue stream for investments in urban realm improvements in Ireland. Parking fees vary in Ireland and can be set and adjusted by local authority. The discrepancies between parking fees in cities and smaller towns are attributed to the increased costs of providing and maintaining the service in cities.

Efficient parking pricing can provide numerous benefits. These include increased turnover and therefore improved user convenience, parking facility cost savings, reduced traffic problems and increased revenues. Given fluctuations in demand, Ireland could consider a dynamic parking pricing system, where tariffs vary over space and time using information on occupancy in surrounding areas. Experts recommend

setting prices to maintain 85-90% occupancy rates, or leaving at least one or two open parking spots per block, to avoid cruising (Shoup, 1997). So-called dynamic parking pricing can help achieve such optimal occupancy rates and prevent both parking capacity saturation and cruising. Several cities, including San Francisco, Seattle, and Washington, DC, have initiated pilot projects that adjust curbside parking prices to occupation in real time and by location. SFpark in San Francisco is a pioneering example of such a pricing system that helped reduce distance travelled by car (Box 4.2).

To encourage the uptake of EVs, Ireland can also consider differentiating parking charges based on the environmental impact of vehicles. The city of London, for instance, introduced differentiated parking fees for on-street parking in the Square Mile in 2018. Several other cities, including Amsterdam, Barcelona and Oslo, use free or exclusive parking zones to incentivise the adoption of electric vehicles. However, such measures should be temporary. The potential loss of revenue due to increased electrification of the fleet needs to be taken under control.

Box 4.2. Dynamic parking pricing: The case of San Francisco

SFpark took effect in April 2011 when the city installed sensors in seven pilot zones. The sensors report the occupancy of each curb space on every block and parking meters that charge variable prices according to time of day.

The city adjusts parking prices in response to occupancy rates about once every six weeks. This trial-and-error process aims at keeping about 15% of spaces vacant on any given block. Meter prices are increased by 25 cents per hour if occupancy on a block exceeds 80%; they are reduced if occupancy is less than 60%. Adjusting the price is expected to redistribute parking demand from crowded blocks to less crowded ones, raising parking space availability and reducing cruising time (SFMTA, 2014). All parking meter revenue is used to subsidise public transit.

SFpark thus allocates parking spaces more efficiently than uniform prices can. Short-time parkers, car poolers, those who have difficulty walking and those who place a high value on saving time will shift towards the more convenient parking spaces. In contrast, long-time parkers, solo drivers, those who enjoy walking and those who place a low value on saving time will shift towards the more distant parking spaces. Although average car ownership has been increasing, daily vehicle-miles travelled in pilot areas dropped by 30% over 2011-13 (DDOT, 2019).

Sources: Adapted from SFMTA (2014), SFpark Book: Putting Theory Into Practice, www.sfmta.com/sites/default/files/reports-and-documents/2018/04/sfpark_eval_summary_2014.pdf and Shoup and Pierce (2013), Getting the Prices Right An Evaluation of Pricing Parking by Demand in San Francisco, https://doi.org/10.1080/01944363.2013.787307ParkDC: Penn Quarter/Chinatown Parking Pricing Pilot, https://ddot.dc.gov/sites/default/files/dc/sites/ddot/page_content/attachments/parkDC%20-%20Executive%20Summary_Final_20190109.pdf.

The ways in which parking is charged also affects the effectiveness of parking pricing policy. It is important to avoid discounts for long-term parking leases (i.e. cheap monthly rates). TDM Encyclopaedia (2019) recommends setting daily rates at a minimum of 6 times the hourly rates, and monthly rates at a minimum of 20 times the daily rates. A better option would be to eliminate unlimited-use yearly passes altogether. Instead, buying books of daily tickets would enable commuters to save money every day they avoid driving.

Removing employer-paid parking subsidy

Free or cheap parking at a workplace needs to be addressed because parking provided free by employers is an implicit incentive for commuting by car. Russo, van Ommeren and Dimitropoulos (2019) estimate the supply of free parking to employees implies a subsidy equal to around 30% of the private costs of a car

trip. In Dublin, only 3.6% of drivers pay for parking when at work. When employers provide free or cheap parking at work, employees do not treat it as an in-kind benefit for income tax.

There are numerous ways to address workplace parking and thereby reduce incentives to drive to work. A city could apply or increase parking charges. It could reduce the number of parking spaces or reserve some for car sharers. It could apply a benefit in-kind tax to the provision of spaces. Local authorities could apply a workplace parking levy. Employers could also offer employees a cash-value in lieu of a parking space, known as a "parking cash-out" (Shoup, 1997; Franco, 2020). Parking cash-outs are common in California, where law requires many employers to offer commuters cash in lieu of any parking subsidy. They have proven effective in reducing the number of solo drivers to work and increasing the number of car poolers and of those who walk or bike to work. In this way, they contribute to reducing vehicle-miles travelled for commuting and related CO_2 emissions (Shoup, 1997).

To minimise adverse tax impacts, employers can offer tax-exempt public transport passes or vanpool benefits. Governments should also make emerging transport services with potential to reduce environmental impacts and congestion – such as bike sharing – eligible for commuter benefits. Further, they should consider allowing employers to make tax-free payments to employees who walk or bike to work. Ireland already has Travel Pass (Taxsaver) and Cycle to Work. Under Taxsaver, employees can purchase seasonal public transport tickets from their gross salary. Cycle to Work allows employers to pay for bicycles and bicycle equipment for their employees (up to a certain amount); the employee pays back through a gross salary sacrifice arrangement of up to 12 months. Both systems provide income tax and social contributions savings. The COVID-19 recovery package temporarily increased the allowable expenditure under Cycle to Work. The potential expansion of these measures, along with reducing the availability of workplace parking in urban centres, will help discourage car commuting.

4.6.4. Reallocation of road and parking space

Road design and management practices in urban areas in Ireland delay public transport and ride-share passengers by traffic congestion. However, these practices require less road space per passenger-kilometre and impose less congestion on other road users. Recent national, regional and metropolitan transport strategies have committed to road space reallocation. These include proposals for bus, cycling and walking priority schemes and car traffic restrictions in urban streets. In particular, the planned BusConnects programmes for Irish cities aim to provide significantly enhanced quality bus corridors and improved segregated cycle lanes.

Micromobility (e-scooters, electric bikes and pedal bikes, whether docked or dockless) presents an additional opportunity. It could help address congestion, emissions and air quality, while better connecting people to public transport. Irish cities prohibit e-scooters, but government is moving towards legalising these services. For that to happen, Ireland will need to identify regulatory frameworks that contain external costs (i.e. cluttering of sidewalks), while allowing service providers to maximise benefits for users. In this context, the demand for redistribution of space will grow considerably. Expanding dedicated cycling lanes for these modes will be essential for increasing safety perceptions, thereby making it more attractive to cycle as well as to use electric micromobility.

Redistributing road space to non-car modes can represent a technically challenging and politically sensitive planning option. This is especially the case for the Greater Dublin Area, where road conditions are already congested, particularly during peak times. Public concerns often tend to focus on predictions of traffic chaos and adverse economic impacts associated with reducing road capacity. Yet a growing body of evidence suggests that well-planned measures aiming at reducing road space for private cars do not necessarily result in additional traffic. On the contrary, there is increasing understanding of "disappearing traffic" from road space reallocation and reductions in road capacity. Given appropriate local circumstances, significant reductions in overall traffic levels can occur from road-space reallocation; people have a far wider range of behavioural responses than has been assumed (Cairns, Atkins and Goodwin, 2002).

Examples from European cities confirm the theoretical findings. For instance, a reduction in capacity on three main roadways in Oslo since 2016 did not result in severe delays or congestion. Car use on commutes fell from 21% to 16%, but the quality of commuters' experience (for all modes) remained high (Tennøy and Hagen, 2020). In Paris, continuous effort to reallocate road space backed by concrete investment programmes resulted in significant mode shift and overall improved liveability (Box 4.3).

Box 4.3. Reallocation of road space: The case of Paris

Since 2012, Paris has had a policy to reduce road space for automobile traffic through the transformation of urban public space, while promoting improved accessibility by public transport, bike and foot. The city has rejected the idea of any form of road pricing for fear it would create a two-tier system that prices out poorer drivers without necessarily deterring the wealthy.

The city radically expanded protected cycle lanes and closed river bank expressways to car traffic. Major intersections are also being redesigned to favour pedestrians and cyclists. The city allocated EUR 150 million to improve the cycling network; bike paths grew by 43% from 2014 to 2020 (i.e. from 700 km to 1 000 km). It removed on-street car parking space to increase the number of bike parking spaces by 10 000. The city also established 2 500 parking spots dedicated to e-scooters to avoid cluttering narrow sidewalks.

Since 1990, the modal share of the automobile has fallen by 45% and public transport has increased by 30%. Between 2019-20, bicycle use in both the centre of Paris and the suburbs rose by 54% in one year. At the same time, Paris has seen a significant decline in traffic fatalities – roughly a 40% drop since 2010.

Source: Héran (2017), "About the modal shift, Lessons from the Parisian case", www.ruedelavenir.com/wp-content/uploads/2019/02/ReportModalParis_2017_F-Heran.pdf; Observatoire du Plan Vélo (2020), https://planvelo.paris/.

Cities that implemented road space reallocation measures had the declared aim of improving liveability, focusing on benefits for citizens. Communication strategies should avoid any impression that authorities are simply hostile to cars. As an example, Copenhagen's successful transformation into a cycle city was based on a positive communication strategy that did not mention motorised vehicles or environmental challenges (Gössling, 2013). Instead, it focused on bicycle benefits, such as greater average speeds and better health. Significant investments in bicycle infrastructure (EUR 40 per person per year) were justified based on cost-benefit analyses showing a net benefit for society for each kilometre cycled.

While reallocation of road space has been high on the policy agenda, implementation across Irish cities has been poorly aligned with previous ambitions. Re-prioritisation of road space requires significant investment, timetabled targets and a strong monitoring regime. It also needs a robust institutional structure to support it and oversee implementation. In a positive step, the new government committed in August 2020 to allocations from the total transport capital budget of 20% for both cycling projects and pedestrian infrastructure. Following this, the NTA announced an allocation of EUR 55 million to 547 projects in 11 counties to support pedestrian and cyclist movement. The NTA will need to monitor advancement of the projects and their success. In this context, all projects should have specific annual targets attached to detailed monitoring and enforcement programmes to ensure their achievement.

The COVID-19 crisis and associated physical distancing requirements imposed additional constraints on the use of space. This has led to temporary solutions, such as pop-up bike lanes and closure of streets for pedestrian use in cities such as Dublin and Cork. Public transport use may decrease in the short term, meaning that trips previously made by public transport will need to be accommodated by other modes. To ensure these trips are made by sustainable modes, cities will need to strengthen measures to manage

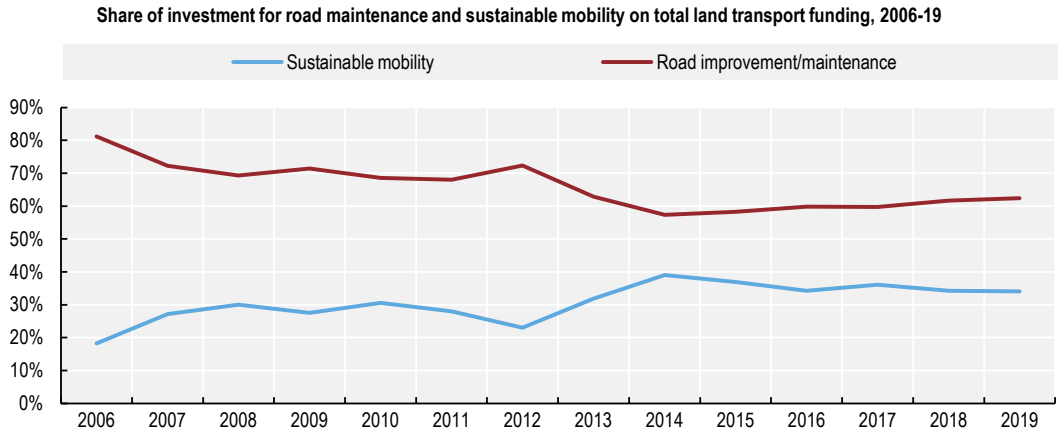
excess post-confinement car traffic. This means reallocating space to allow for physically spaced walking and cycling. In line with this goal, the government issued the "Design Manual for Urban Roads and Streets (DMURS) – Interim Advice Note" in June 2020. The Interim Advice Note provides guidance to NTA and local authorities on how to address social distancing in transport, and how to facilitate walking and cycling. The guidance note aims to align temporary solutions to address immediate public health concerns with longer-term sustainable mobility goals and government policies, with a view to creating a more liveable environment. In line with the guidance, a joint NTA and Dublin City Council COVID-19 Interim Mobility Intervention Programme seeks to turn the heart of Dublin City into a priority zone for walking, cycling and public transport in the long run.

Investment in sustainable mobility

Following the economic downturn in 2009, investment in transport infrastructure plummeted along with the slowdown in economic activity. The DoT's capital expenditure budget, which is a proxy for capital investment in transport infrastructure, increased to EUR 1.59 billion in 2019. However, capital investment of the DoT has averaged 0.45% of gross domestic product (GDP) since 2013, well below the levels of 2003-08 (above 1% of GDP) prior to the economic crisis. Given that capital investment in recent years has also funded new infrastructure, budget allocations may be insufficient to maintain infrastructure (DTTAS, 2019a).[9]

The largest expenditure item within the DoT is land transport, which is made up of road improvement and maintenance, public transport, public service obligations (PSOs) and sustainable transport. Between 2006-12, roads received an average of over 70% of land transport funding. Meanwhile, public transport averaged less than 30% over the same period. In recent years, this gap has narrowed. In 2014-19, expenditure averaged 60% on roads and 35% on public transport and PSOs (Figure 4.5) (DTTAS, 2019b).

Figure 4.5. The gap in allocation of investment for roads maintenance and sustainable mobility has narrowed



Note: Percentage shares of gross expenditure for land transport. Sustainable mobility includes carbon reduction and public service provision.
Source: DPER (2020), "Gross Expenditure By Vote History" *DPER Databank* (database).

StatLink https://doi.org/10.1787/888934231972

The NPF and NDP provide for significant investment in and improvement of public transport and the interurban rail network. NDP 2018-27 allocated more than EUR 10 billion for public transport in 2020 to support the progression of major infrastructural projects, increased capacity on rail services and phased transition of the public transport fleet to lower emission fuel types. While planned investment in public transport has increased compared to previous years, the National Roads Programme 2018-27 under the

NDP still identifies interurban, national and regional road construction plans to relieve congestion and increase regional connectivity. Given the fiscal reality within Ireland and the stated objectives to promote sustainable mobility, investment in the over-scaled road building is counterproductive. Evidence suggests that accommodating traffic growth via increases in road capacity results in induced demand (where greater road capacity leads to more traffic) (ITF, 2016;[10] WSP, 2018). Inter-regional connectivity can be achieved through high quality rail links. Given that passenger levels on public transport have been increasing (Section 4.2.1), the rail and bus network should be viewed as valuable national assets. Ensuring regional links via public transport and not through adding road capacity can help free up bottlenecks on existing roads and overall promote a move towards more sustainable travel. As opposed to expanding the road network, Ireland should consider limiting road investment to necessary maintenance and construction of small-scale town bypasses to relieve urban congestion. At the same time, it needs to prioritise expansion of public transport spending over new road infrastructure.

The June 2020 Programme for Government stipulates important revisions to the NDP and investment priorities. The document commits to a two-to-one spend on public transport over roads, in line with the recommendation of the 2017 Citizens' Assembly. It also commits to an allocation of 20% of the 2020 transport capital budget (EUR 360 million) per year for cycling and pedestrian projects, split in equal shares, for the lifetime of the government. The government plans to deliver a five-year, multi-annual funding programme linked with a specific target of new separated cycling and walking infrastructure. This will be delivered or under construction by end 2024. This aims to enable an increase in the number of people taking daily journeys by foot and bicycle, which would help improve quality of life and air quality.

The government also plans to develop and implement a sustainable rural mobility plan, which responds to the Citizens' Assembly recommendations for broader availability and uptake of sustainable transport options in rural areas. Ireland has made positive steps over the past number of years with improving rural connectivity by increasing frequency of some bus and rail services and enhancing connectivity between rail and bus services. "Local Link", the Rural Transport Programme, provides nationwide community-based public transport system in rural Ireland. Local Link services comprise conventional fixed services with regular routes, stopping places and timetables and Demand Responsive Transport (DRT) services. DRT, which responds to local demands, constitute the vast majority of Local Link services. Given that cars remain the most convenient mode in rural areas, rural public transport programmes, especially bus links, need significant investment to reduce car dependence for local journeys.

Finally, the 2020 Programme for Government prioritises investment in heavy rail. To that end, it will expand the fleet, promote electrification and commission economic evaluations of higher speed services between major cities. Rail infrastructure needs upgrading. Most lines are single track and less than 3% of the network is electrified. This compares to 35% in the United Kingdom and 60% on average in the EU-28.

4.6.5. Promoting compact development and integration between transport and land use

Ireland faces urban sprawl and low-density development, which has "locked in" unsustainable travel patterns. This type of land-use development has created places that lack adequate public facilities. It has also diminished liveability. Crucially, it has also created living spaces that depend on private cars for long commutes, particularly into Dublin and other cities. Numerous transport policies have been adopted in recent years. However, land-use and transport planning has largely failed to successfully advance sustainable mobility objectives and compact development patterns.

In most European countries, apartments represent 30-40% of housing stock compared to 10% in Ireland. In 2016, 37% of the population lived in settlements (i.e. towns or villages) defined by the CSO as rural (fewer than 1 500 people). This compares to 15% in Finland, 14% in New Zealand and 12% in Denmark (CSO, 2016b). In part, this reflects the historic land ownership pattern, which is characterised by small multiple landholdings in areas outside cities. This ownership system, combined with weak planning laws

in rural areas from the 1970s, created a dispersed housing pattern spatially, largely based on urban-generated demand.

Potential implications of COVID-19 associated with the expansion of teleworking could contribute to increasing sprawl by affecting housing and transport demand, while exacerbating disparities between regions and income groups. Working from home is likely to continue to a greater extent than before. According to a recent survey of Ireland's workers, more than 80% of those that started working from home during the lockdown reported interest in continuing to work remotely (Moore, 2020). At the same time, 30% of workers across the OECD region can fully adjust to remote work (Espinoza and Reznikova, 2020). It may be unrealistic to expect everyone to work from home indefinitely. Nevertheless, working partly from home could well become the norm in many occupations.

Recent policy documents and guidelines underline the prominence of reversing urban sprawl. Adoption of the NPF in 2018 strongly promoted compact growth and the regeneration and densification of urban settlements. The NPF targets delivery of least 40% of all new housing within existing built-up areas of cities, towns and villages on infill and/or brownfield sites. The local development plans, many of which are in preparation, will further detail the ways in which the targets will be met at a local level. The Office of the Planning Regulator (OPR) oversees this process. This hierarchy of plans and associated regulatory processes is at early stages, the effectiveness of which will be assessed in coming years.

Along with the adoption of the NPF, significant reforms have been made to the planning system to facilitate more compact forms development, including the publication and review of different ministerial guidelines.[11] The Urban and Rural Regeneration and Development Funds (EUR 2 billion and EUR 1 billion of funding to 2027, respectively) aim at enabling delivery of a greater proportion of residential and mixed-use development within existing built-up footprints of Irish cities and towns. This would ensure that more parts of urban areas can become attractive and vibrant places.

Statutory planning guidelines issued by the Minister for Housing, Planning and Local Government strongly support apartment development; increasing the number of units per floor in any development; and greater flexibility in terms of apartment type mix and new provisions for studio-type accommodation. Moreover, owners of commercial properties will also be able to convert unused space for residential use without securing planning permission. This could provide up to 4 000 homes in Dublin City alone (DHPLG, 2018).

In 2019, approvals of apartment developments – key to sustainable urban development – exceeded housing for the first time. However, 55% of all houses in the Eastern and Midland Regional Assembly area were permitted in the four commuter counties outside of Dublin (Kildare, Louth, Meath and Wicklow) (OPR, 2019). This poses a challenge to the government's planning objectives in tackling the sprawl of major urban areas.

In spite of policies identified in the NPF and local development plans, many development proposals remain car-centric. Proposals often include strong walking and cycling permeability within the boundary of the site itself. However, they are frequently on the fringes of cities and towns at a significant remove from existing transport links or services (grocery stores, health facilities, etc.). They are also often sited in areas with limited pedestrian and cycling infrastructure. Many areas suffer from a legacy of poorly connected street networks and inadequate pedestrian/cyclist facilities. This, in turn, discourages residents from using active travel modes outside of the development itself. Overall, various initiatives are underway to better ensure the spatial alignment of population and the supporting services, employment and infrastructural development. Selection and assessment of appropriate locations for future development will be completed through the county/city development plan processes underway.

To ensure that the planning system and unsustainable dispersed sprawl is ameliorated, planning regulations must be further tightened. Regulations must ensure that sustainability mobility policies are actually applied and enforced. All new development should promote compact settlement and have easy access to transport links, as well as safe walking and cycling routes. This means having strictly enforced

threshold standards for development to proceed. Land zoned for residential development must be close to, and/or be well connected by, public transport corridors (rail or bus) to existing and/or proposed services (e.g. schools, retail, community/health centres, sports/amenity facilities, etc.) and employment sites. Decisions for new housing must be conditional on integration with existing communities, affordability and mix of housing types, walking and cycling access to local services and schools, public transport access to employment locations and availability of recreation facilities.

4.7. Strategy to promote electric vehicles

The uptake of EVs is a pillar of Ireland's strategy to curbing GHG emissions from transport and helping to meet the 2030 emissions reduction target in the non-ETS sectors. The 2019 Climate Action Plan sets a target of nearly 1 million EVs in the passenger and light commercial vehicle stock by 2030. Of these, 840 000 are passenger EVs, or approximately one-third of all cars.[12] Achieving this target would make transport GHG emissions decline to 7.5 Mt CO_2-eq. Project Ireland has allocated EUR 200 million to support achievement of this target.

To increase the pace of EV uptake, Ireland has some of the most generous supports in the world to buy these vehicles. These include a purchase grant, VRT relief, a toll incentive, a home charger installation grant and reduced motor tax rates (Table 4.5). Expenditure on all of these schemes is rapidly accelerating. Ireland also plans to ban the sale and registration of petrol and diesel cars by 2030 under the Climate Action Bill. The aim is to ensure that one-third of vehicles on the road are electric in ten years.

Table 4.5. Incentives for electric vehicle purchase

Grant scheme by Sustainable Energy Authority of Ireland	A grant of up to EUR 5 000 towards the purchase of a new BEV or PHEV (launched 2011). The grant is capped at EUR 3 800 if an employer is purchasing the vehicle for an employee.
Exemption on benefit-in-kind (BIK)	There is an exemption on BIK from electric cars for 2017-21 (it does not extend to hybrid cars). The employer would not have to contribute PRSI of 10.95% on the EV and the employee would not pay tax.
VRT relief	Up to EUR 5 000 for new BEVs until end 2021; and up to EUR 2 500 for new PHEVs until end 2019.
Charging supports	A grant of up to EUR 600 is available to support installation of home charger points for buyers of new and second-hand EVs.
Electric Vehicle Toll Incentive Regime	BEVs and PHEVs qualify for 50% and 25% toll reductions, respectively, up to a EUR 500 annual threshold for private vehicles and EUR 1 000 for commercial vehicles. A higher incentive rate of 75% discount for BEVs and 50% discount for PHEVs applies for off-peak travel on the M50.
Low motor tax	Electric vehicles qualify for the lowest motor tax band available.
Fuel excise/carbon tax	No fuel excise duties are applied to electricity consumption, whereas these duties represent a significant proportion of diesel and petrol prices.
Public charging points	Charged at 29c per kWh and a EUR 5 monthly subscription; ongoing expansion of fast charging points.

Notes: BEVs = Battery electric vehicles. PHEVs = Plug-in hybrid electric vehicles. PRSI = Pay-related social insurance.
Source: Kevany (2019), "Spending Review 2019 Incentives for personal Electric Vehicle purchase", Department of Public Expenditure and Reform, Dublin, https://assets.gov.ie/25107/eb5a541e3b614c94a3e47c8d068e72c9.pdf.

Despite generous level of supports in Ireland to buy and operate an EV, the pace of EV adoption has generally been behind the level of ambition in government targets. The car stock shows a low usage of EVs; in 2019, electric and plug-in hybrid electric cars accounted for less than 3% of total stock of passenger cars in Ireland (Table 4.1).

Sales in electric and hybrid cars have increased progressively in recent years.[13] Electric and plug-in hybrid electric cars accounted for 1.6% of all car sales in 2018 compared to the EU average of 2%

(DTTAS, 2019b; EEA, 2019). However, electric cars accounted for 10% of new private cars licensed in August 2020, compared with 3.5% in the same period in 2019 (CSO, 2020c).

Availability of vehicles and charging infrastructure, limited choice of models, range anxiety and low levels of consumer awareness have all considerably slowed down uptake of EVs. These trends, however, have been changing. For instance, the choice of models has grown significantly.[14] This has likely played a role in the recent growth in uptake levels in Ireland and in Europe in general (IEA, 2020). Market analysis during development of the Climate Action Plan makes a connection between total price and ownership. It suggests that rapid falls in the purchase price of EVs will make them an increasingly attractive option for motorists when examined based on total cost of ownership (purchase price, maintenance and fuel consumption).

Another reason for lower uptake, compared to other countries, has been attributed to the taxation regime. VRT and motor tax rates in Ireland are based on CO_2 emissions. However, overall taxation levels on the sale of new internal combustion engine vehicles (ICEVs) are below that applied in leading countries in terms of EV penetration. Evidence suggests that EV take-up is higher in countries such as the Netherlands and Norway where taxation for high-emission cars is significantly higher than for low-emission cars. At the same time, tax differences are not as substantial in countries with lower EV take-ups such as Germany and the United Kingdom. Norway has been successful at increasing the stock of EVs largely due to its policy at equalising the difference in purchase price (or lifecycle cost) between battery electric vehicles (BEVs) and ICEVs (IEA, 2020; see Box 4.4).

Box 4.4. Electric vehicle strategy in Norway

Norway set a national goal that all new cars sold by 2025 should be zero-emission (electric or hydrogen). To enable this transformation, it has been using a variety of fiscal and non-fiscal incentives to encourage the uptake of EVs.

Norway has the highest per capita share of EVs in the world with battery EV sales accounting for 42% of the domestic market in 2019. This success is primarily due to incentives that eliminated the price advantage of diesel and gasoline cars. The Norwegian system heavily taxes internal combustion engine vehicles (ICEVs) based on curb weight, engine power, and CO_2 and NO_X emissions. EVs are also exempt from the 25% value added tax. Battery electric vehicles are fully exempt from both taxes and partly exempt from annual circulation taxes. As a result, an EV version of a car can reach at least price parity with the ICEV version.

Norway offers several non-fiscal and non-monetary incentives such as free parking, road toll exemption and reduced rates on ferries. Besides rolling out EV incentives, Norway has also heavily invested in charging infrastructure to support the transition to more sustainable vehicles. The Norwegian government has committed to a goal of at least one fast charging station every 50 km on major highways and offering subsidies to providers to accelerate installations. Between 2014-17, the number of EV chargers along these key routes had increased from 300 to around 1 500. Overall, Norway has more than 15 000 public charging points.

Source: Lindberg and Fridstrøm (2015), "Policy strategies for vehicle electrification", Discussion Paper, No. 16, International Transport Forum, Paris, www.itf-oecd.org/sites/default/files/docs/dp201516.pdf.

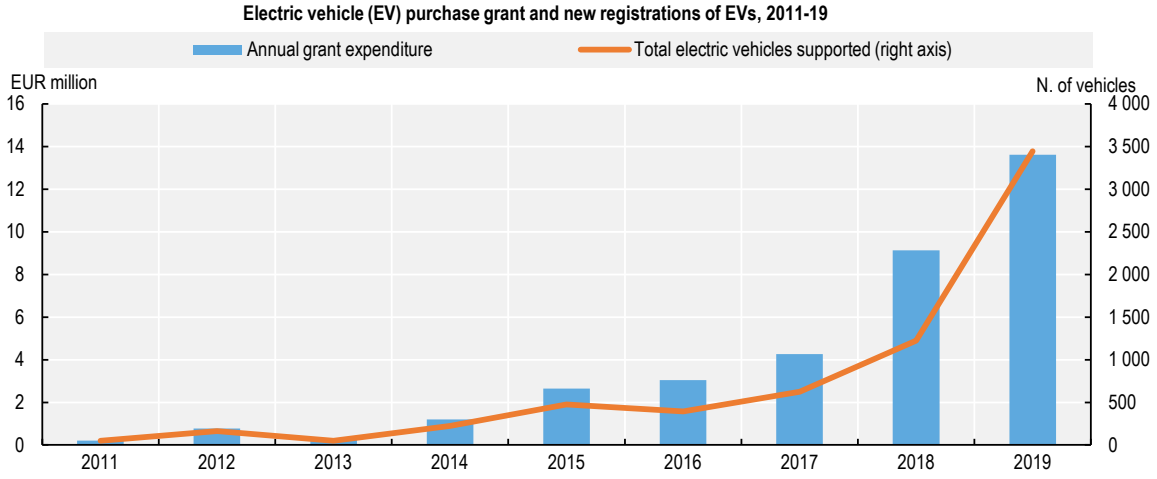
The government has set out strategies on how to scale up ongoing support measures to overcome identified barriers. These measures are expected to result in 400 000 EVs on the road by 2030. Investment in public charging points has been a cornerstone of the strategy given their relatively small number. Ireland has about 1 100 charging points compared to 33 000 in the Netherlands and more than 14 000 in the United Kingdom (in 2017). The Electricity Supply Board (ESB), the state-owned electricity company, is

responsible for nationwide installation of EV charging points. It is investing EUR 20 million in a network of high-powered EV charging points across the country. This will allow more than 50 high-power ESB network charging hubs to be installed on motorways and national roads.

On balance, evidence suggests that financial incentives and availability of charging points do affect EV adoption rates. Furthermore, it suggests that increasing exposure to EVs has a corresponding effect on consumer interest in these vehicles. However, the cost to the state of maintaining the level of EV support has grown significantly (Figure 4.6). In total, the average EV purchaser receives a direct subsidy from the state of between EUR 10 141 and EUR 13 616 (Kevany, 2019). Generous grants for the purchase of EVs also have opportunity cost in terms of forgone investment in non-motorised modes.

At the same time, reduced fuel excise receipts drain the state's finances, as excise is not levied on domestic electricity usage. This suggests that if the supports are continued, every 100 000 new EVs will cost the Exchequer between EUR 1.14 billion and EUR 1.36 billion. These EVs are a combination of BEVs and plug-in hybrid electric vehicles (PHEVs). The growth in EVs will also reduce Exchequer revenues. By 2030, the Exchequer will receive EUR 1.5 billion less revenue from motor tax, VAT and fuel oil tax. If Ireland reaches its Climate Plan targets, it will lose EUR 500 million in annual revenue by 2030 (Kevany, 2019). Higher tax for polluting vehicles and lower tax for clean vehicles (i.e. bonus-malus system) can help reduce the need to subsidise EVs. It is also important to consider that promotion of electric vehicles goes in the direction of fostering car ownership and use, with associated impacts in terms of congestion. Additionally, non-exhaust particulate emissions from tyre wear, brake wear, road surface wear and resuspension of road dust EVs are also high.

Figure 4.6. Increasing grant for the purchase of EVs



Note: Grants from the Sustainable Energy Authority for the purchase of electric vehicles (2019 data up to July) and number of electric vehicles licensed for the first time.
Source: CSO(2020), "Vehicle Licensing Statistics", *StatBank* (database); Kevany (2019), *Spending Review 2019: Incentives for personal Electric Vehicle purchase*.

StatLink https://doi.org/10.1787/888934231991

The most successful countries at EV take-up, such as Norway or the Netherlands, have used congestion charging and low-emission zones to complement subsidies, in tandem with efficient taxation regime for ICEVs. In Ireland, there is substantial potential to manage travel demand via fiscal and non-fiscal instruments as a way to curb excessive car use, while encouraging a shift towards low-carbon modes.

Social costs reflected in potential distributional impacts are also quite high. The benefits of EV financial support are regressive in nature as they tend to benefit the wealthier in society. Higher income households

simply tend to have more capital to invest in low-carbon assets. These effects are particularly pronounced in the new car market. Only purchasers of new cars with a value above EUR 14 000 can take advantage of the EV grant offered by the Sustainable Energy Authority of Ireland. Most EVs in the new car market are significantly more expensive than the average car. The grant is thus limited to those most able to bridge the affordability gap. Those with lower disposable incomes are more likely to purchase previously owned vehicles. Yet a lack of enough cheap second-hand EVs is likely to remain an issue for at least a decade. This means lower-income groups, especially those that are car-dependent, risk being left out. The government's upcoming transport decarbonisation strategy should take much more action to expand the second-hand EV market sooner and ensure an equitable transition to EVs. Special rebates for low-income people and incentives for used vehicle purchases should be considered as part of the strategy.

4.8. Tackling the environmental impact of freight transport

The logistics sector plays a vital role in achieving the targets set out in the Climate Action Plan. Trucks and vans accounted for 27% of all transport GHG emissions and about 5% of Ireland's total CO_2 emissions in 2017 (Section 4.3.1). Given that, under a business-as-usual scenario, emissions from freight are set to increase up to 2030, carbon contributions from this transport sub-sector are too large to ignore. However, the Climate Action Plan fails to propose an integrated strategy to mitigate the impact of road freight, shipping and land transport of goods, particularly heavy goods transport. The plan highlights only the strategy to expand the compressed natural gas (CNG) network.

While the sector itself is committed to reducing its environmental impact, the government should provide a clear vision for a transition to a low-carbon future for freight transport. It should further develop a comprehensive and dynamic policy agenda to promote low- or zero-emission vehicles, especially for HGVs. The Programme for Government of June 2020 committed the government to publish and implement a ten-year strategy for the haulage sector. This focused on improving efficiencies and standards, as well as helping the sector move to a low-carbon future. The strategy should include plans to support the move to alternatively fuelled vehicles. This is especially the case in the context of potential impacts of plans and references to fuel tax equalisation and the banning of the sale of petrol and diesel cars by 2030 (Section 4.7).

Developing low-carbon solutions is particularly challenging in the freight sector. There are persistent fears over technology lock-in and technological difficulties and costs of electrifying fleets due to the weight and size of vehicles. The government is therefore exploring alternative fuel types such as biogas, biofuels, hydrogen, CNG and liquefied natural gas (LNG). The 2019 budget introduced a new accelerated capital allowance programme for gas-fired commercial vehicles and refuelling equipment to encourage their uptake as an economically and environmentally friendly alternative to diesel (IEA, 2019). CNG can generate savings of up to 35% for fleet owners compared to diesel (GNI, 2019). Meanwhile, CNG HGVs and buses offer comparable refuelling times to diesel. Gas Networks Ireland is studying the impact of installing 14 CNG refuelling stations and setting up a large-scale renewable gas injection point on the gas network in Ireland.

While CNG is promoted for its lower carbon content, it is fundamentally still a fossil fuel, with potential for significant methane leakage. T&E (2018) reports the GHG effects of CNG as only comparable to best-in-class diesel. ICCT (2020) also reports that GHG emissions of LNG trucks are systematically underestimated in the European CO_2 regulations for trucks, as a large portion of tank-to-wheel emissions are not considered. Specifically, current certification procedure neglects methane and nitrous oxide emissions. ICCT (2020) suggests that the technology can lock countries on a pathway that is not compatible with its climate-neutrality goals. Therefore, there is a need to revisit the rationale behind the regulatory and fiscal incentives for LNG trucks. In the long run, the potential of freight electrification, if realised, could make significantly higher contributions to the low-carbon transition.

Ireland has limited capacity and usage of rail for freight transport as the small scale of the Irish market is insufficient to justify large-scale capital expenditure. However, it should consider the potential for switching some activity to rail freight. Potential measures include carbon or tax credits for shippers to incentivise rail rather than road use, reduction of track access charges to make rail more competitive with road freight and promotion of rail freight to shippers and to freight forwarders.

Further institutional support to make low-cost elements mandatory in freight may also quickly reduce emissions in the sector. This could combine with developing industry standards such as making eco-driving training mandatory and supporting companies to invest in such training. Industry standards can also help address competing priorities while working towards decarbonisation. However, this can only occur if all freight categories adopt the standards and if they are supported by the wider institutional architecture.

The Irish road freight sector is fragmented with small enterprises operating on a tight margin. Additional measures, such as standardisation and sharing of logistics data, could accelerate collaboration between organisations. This, in turn, could thereby improve logistics efficiency and contribute to reducing CO_2 emissions. With issues of competitiveness at stake, there is also a need to enhance the level of inspections, implementation and follow-up by relevant authorities in the institutional framework (including the Road Safety Authority) to bring consistency and oversight to the freight sector.

Providing governmental support in preparing for Brexit is vital. Irish transport will be adversely affected by the United Kingdom's decision to leave the European Union, which is expected to affect the industry profoundly over the next five years. The volumes of cargo going to and from the United Kingdom through Irish ports are considerable: 21 million tonnes in 2019 (CSO, 2020b). The government should work with the freight distribution and logistics sector to protect the competitiveness of the domestic industry.

The COVID-19 crisis has put additional strain on freight operators. Social distancing measures have caused significant disruption in downstream construction and manufacturing markets. This is expected to weigh on freight volumes in the current year. ITF estimates that worldwide freight transport, measured in tonne-kilometres, will be 36% below the level foreseen without COVID-19 in 2020. Non-urban freight activity, i.e. national and international goods transport outside of cities, could be 37% lower overall in 2020 compared to business-as-usual estimates. Freight transport within cities can expect to be hit significantly less hard than national and international goods transport as increased online shopping adds deliveries (ITF, 2020). In urban areas, demand for transport services is expected to rise notably as economies re-open. Potential negative effects of increased freight activity, particularly in relation to congestion in urban areas, will need to be addressed.

4.9. Making transport infrastructure resilient to climate change

The 2018 National Climate Change Adaptation Framework (Chapter 1) requires the Minister for Transport, Tourism and Sport to publish a statutory sectoral adaptation plan. The Strategy for Adapting to Climate Change on Ireland's Light Rail and National Road Network focuses on the effects of more intense rainfall and increased levels of groundwater. It also details how TII can develop action plans to minimise incidence of road closures due to flooding.

Given infrastructure lasts a long time, early action is needed to integrate adaptation into decision making. TII already has standards to promote quality and consistency of approach in relation to planning, design, construction and maintenance of roads and bridges, as well as light rail projects. It regularly updates these standards to reflect new developments and technologies. Climatic factors, such as increases in rainfall intensities, have been factored into design standards of national road schemes for several years. Similarly, Irish Rail has developed initiatives to counteract the issues posed by climate change. First, it developed internal standards and processes for infrastructure management. Second, it developed environmental sustainability policy and processes that considered requirements for resilient infrastructure. Finally, it

developed remote infrastructure monitoring to protect the railway from asset failure. Yet climate and socio-economic changes remain uncertain. Thus, one of the major challenges is to make informed decisions on future-proofing and prioritising assets across the whole network.

Many countries, including Ireland, consider critical infrastructure a major concern. To date, Ireland is lacking criteria to identify and subsequently prioritise investment in adaptive capacity. Such criteria should consider the social, economic and environmental functions performed by each asset and how each asset helps the system function overall. Most importantly, quantitative data are needed to justify immediate stakeholder costs. Without these data, a full priority impact assessment, and identification of operational and systemic thresholds, is not possible.

How can Ireland identify critical locations in an infrastructure network? Methods and decision-support tools will be needed that help planners and policy makers act on several issues. First, they need to make rational assessments of threats to facilities and infrastructure. Second, they must assess the consequences of network degradation and failure at various locations and under different circumstances. Finally, they must analyse what to do about these consequences. To that end, Ireland should develop a common risk assessment approach to inform adaptation planning for transport infrastructure owners and operators, as well as local authorities. These would help determine adaptation planning and justify associated costs.

Experience with risk assessment and methodologies in other countries could be useful for Ireland. National standard organisations in Australia, the United Kingdom and the Netherlands have released risk management guidelines that focus on resilience for buildings and infrastructure. The roads authority in Western Australia has developed guidelines to identify climate change risks relevant to construction of roads and bridges (OECD, 2018). The US Federal Highways Administration developed a conceptual model for assessing vulnerability and risk of climate change. This model could be a useful example of inclusion of climate change and extreme weather impacts into planning for transport systems (Box 4.5).

Information and quantitative data on climate hazards, exposure and network vulnerabilities will be required to inform regional risk assessments and development of climate-resilient infrastructure. Traditionally, historical data have been used to inform analysis of the potential likelihood and severity of impacts. Historical experience may provide information on the significance of the impact to the transport system if a certain asset is damaged or destroyed. It could also help justify appropriate funding for future adaptation measures. The historical performance of assets during specific weather events could consider:

- the repair costs or retrofits caused by past weather events
- budgets and spending for services that respond to weather events
- effects of past weather events on services provided by an asset (e.g. changes in vehicle miles or kilometres travelled, the value of the goods transported)
- the role of the asset in emergency response and evacuations required in past weather events (ITF, 2016).

In addressing climate change, these historical records need to be complemented with projections of how trends might change. Historic climate data and climate change projections can be integrated with other data sources to assess climate risk. Other sources included hydrological modelling and information on the location and characteristics of infrastructure assets.

Considering climate impacts for individual assets, such as a bridge or a railway line, is necessary but insufficient to ensure the system functions reliably despite a changing climate. For this reason, efforts to ensure resilience at the project level should be embedded within a strategic approach to infrastructure network planning. Such an approach should account for the direct and indirect effects of climate change and climate variability (OECD, 2018). For instance, the UK Highways Agency has identified 25 asset components divided into 7 asset sub-classes that are critical for the “highway asset” to function properly and meet users’ service needs and expectations (Highways England, 2016).

In addition, improved understanding of cascading impacts between sectors would allow for the identification of specific sectoral assets that are critical to the functioning of other sectors. This would require co-ordination between different ministries, research institutions and stakeholders involved in planning. The Netherlands is a good example of such horizontal co-ordination as an interdepartmental working group has begun to implement the adaptation strategy. Several ministries and the regional and local authorities are part of this group, as well as the main research institutions (EC, 2018a).

Box 4.5. Risk assessment model developed by the US Federal Highways Administration

The risk assessment model developed by the US Federal Highways Administration consists of three primary steps:

1. Develop inventory of assets

A country's transport agency compiles an inventory of all assets it wishes evaluated and gathers any information that may help evaluate resilience of the asset to climate stressors and potential cost of damage. Using priorities and metrics (such as traffic flow, emergency management, movement of goods), the agency considers which assets are most important for meeting those priorities. Other criteria to prioritise assets could include usage level (annual average daily traffic), class (local roads vs. arterials), ownership (private or public), importance of an asset within the larger transportation network (including potential for adverse network effects), its value in emergency situations (e.g. for evacuation) and/or redundancy.

2. Gather climate information

Historical climate and weather information will provide clues as to how assets may withstand climate stressors. Projected climate information is important for estimating how to plan for climate conditions. Both types of information will be used, although they are acknowledged as imperfect predictors of asset-level climate impacts.

3. Assess risk

In this phase, agency will (i) screen assets that are less vulnerable to projected climate effects; (ii) assess the likelihood of a particular impact resulting from a defined set of stressors; (iii) assess the consequence of the impact on both the asset and surrounding community (and beyond); and (iv) assess the integrated risk of the consequence and its likelihood.

For assets deemed "vulnerable", agencies should assess the likelihood of a particular impact and the consequence of that impact on the surrounding community or region (from a health/safety, economic, environmental, cultural, or other point of view). Assets with a low likelihood of being impacted by future climate and with low consequences from any such impact will be screened, recorded and revisited as resources allow. The remaining assets, grouped according to high/low likelihood and high/low consequence of impact, are the outcome of the risk assessment model.

Source: ITF (2016), Adapting Transport to Climate Change and Extreme Weather: Implications for Infrastructure Owners and Network Managers, ITF Research Reports, OECD Publishing, Paris, https://doi.org/10.1787/9789282108079-en.

Another important issue is related to difficulties in obtaining funding or justifying investment in improved resilience. Some countries establish specific funds for different actions related to climate change adaptation. For instance, the Swedish government proposed SEK 461 million (about EUR 44.8 million) of public funding for 2018-20 for climate change adaptation activities. This would be allocated to adaptation to climate change and climate services, capacity building, the Swedish National Knowledge Centre for Climate Change Adaptation and the climate adaptation portal. Through this allocation, resources are also provided to a number of public agencies to develop adaptation knowledge. Finally, it provides funds to prevent or mitigate the negative consequences of natural hazards (EC, 2018b).

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Notes

[1] Dublin City Centre refers to the area for which Dublin City Council (DCC) has been conducting traffic counts at 33 locations around the cordon formed by the Royal and Grand Canals.

[2] The main policy instruments impacting transport emissions in this scenario are the Biofuels Obligations Scheme11 and uptake of electric vehicles.

[3] The NTA most closely reflects the model of a public agency with subcontracted services.

[4] The DoT has commissioned a large-scale study to consider the potential roles of congestion pricing, low-emission zones and other demand management measures restricting certain vehicles from entering built-up urban areas. The work is considering key demand management drivers in each Irish city (e.g. congestion, air quality, climate considerations). It will also review international best practice on measures such as urban congestion charging, low-emission zones and parking pricing policies. Finally, it will recommend the most appropriate responses for Dublin, Cork, Galway, Limerick and Waterford, considering overall transport strategies in each case.

[5] In addition to the morning and evening peak hours, a third peak is applied in the middle of the day on weekdays to cover movements around lunch time and for scheduled office meetings.

[6] Cost burden could be defined as household expenditure on road pricing charges as a percentage of median income. Sensitivity for this value could be proxied by the median income in the region. Simple accessibility indicators (i.e. number of jobs accessible in one hour) could be used to measure accessibility to jobs and services by public transport and walking.

[7] Franco (2020) estimates that complying with the default parking minimum increases the cost of an office building in Los Angeles by an average of 48%. These parking costs often make it financially unviable for developers to build affordable housing units in new residential developments.

[8] The Directive requires that all new and thoroughly renovated residential buildings with more than ten parking spaces must be equipped with the appropriate pre-wiring for a charging point to be installed in each space.

[9] The DoT estimates at least EUR 1.3 billion annually is needed from the department to maintain infrastructure (DTTAS, 2019a).

[10] A 1994 report developed by the Standing Advisory Committee for Trunk Road Assessment in the United Kingdom provided an important reference on evidence of induced demand (ITF, 2016).

[11] This includes the Design Standards for New Apartments (2018), Urban Development and Building Heights (2018), the introduction of the Strategic Housing Development process, the Vacant Site Levy, the Local Infrastructure Housing Activation Fund and creation of the Land Development Agency.

[12] This target would be achieved through a combination of battery electric vehicles and plug-in hybrid electric vehicles.

[13] Sales of electric cars in 2019 were 182% higher than in the previous year, while sales of plug-in hybrid cars rose by 84% (DTTAS, 2020, 2019b).

[14] There were 7 new EVs on the European market in 2018, a number that will rise to 45 in 2021.

OECD Environmental Performance Reviews

IRELAND

Ireland's progress in delinking the economy from environmental pressures has been uneven in the last decade. Greenhouse gas emissions, waste generation and nutrient pollution rose with strong economic growth between the mid-2010s and the inception of the COVID-19 pandemic. The country's dispersed settlement pattern implies that roads are the dominant transport mode. Climate, circular economy and biodiversity policies have gained renewed impetus, with various ambitious policy initiatives and large public investment plans. These need to be swiftly implemented to alleviate the growing pressures from intensification of agricultural practices, demographic development, urban sprawl and road traffic. Encouraging businesses and households to take action is key. This requires providing consistent price signals for the use of energy and natural resources and for better managing travel demand, while taking into account affordability, employment impact and regional disparities.

This is the third Environmental Performance Review of Ireland. It evaluates progress towards green growth and sustainable development, with a special chapter focusing on sustainable mobility and freight.

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