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OECD Environmental Performance Reviews: United Kingdom 2022

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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 the United Kingdom since the previous review in 2002. 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 United Kingdom's historical environmental record, present state of the environment, physical endowment in natural resources, economic conditions and demographic trends.

The OECD is indebted to the UK and devolved governments for their co-operation in providing information, for the organisation of the virtual review mission (14-17 September 2021) and policy mission (29 November 2021), as well as for facilitating contacts inside and outside government institutions.

Thanks are also due to the representatives of the two examining countries, Helge Wendenburg (Germany), and Yasuhiko Hotta (Japan), for participating in the review.

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The OECD Working Party on Environmental Performance discussed the Environmental Performance Review of the United Kingdom at its meeting on 15 February 2022 and approved the Assessment and Recommendations.

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Reader's guide

Signs

The following signs are used in figures and tables:

.. : not available

– : nil or negligible

. : decimal point

Country aggregates

OECD Europe: This zone includes all European member countries of the OECD, i.e. Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, 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, Costa Rica, Israel*, Japan, Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

Currency

Monetary unit: Pound Sterling (GBP)

In 2021, USD 1 = GBP 0.725

In 2020, USD 1 = GBP 0.780

In 2019, USD 1 = GBP 0.784

Cut-off date

This report is based on information and data available up to December 2021.

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Basic statistics of the United Kingdom

2020 or latest available year (OECD values in parenthesis)[1]

PEOPLE AND SOCIETY					
Population (million)	68		Population density per km^2	279	(36)
Share of population by type of region			Population annual growth rate, latest 5 years	0.6	(0.6)
Predominantly urban (%)	74	(48)	Income inequality (Gini coefficient)	0.37	
Intermediate (%)	22	(28)	Poverty rate (% of pop. with less than 50% med. income)	12	
Rural (%)	4	(24)	Life expectancy	80	(81)
ECONOMY AND EXTERNAL ACCOUNTS					
Total GDP (GBP billion)	2112		Imports of goods and services (% of GDP)	31	(29)
Total GDP (USD billion, current PPPs)	3136		Main exports (% of total merchandise exports)		
GDP compound annual real growth rate, latest 5 years	-0.5	(0.8)	Machinery and transport equipment	34	
GDP per capita (1 000 USD current PPPs)	47	(45)	Chemicals and related products, n.e.s.	16	
Value added shares (%)			Miscellaneous manufactured articles	14	
Agriculture, forestry and fishing	1	(2)	Main imports (% of total merchandise imports)		
Industry including construction	20	(24)	Machinery and transport equipment	31	
Services	79	(74)	Commodities and transactions, n.e.s.	16	
Exports of goods and services (% of GDP)	30	(29)	Miscellaneous manufactured articles	14	
GENERAL GOVERNMENT					
Per cent of GDP					
Expenditure	51	(48)	Education expenditure	4.9	(5.0)
Revenue	38	(38)	Health expenditure	7.7	(7.8)
Gross financial debt	154	(130)	Environmental protection expenditure	0.6	(0.5)
Fiscal balance	-12.9	-(10.4)	Environmental taxes (% of GDP)	2.1	(1.5)
			(% of total tax revenue)	6.2	(5.0)
LABOUR MARKET, SKILLS AND INNOVATION					
Unemployment rate (% of civilian labour force)	4.6	(7.1)	Patent in environment-related technologies (% of all technologies, average of latest 3 years)[2]	11.4	(11.6)
Tertiary educational attainment of 25- to 64-year-olds (%)	49	(39)	Environmental management	4.0	(3.9)
Gross expenditure on R&D (% of GDP)	1.8	(2.5)	Climate mitigation technologies	9.4	(9.5)
			Climate change adaptation technologies	2.8	(2.2)
ENVIRONMENT					
Total Energy Supply (TES) intensity TES per capita (toe/cap.)	2.3	(3.7)	Road vehicle stock (vehicles/100 inhabitants)	59	
TES per GDP (toe/1 000 USD 2015 PPPs)	0.06	(0.09)	Water stress (abstraction as % of available resources)	4.3	(8.6)
Renewables (% of TES)	13.9	(11.9)	Water abstraction per capita (m^3/cap./year)	111	(696)
Carbon intensity (energy-related CO_2)			Municipal waste per capita (kg/capita)	455	(538)
Emissions per capita (t/cap.)	4.5	(8.3)	Material productivity (USD, 2015 PPPs/DMC, kg)	5.3	(2.9)
Emissions per GDP (t/1 000 USD 2015 PPPs)	0.12	(0.19)	Land area (1 000 km^2)	242	
GHG intensity[3]			% of arable land and permanent crops	25	(11)
Emissions per capita (t CO_2 eq/cap.)	6.7	(11.3)	% of permanent meadows/pastures	47	(23)
Emissions per GDP (t CO_2 eq/1 000 USD 2015 PPPs)	0.15	(0.26)	% of forest area	13	(33)
Mean population exposure to air pollution ($PM_{2.5}$), µg/m^3	10.0	(13.9)	% of other land (built-up/other land)	13	(32)

1. Values earlier than 2014 are not taken into consideration. OECD value: where the OECD aggregate is not provided in the source database, a simple 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.
Source: Calculations based on data from databases of the OECD, Eurostat, IEA/OECD and World Bank.

Executive summary

Progress on decoupling but environmental challenges are pressing

Over the past decade, the United Kingdom has reduced several environmental pressures while growing its economy. Protected areas, especially marine areas, significantly expanded. However, air pollution, deteriorating natural assets and missed biodiversity targets are all concerns. Further efforts are needed to achieve net zero greenhouse gas (GHG) emissions by 2050, prepare for climate change, reverse biodiversity loss and ensure a more resource-efficient circular economy.

A new framework for environmental protection after leaving the European Union

The 2021 Environment Act lays out a domestic framework for environmental governance post-EU exit (mostly for England). It legalises environmental principles, requires the UK government to set targets on air quality, water, biodiversity, resource efficiency and waste reduction, and establishes an Office for Environmental Protection. Devolution of responsibility for environmental policy to Northern Ireland, Scotland and Wales allows for tailored policy making but requires stronger co-ordination and peer learning between the UK and devolved governments in the absence of common EU law.

Ambitious climate targets should be quickly translated into reality

Ahead of its presidency of the 2021 UN Climate Change Conference of the Parties (COP26), the United Kingdom has led the way. It was the first G7 country to legislate for net zero GHG emissions by 2050 to deliver on the Paris Agreement. It has significantly reduced GHG emissions with the shift in electricity generation from coal to gas and renewable energy, but progress is slower outside the energy industries. The 2021 Net Zero Strategy outlines indicative emission reductions to meet the sixth carbon budget (2033-37) and ultimately net zero by 2050. Although it puts forward credible proposals, it is not yet clear how it will deliver on its ambition.

Public spending and investment could be further aligned with environmental goals

The UK government has introduced one of the largest fiscal responses to the COVID-19 crisis globally. The 2020 Ten Point Plan for a Green Industrial Revolution, the 2021 plan to Build Back Better, Net Zero Strategy to Build Back Greener and the Fairer, Greener Scotland Programme for Government 2021-22 reflect UK's priority on green recovery. During the pandemic, green measures have rightly supported public transport services and active travel. However, opportunities have been missed to boost the decarbonisation of buildings or to condition support on environmental improvements. In a welcome step, the 2021 Autumn Budget outlined the public spending contribution to the Net Zero target over 2021-25. Future budgets could also report the potential negative contribution of programmes such as road investment. The United Kingdom has a robust framework for policy evaluation, but environmental impacts of public investments could be better monitored and considered in decision making.

Biodiversity funding needs scaling up

Public spending on biodiversity fell notably in the past decade. Post-EU exit, new sources of public financial support are aiming to reverse the trend. In England, environmental land management schemes will gradually replace payments from the EU Common Agricultural Policy and pay farmers for provision of public goods. The four countries plan to create woodlands and restore peatlands but should do more to mobilise private finance. The Environment Act calls on local authorities to develop local nature recovery strategies in their spatial planning; encourages landowners to adopt voluntary long-term conservation covenants; and introduces Biodiversity Net Gain to property developers. These are all steps in the right direction. However, coherence must be sought between these new environmental policy instruments, and between them and public financial support for biodiversity.

Carbon prices send inconsistent signals

The UK government has introduced several economic instruments to help reduce GHG emissions. However, the complex system of explicit and implicit carbon prices sends inconsistent signals across sectors and fuels, favouring for example gas over electricity. Road fuel taxes are relatively high, but their freeze since 2011 has reduced the incentive to shift to public and active transport. As electric vehicles develop, the governments need to address transport externalities and tax revenue loss. Although the United Kingdom has no “official” fossil fuel subsidies, the National Audit Office and the OECD have identified tax support for oil and gas consumption and production. These rebates may encourage environmentally harmful practices and should be systematically screened to reform those that are not justified on economic, social and environmental grounds.

Progress in municipal waste reduction, reuse and recycling needs to continue

Landfilling of municipal waste has fallen since 2010 and incineration with energy recovery has increased, largely due to high landfill taxes. Northern Ireland, Scotland and Wales have significantly improved the separate collection, recycling and composting of municipal waste. Recent policies and the provisions of the 2021 UK Environment Act set the scene for better progress in England, where recycling and composting have increased slowly. The United Kingdom is preparing to strengthen and expand extended producer responsibility schemes and introduce deposit-return schemes. A tax on plastic packaging with less than 30% recycled content took effect in 2022.

Further use of economic instruments, such as incineration taxes, could support greater recycling and composting. The United Kingdom should consider other instruments, including pay-as-you-throw mechanisms that charge households for the volume of their residual waste, along with full financing of waste collection and treatment costs via user fees. UK governments still need to clean up contaminated sites and combat illegal waste dumping.

The United Kingdom is preparing for more ambitious action on the circular economy

Across the United Kingdom, governments have supported work on the transition to a circular economy, and private sector initiatives have reduced waste and increased circularity in key sectors including food and textiles. Cities including London and Glasgow have worked with businesses to promote the circular economy at local level. The construction sector, a major consumer of raw materials and waste producer, struggles to improve resource productivity; consumption of aggregates in the sector increased alongside growth in production.

Recent UK policies set long-term ambitions to improve resource efficiency and move towards a circular economy: England calls for doubling resource efficiency by 2050, while both Scotland and Wales have set zero waste objectives. A recent private initiative calls for zero avoidable waste in the construction industry. Achieving these ambitions will require renewed public and private efforts, including promotion of domestic recycling and reprocessing and increased durability, reusability and recyclability of products.

To build on achievements, the UK’s four nations should put in place stronger co-operation mechanisms, along with greater monitoring and evaluation of circular economy progress, to identify and address problems.

Assessment and recommendations

The Assessment and Recommendations present the main findings of the OECD Environmental Performance Review of the United Kingdom. They identify 26 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 15 February 2022.

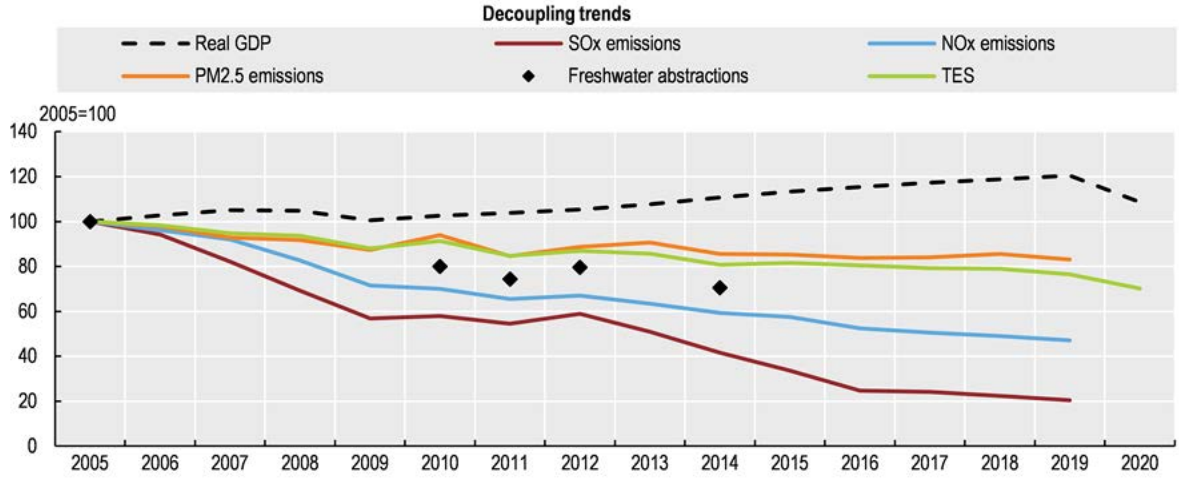
1. Towards green growth

Addressing environmental challenges at the time of EU exit and COVID-19

Over the past decade, progress has been made across the United Kingdom in decoupling several environmental pressures from economic growth. These pressures include greenhouse gases (GHGs) and air pollutant emissions; municipal waste generation; energy and material consumption; and water abstractions (Figure 1, Figure 2, Figure 5). At the same time, the United Kingdom has improved wastewater treatment and expanded the network of protected areas (Figure 3). However, air pollution remains a health concern (PHE, 2019). Agricultural management, climate change and infrastructure development continue to put pressure on the natural environment, causing habitat loss, fragmentation and degradation (Hayhow et al., 2019). Further efforts are needed to achieve net zero GHG emissions by 2050, address the growing risks of climate change, reverse the loss of biodiversity and ensure a more resource-efficient circular economy.

The UK government has devoted a great deal of time and effort to ensuring EU environmental law was adequately retained in the national legislation after exit from the European Union (EU exit) on 31 January 2020. The Environment Act 2021 lays out a domestic framework for environmental governance post-EU exit (most provisions apply to England only). It puts environmental principles[1] into law; introduces legally binding long-term targets on air quality, water, biodiversity, resource efficiency and waste reduction; and establishes a new Office for Environmental Protection (OEP). The implementation of the Act, the setting of targets and operation of the OEP will tell whether the UK government's ambition is commensurate with the challenge of protecting and enhancing the environment for future generations.

Figure 1. The United Kingdom has made progress in decoupling several environmental pressures from economic growth



Note: GDP at 2015 prices. TES: Total energy supply.
Source: OECD (2021), *Environment Statistics* (database).

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The United Kingdom has been hard hit by the COVID-19 pandemic, with the largest gross domestic product (GDP) contraction (-9.7%) in the G7 in 2020 (OECD, 2021a). A fast initial roll-out of COVID-19 vaccines has weakened the link between new COVID-19 cases, hospitalisations and deaths, allowing a broad reopening of the economy. Activity rebounded quickly driven by consumption growth, and GDP is expected

to reach its pre-pandemic level at the beginning of 2022. It is estimated that the long-run GDP will be reduced by 4% by the EU exit and a further 2% by the pandemic (OBR, 2021).

The United Kingdom has ambitious climate targets and an economy-wide strategy, setting a path to net zero by 2050

The United Kingdom is at the forefront of global climate action. Ahead of its presidency of the 2021 UN Climate Change Conference of the Parties (COP26) in Glasgow, it has led the way by raising its national ambition. In 2019, it was the first G7 country to legislate for net zero GHG emissions by 2050[2] to deliver on the Paris Agreement, a step up from its previous 80% reduction target. In 2020, it submitted a new Nationally Determined Contribution committing to reduce GHG emissions[3] by at least 68% by 2030 from 1990 levels. This is clear progress from the previous commitment of 57%[4] and the highest reduction target set by a major economy (Cuming, 2021).

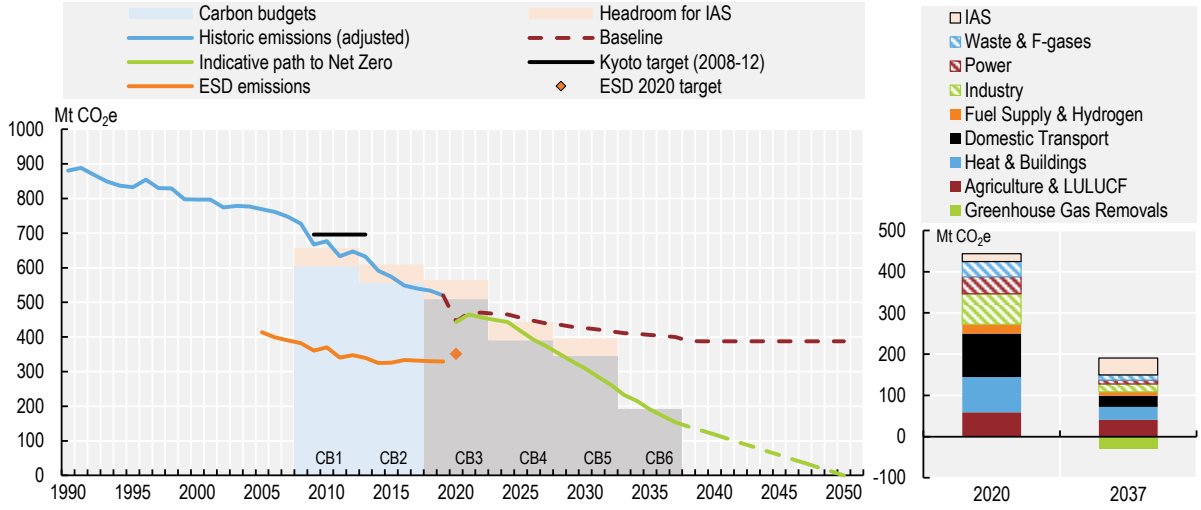
As provided by the 2008 Climate Change Act, the government adopted a Net Zero Strategy (NZS) in October 2021. It builds on the 2020 Ten Point Plan for a Green Industrial Revolution and sectoral plans, including the 2020 Energy White Paper, the 2021 Industrial Decarbonisation Strategy, Transport Decarbonisation Plan and Hydrogen Strategy, as well as the Heat and Buildings Strategy. The NZS outlines indicative emission reductions by sector to meet the sixth carbon budget (2033-37) and ultimately net zero by 2050 (Figure 2). It calls for fully decarbonising electricity by 2035, subject to security of supply, and rapidly electrifying transport, heating and industry. These actions would be supplemented by low-carbon hydrogen, carbon capture and land-use change (CCC, 2021a). The vision is backed by key milestones sending strong signals to investors and consumers, including 40 gigawatts (GW) of offshore wind capacity and 5 GW of hydrogen production capacity by 2030.

UK GHG emission intensities per capita and per GDP (excluding emissions from land use, land-use change and forestry) are low compared to other OECD countries. However, intensity per capita is above the OECD Europe average when emissions embedded in imported goods and services are included. The country has one of the strongest records of emissions reduction in the OECD over 1990-2019 (44%) (OECD, 2021b). Energy industries have been the largest source of emission reductions, with the shift in electricity generation from coal to gas and, in the past decade, to renewable energy. Progress is slower in other sectors. With the COVID-19 crisis, GHG emissions are estimated to have decreased by 9% in 2020.

The United Kingdom met its first and second carbon budgets (2008-12 and 2013-17) and is on track to meet its third budget (2018-22) (Figure 2). Baseline projections show it would not have reached the fourth and fifth budgets (2023-27; 2028-32) set to achieve the 80% reduction target with policies in place until mid-2019. As of mid-2021, before the NZS was adopted, only 20% of emissions savings for the sixth budget, which sets the path to net zero, had policies “potentially on track” for full delivery (CCC, 2021b). The NZS put forward credible policy proposals to put the United Kingdom on track to net zero (CCC, 2021a). However, it is not yet clear how the NZS will deliver on this ambition. The impact of individual measures is not quantified and some, notably in the agriculture and building sectors, remain to be developed. The government will report on its progress annually. This will provide valuable input to the OECD International Programme for Action on Climate, in which the United Kingdom is actively involved.

Figure 2. Policies must be implemented quickly to put the United Kingdom on a net zero path

Past performance against climate objectives and indicative path to net zero



Note: The sixth carbon budget (CB6) includes international aviation and shipping emissions (IAS), but the previous ones do not. Historic emissions are adjusted for accounting changes, including wetlands brought in under the 2019 inventory and IAS emissions; and converting the projections into Global Warming Potential values with climate-carbon feedbacks of the IPCC Fifth Assessment Report. The Kyoto target should be compared to lower emissions. Baseline: based on policies implemented, adopted or planned as of August 2019. ESD: GHG emissions in Effort Sharing Decision sectors (not covered by the Emissions Trading System). LULUCF: land use, land-use change and forestry.
Source: (BEIS, 2021), Net Zero Strategy-charts and tables; (Eurostat, 2021), Greenhouse gas emissions in ESD sectors.

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The United Kingdom is experiencing widespread changes in the climate (CCC, 2021c). Average temperature is around 1.2°C warmer than the pre-industrial period. Meanwhile, UK sea levels have risen by 16 centimetres, and episodes of extreme heat, intense rainfall and associated flooding are becoming more frequent. Continuing sea level rise will increase the risks of flooding and affect coastal infrastructure. The United Kingdom is expected to experience warmer, wetter winters and hotter, drier summers, along with more frequent and intense extremes. Actions have been taken to tackle flooding and water scarcity, but overall progress in planning and delivering adaptation is not keeping up with increasing risk (CCC, 2021c).

Air pollution has been reduced but remains a health concern

Emissions of major air pollutants have declined significantly over recent decades with the shift from coal for domestic heating and power generation and stricter emissions standards and regulations. However, the rate of reduction has slowed down for some pollutants in recent years. In 2019, sulphur oxide (SOx), nitrogen oxides (NOx) and fine particulate matter ($PM_{2.5}$) emission intensities per capita and per GDP were among the lowest in OECD countries. That same year, the United Kingdom had already met its 2020 reduction targets for SOx, NOx and non-methane volatile organic compounds (NMVOCs). However, further efforts were needed to meet 2020 targets for reducing ammonia (from agriculture) and $PM_{2.5}$, as well as to meet 2030 targets for all pollutants except NMVOCs.

Population exposure to $PM_{2.5}$ has constantly decreased since 2005 but remained in 2019 above the new World Health Organization guideline value[5] of 5 micrograms per cubic metre (μ/m^3) (OECD, 2021b). People in Scotland are least exposed to air pollution (6.7 μ/m^3), while people in Greater London are exposed to levels twice as high. In 2020, concentrations of nitrogen dioxide (NO_2) were lower due to less

road traffic as a result of COVID-19 lockdown restrictions. Five zones (out of 43) exceeded the annual mean limit value for NO_2, down from 33 in 2019. Urban background ozone pollution has an overall long-term increasing trend. Air pollution, including from domestic heating and road traffic, continues to be the largest environmental risk to the public's health. In the United Kingdom, between 28 000 and 36 000 deaths are attributable to human-made air pollution each year.

Natural assets are deteriorating and biodiversity targets have not been met

Most natural assets are deteriorating according to the Natural Capital Committee (NCC), an independent advisory committee that ran from 2012 to 2020 (Table 1.) In 2019, only 16% of surface waters in England met the "good ecological status" standard under the EU Water Framework Directive. However, a higher percentage met this standard in the devolved nations, especially in Scotland[6] (Defra, 2021). The most common pressures impacting water bodies are physical modification, and diffuse pollution from agriculture, from wastewater, and from cities and transport. In 2016, the United Kingdom complied with the collection and secondary treatment targets (Articles 3 and 4) of the EU Urban Waste Water Treatment Directive. It was close to achieving the more stringent target (Article 5). However, pollution from sewer overflows is of particular concern (Environment Agency, 2021).

Table 1. Overall assessment of the state of England's natural capital

Natural capital asset	25 Year Environment Plan goal area	RAG rating
Atmosphere (abiotic)	Clean air Mitigating and adapting to climate change	A[1]
Freshwater (abiotic)	Clean and plentiful water	R
Marine (abiotic)	Mitigating and adapting to climate change	R
Soils (abiotic)	Mitigating and adapting to climate change	R[2]
Biota (biotic)	Thriving plants and wildlife Enhancing biosecurity	R[3]
Land (terrestrial, freshwater, and coastal margins habitats) (abiotic and biotic)	Enhancing beauty, heritage and engagement with the natural environment Reducing the risks of harm from environmental hazards Mitigating and adapting to climate change Using resources from nature more sustainably and efficiently	R
Minerals and resources (abiotic)	Using resources from nature more sustainably and efficiently Minimising waste	A

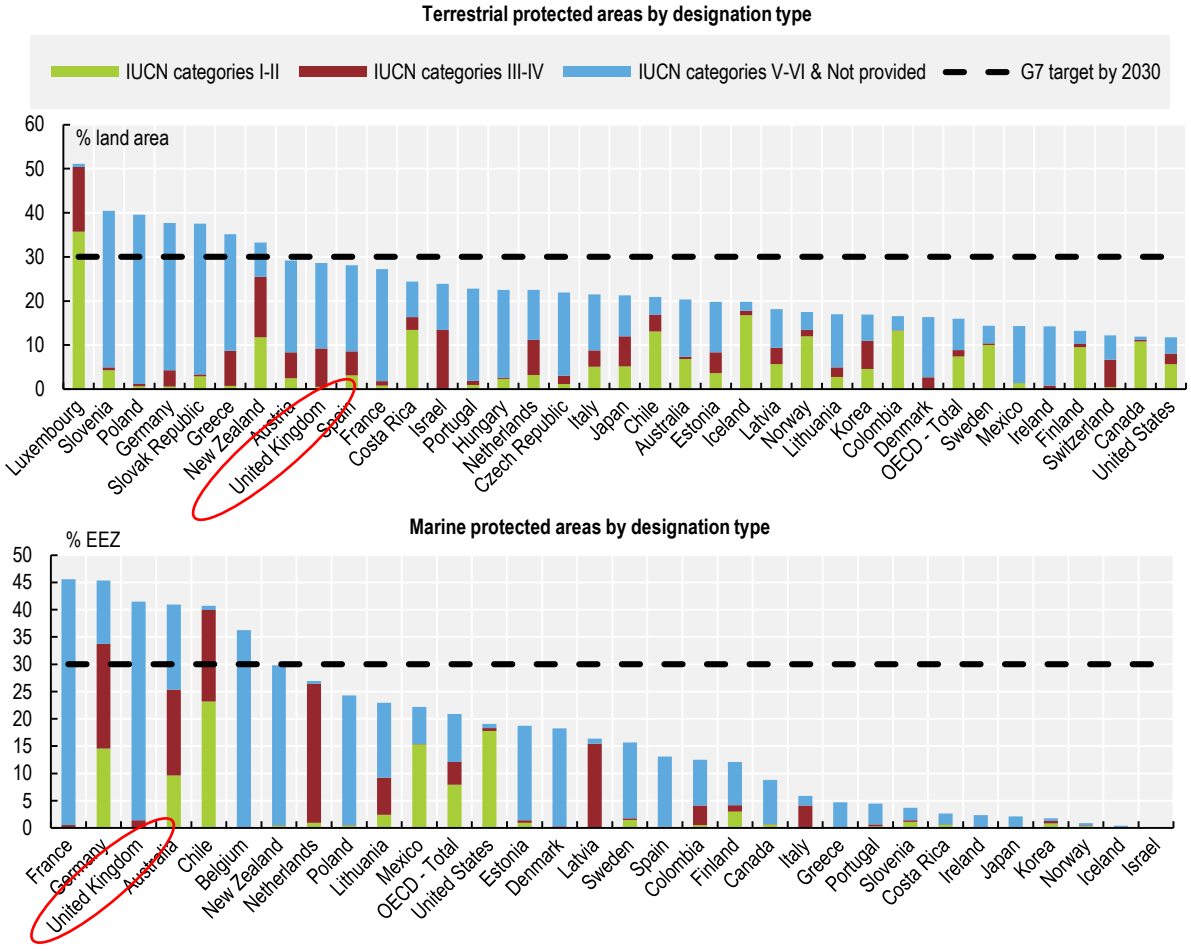
Note: The RAG rating is based on a trend assessment (historical) and the progress towards compliance with targets and/or other commitments. R (Red) indicates a decline/deterioration; A (Amber) indicates no change, or where the evidence is inconclusive; and G (Green) indicates an improvement.
1) Air pollution has been reduced but levels are still resulting in significant health impacts in some urban areas.
2) Based on limited data that show the condition and extent of soils have deteriorated.
3) Based on the example datasets assessed by the NCC, all show declines in abundance and/or distribution of terrestrial species.
Source: NCC (2020), *Final Response to the 25 Year Environment Plan Progress Report*.

In 2019, the United Kingdom reported it was on track to meet 5 of the 20 Aichi targets[7] of the United Nations Convention on Biological Diversity. These targets comprised mainstreaming, protected areas, implementation of the Nagoya Protocol and National Biodiversity Strategy, and mobilisation of information and research (JNCC, 2019). However, according to the Royal Society for the Protection of Birds, most assessments point towards ongoing loss of UK biodiversity, or no recovery from depletion (HoCs, 2021a). Biodiversity indicators show progress in several assessed measures, including agri-environment schemes, reducing air and marine pollution, extending marine protected areas and improving knowledge, but many present mixed or negative trends (Defra, 2021). In particular, the abundance of UK priority species, and common farmland and woodland birds is in long-term decline while pressure from invasive species is

increasing. Most UK habitats and species of European importance are in unfavourable condition. The United Kingdom is one of the most nature-depleted countries in the world according to the Natural History Museum (Davis, 2020).

The extent of protected areas has increased significantly since 2015 to cover 29% of land area and 42% of the economic exclusive zone in 2020 (Figure 3). This is well above the Aichi 2020 targets of protecting at least 17% of land and 10% of marine and coastal areas and close to the G7 targets of protecting at least 30% of land and sea by 2030. However, only 0.5% of land area has strict management objectives (International Union for Conservation of Nature management categories[8] I and II), compared to 7.4% on average in OECD countries. Only around 5% of UK land is both protected and managed effectively for nature (HoCs, 2021a).

Figure 3. Protected areas coverage is high but terrestrial areas are in unfavourable condition



Note: IUCN categories I-II: Strict Nature Reserves, Wilderness Areas and National Parks; III-IV: Natural Monuments and Habitat & Species Management Areas; V-VI & Not provided: Protected Landscapes and Seascapes, Protected areas with sustainable use of natural resources and areas with no management category provided. The IUCN protected area management categories, classify protected areas according to their management objectives but do not indicate whether protected areas are managed or enforced effectively. IUCN categories are not truly hierarchical; however, sites designated as the "stricter" categories (I-II in particular) are likely to be more restrictive in the sorts of permitted activities. Different approaches are likely explained by varying national priorities but also by factors such as local geography, ecology and pre-existing patterns of human settlement.
Source: OECD (2021), "Environment at a Glance: Biological resources and biodiversity", Environment at a Glance: Indicators.

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Improving environmental governance and management

Diverging approaches across devolved jurisdictions require stronger co-ordination

The responsibility for environmental policy and regulation is devolved in Scotland, Wales and Northern Ireland to the Scottish government, the Welsh government and the Northern Ireland Executive. There is no devolved government for England; the UK government makes decisions and proposes legislation that concerns England. Devolution results in tailored policy making and enables administrations to learn from each other's policies and implementation practices. There is growing divergence between the environmental policy approaches of the four nations. This divergence requires stronger co-ordination mechanisms between the UK government and devolved administrations (as is the case, for example, on biodiversity protection) to maintain a UK-wide level playing field in the absence of common EU law. A review of intergovernmental relations in 2021 has made changes to the structures and ways of working that will strengthen engagement across the four UK nations.

The institutional capacity of environmental authorities across the United Kingdom has suffered from more than a decade of budget cuts, diversion of resources to address EU exit-related needs and, in the case of Scotland, a major cyberattack in 2020. This has undermined the agencies' ability to design and implement many cutting-edge policies and practices.

Regulatory and policy evaluation is strong, but environmental assessment could be improved for non-environmental legislation and policies

The United Kingdom continues to emphasise evidence-based policy making. Regulatory and policy evaluation, ex ante and ex post, plays an important role in environmental governance. Strategic environmental assessment is widely used in land-use planning and environment-related policies, less for non-environmental plans and programmes such as regional economic strategies. However, regulatory impact assessment focuses primarily on the regulatory burden on businesses and does not, unlike in several other OECD member countries, identify and address potential environmental impacts of draft regulations (Nesbit, 2019).

The OEP in England and Northern Ireland[9] and Environmental Standards Scotland, both created in 2021, are independent bodies to ensure government accountability for implementing environmental policy and law. Wales has appointed an interim assessor to oversee the functioning of environmental law. The United Kingdom has long been a frontrunner in performance measurement, using indicators to gauge both policy implementation and corporate results of environmental authorities.

Good regulatory practices must be preserved

The country has long been a standard setter within the European Union and beyond with regard to good practices in setting, and ensuring compliance with, environmental requirements. These include diversification of permitting regimes based on the regulated activity's level of environmental impact. General binding rules, registration and notification are used for lower-risk activities, reducing the administrative burden on regulators and regulated businesses.

UK environmental regulators increasingly rely on advice and guidance to promote compliance and green business practices. The promotional tools are tailored to specific activity sectors. Sectoral compliance assurance plans focus on practical ways of delivering environmental, social and economic outcomes. Green practice promotion tools also include incentives for adoption of environmental management systems and public recognition of environmental excellence.

The risk-based approach, together with the emphasis on compliance promotion, has helped UK environmental authorities to improve permit compliance levels over the years. Risk-based planning of

environmental inspections in England and Scotland is based on sophisticated tools and protocols that consider, among other factors, the regulated sector, site location and the operator's compliance record. There are also methodologies, such as England's Compliance Classification Scheme, to assess and categorise offences to arrive at compliance ratings for individual operators. UK environmental regulators make compliance indicators a key part of their performance management.

Over the last decade, the United Kingdom has emphasised administrative response to non-compliance, as the number of criminal prosecutions has declined steadily. The decriminalisation of less severe violations has made enforcement more proportionate to non-compliance, more expedient and more efficient. Enforcement undertakings have been increasingly used. In these cases, the offender makes a voluntary offer, accepted by the regulator, to restore and remediate the local environment and prevent repeated non-compliance instead of paying a fine. However, the implementation of variable administrative monetary penalties has been slow.

Promoting investment and economic instruments for green growth

Green recovery effort has focused on sustainable transport

The UK's priority on green recovery is reflected in the 2020 Ten Point Plan for a Green Industrial Revolution, the 2021 plan to Build Back Better (Plan for Growth), NZS to Build Back Greener and the Fairer, Greener Scotland Programme for Government 2021-22. Since March 2020, the United Kingdom has introduced successive packages of support measures equivalent to 15% of 2020 GDP, one of the largest fiscal responses to the COVID-19 crisis globally (OBR, 2021). As part of this package, green measures are estimated at 1.2% of GDP (OECD, 2021c). Support for public transport services, cycling and walking is prominent. Of the 50 largest economies covered by the Global Recovery observatory, the United Kingdom invested the most on green transport (O'Callaghan and Murdock, 2021). This is a positive step to reverse declining use of public transport resulting from the pandemic while aligning the climate and well-being agendas through active travel promotion. Significant budgets were also announced to promote electric vehicles (EVs), renewables, woodland creation and peat restoration.

However, the early cancellation of the energy saving investment scheme (Green Homes Grant) resulted in few homes upgraded and limited impact on job creation (NAO, 2021a). In addition, some measures of the package ran counter to the climate objectives (e.g. facility loans to car manufacturers and airlines with no environmental conditions). Environment-related measures represent a small share of the COVID-19 response package due to the importance of rescue measures. The UK and Scottish governments aim to further mobilise green private investment and promote green finance through the new UK Infrastructure Bank and the Scottish National Investment Bank.

Environmental goals could be better embedded into public spending…

The United Kingdom has made progress in integrating environmental objectives into departmental plans. The 2021 Autumn Budget and Spending Review outlines the public spending contribution to Net Zero (GBP 26 billion) and other green objectives[10] (GBP 4 billion) over 2021-25 (HM Treasury, 2021). However, progress is uneven across departments and the potential negative contribution of programmes is not published. Some countries, such as France, have assessed the environmental impact (positive and negative) of their stimulus packages in budget documents. The United Kingdom could follow the same approach to ensure that public spending is consistent with environmental objectives. The Environment Act exempts taxation, central spending and resource decisions from the application of environmental principles.[11] This is intended to ensure the Treasury Minister's ability to alter the UK's fiscal position but goes against the recommendation of the House of Commons Environmental Audit Committee (HoCs, 2021a).

The United Kingdom has a robust framework for monitoring and evaluating public spending programmes, including a Green Book to appraise the costs and benefits of policies, projects and programmes. The Green Book has been updated to include stronger guidance on establishing clear objectives on climate following an HM Treasury review (2020a); to account for the effects of climate change even where net zero is not the primary objective of a proposal; to embed a natural capital approach in appraisal, and to better value unmonetisable costs and benefits (HM Treasury, 2020a). Natural capital approaches have been adopted across infrastructure sectors and activities. However, challenges remain relating to planning policy and practice and to measurement and valuation of natural capital (NIC, 2021).

…and infrastructure planning

As part of the government objective to increase public investment from 1.9% of GDP to 2.7% by 2025/26, the 2020 National Infrastructure Strategy seeks to boost growth and productivity across the whole of the United Kingdom. To that end, it aims to level up and strengthen the Union, putting it on the path to net zero and supporting private investment (HM Treasury, 2020b). It provides for GBP 27 billion investment in economic infrastructure (transport, energy and digital communications) in 2021/22. Significant investment is planned in rail, including for construction of high speed rail. The 2021 Transport Decarbonisation Plan aims to shift travel from road to rail, public transport and active transport, among other priorities. However, the rail system suffers from poor passenger service performance; fragmentation and lack of accountability; concerns around increasing costs and financial sustainability (HoCs, 2021b). The 2021 Williams-Shapps Plan for Rail was designed to address these issues. There are questions about whether infrastructure programmes sufficiently consider regional disparities and environmental objectives. The Road Investment Strategy (GBP 24 billion investment over 2020-25) does not seem consistent with climate objectives (CCC, 2021b) (Transport for Quality of Life, 2020).

The NZS estimates that additional annual investment must grow to GBP 50-60 billion by 2030 (HM Government, 2021). With operational savings generated through reduced reliance on fossil fuels, the net cost of the net zero transition is estimated at 1-2% of GDP by 2050, depending on sources (CCC, 2020) (HM Government, 2021). The power and buildings sectors are expected to contribute most to investment costs due to the increase in electricity generation and high costs of decarbonising buildings, while vehicles are anticipated to dominate net operating savings. The GBP 26 billion public investment committed for net zero to 2025 appears generous in some areas (e.g. innovation, EV charging infrastructure) but low in others (e.g. heat pumps and heat networks). While contracts for differences are promoting investment in renewables effectively, there are concerns about insufficient funding to stimulate energy efficiency in the least efficient, owner-occupied homes (CCC, 2021a).

The United Kingdom announced new funds for biodiversity, but other financing sources need scaling up

UK public spending on biodiversity fell by more than a quarter over 2010-19. Post-EU exit, new sources of public financial support such as England's Nature for Climate Fund (GBP 750 million to 2025) are aiming to reverse the trend. Under the 2020 Agricultural Act, environmental land management (ELM) schemes will gradually replace the payments inherited from the EU Common Agricultural Policy in England[12]. The goal is to shift from supporting income and market prices to paying farmers for the provision of public goods, a welcome step towards market orientation of agricultural production and protection of biodiversity. The United Kingdom has gained valuable experience in testing results-based payments to farmers: pilots have demonstrated better performance to improve biodiversity than current action-based agri-environment measures.

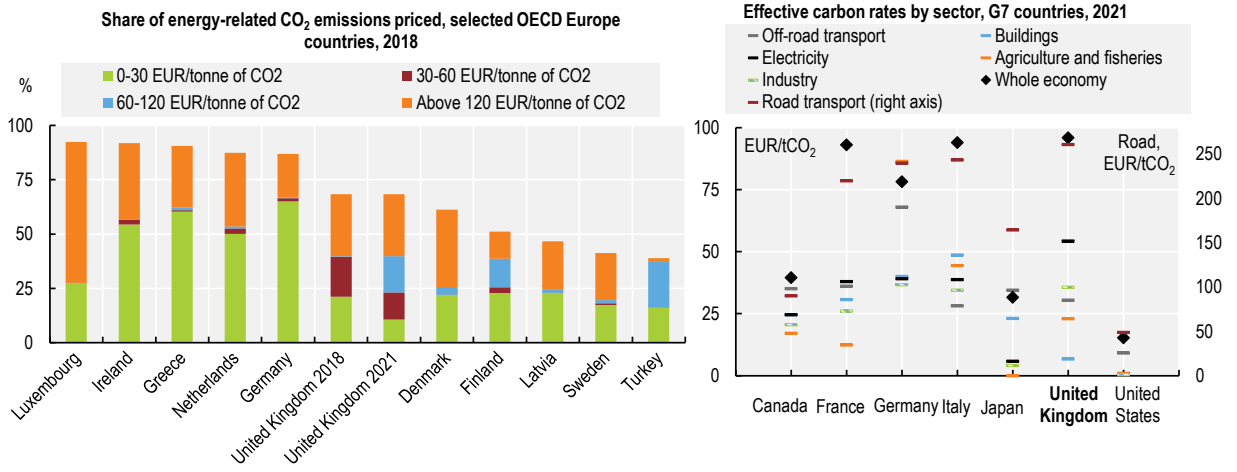
England is pursuing a proactive policy to increase forest cover by allocating 80% of the Nature for Climate Fund to the Trees Action Plan 2021-24. The devolved administrations have also published plans for woodland creation and peatland restoration. The removal of GHGs by forests will be required to achieve

net zero. However, more should be done to mobilise private finance to foster woodland creation and their GHG removal, biodiversity and ecosystem services. Beyond measures since 2019 in England to develop a national forest carbon market, the United Kingdom could consider allowing forest carbon credits in compliance markets (UK Emissions Trading System [ETS]), as is done in New Zealand. The Environment Act calls on local authorities to develop local nature recovery strategies in their spatial planning; encourages landowners to sign up, on a voluntary basis, to long-term conservation covenants; and introduces Biodiversity Net Gain (BNG) to property developers. These are all steps in the right direction. However, coherence must be sought between these new environmental policy instruments, and between them and public financial support for biodiversity such as the ELM schemes and the Nature Fund for Climate. The United Kingdom could consider taxing building permits in combination with the future land offset market (as part of the BNG policy) to ensure a floor price to the market.

Carbon prices send inconsistent signals across sectors and fuels

Carbon emissions are priced through the UK ETS, which replaced the EU ETS in 2021, fuel duties and a climate change levy (that is not based on fuels' carbon content). In addition, since 2013, a carbon price floor taxes fossil fuels used in electricity generation via carbon price support (CPS) rates on top of the ETS allowances price. The increase in CPS rates has helped drastically reduce the share of coal in electricity generation. Compared with other OECD European countries, effective carbon rates[13] are high in the road and electricity sectors but low in others, especially in the residential and commercial sector (Figure 4). In 2021, only 45% of carbon emissions from energy use were priced above EUR 60 per tonne of CO_2, the midpoint benchmark for carbon costs in 2020.

Figure 4. Carbon prices vary by sector and fuel



Note: Includes emissions from the combustion of biomass. Left panel: Top 5 and bottom 5 OECD Europe countries. Price levels have increased in EU countries in 2021 due to the significant increase in EU ETS prices. This increase is not reflected in the left panel.
Source: OECD (2021), Carbon pricing in times of COVID-19: What has changed in G20 economies? OECD (2021), "Effective carbon rates", OECD Environment Statistics (database).

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The complex system of explicit (ETS, CPS) and implicit (climate change levy, fuel duty and different tax treatments) carbon prices[14] sends inconsistent signals across sectors and fuels. It does not reflect the environmental damages from energy use. For example, while electricity consumption is subject to a carbon price under the ETS and the CPS, gas consumption faces no or low carbon prices. In addition, the cost of support to renewables (such as the renewables obligation and contracts for difference) is passed through

to consumers. This increases electricity bills and provides an incentive to use gas rather than electricity. The United Kingdom is one of the few OECD members to tax diesel and petrol at the same nominal rate. This is positive as diesel has higher carbon content than petrol, and diesel engines generally generate higher local air pollution cost. However, fuel duties have been frozen since 2011, reducing the incentive to shift to public and active transport and to EVs.

NZS commits to implement a net zero consistent trajectory for the annual ETS cap and to explore expanding the system to sectors that are not subject to an explicit carbon price, as planned by the European Union. It also pledges to rebalancing policy costs from electricity to gas bills to ensure that heat pumps are no more expensive to buy and run than gas boilers. However, the government has yet to clarify the role of taxes in achieving UK targets. The exchequer departments have limited understanding of their environmental impact (NAO, 2021b). Recent decisions on taxation (e.g. renewed freeze of fuel duty and vehicle excise duty for heavy goods vehicles (HGVs), suspension of the HGV road user levy, reduced rate for air passenger duty for domestic flights) run counter to climate objectives.

Road pricing will be needed to address transport externalities and loss of fuel tax revenue

Since the first year vehicle excise duty (VED) was based on CO_2 emissions (2001), the number of diesel cars has almost tripled. The 2017 reform reversed this trend by introducing a criterion on NOx emissions in VED. However, average CO_2 emissions per kilometre of new cars have risen over 2016-19, due to the rising share of larger vehicles. After a new car has spent a year on the road, VED is charged at a flat rate. This reduces the incentive to choose low-polluting second-hand vehicles, although EVs are exempt from VED. The government ran a Call for Evidence on increasing VED for more polluting vehicles and greening VED after first registration. Sales of ultra-low emission vehicles[15] have recently increased but only accounted for 10% of new car registrations in 2020. As in other OECD countries, the United Kingdom encourages the use of passenger cars through favourable company car tax taxation, which is not justified on environmental or equity grounds. By contrast, the cycle to work scheme[16] has successfully supported biking and could be further promoted for low income, self-employed workers and employees of small and medium-sized enterprises (SMEs).

As EVs develop, road pricing will be needed to address transport externalities and loss of fuel duty revenue. The London low emission and ultra-low emission zones and congestion charge have reduced congestion and air pollution effectively, although more needs to be done. Bath, Birmingham and Portsmouth have introduced Clean Air Zones that charge entry to the most polluting vehicles. However, private cars are not always charged. Since 2014, there has been a road user levy for heavy goods vehicles using UK roads. However, in practice, only non-UK hauliers pay the charge as UK hauliers receive an equivalent reduction in their VED (Butcher and Davies, 2020). The levy has been based on weight, number of axles and Euro emissions standards since 2019. It was suspended from August 2020 to help the haulage industry recover from the effects of COVID-19. There has been some discussion over the years about introducing a network-wide road pricing system, which would make differential charges based on time and distance travelled. However, it has never been implemented.

Support measures with potential environmentally harmful impact should be tracked

In 2020, the UK government announced an end to support for fossil fuel projects overseas. According to the official definition, the United Kingdom has no fossil fuel subsidies. However, the National Audit Office and OECD Inventory report large tax reliefs supporting fossil fuel consumption. These include reduced rate of value added tax (VAT) on supply of domestic fuel and power; VAT exemption of domestic passenger transport; fuel duty not charged on kerosene used as heating fuel; and reduced rate on diesel used in off-road vehicles (NAO, 2021b). Other measures encourage oil and gas investment in the United Kingdom. The “Ring-fence” corporate income tax enables a 100% first year allowances for capital expenditure by the

oil and gas sector. In addition, operators can fully deduct decommissioning costs from their corporate profits in the year in which they are incurred. In November 2021, Wales joined the Beyond Oil and Gas Alliance, which seeks an end to oil and gas production. The current agricultural policy mix supports farm holdings through decoupled payments and payments that promote environmentally friendly practices. At the same time, market measures and tax rebates on diesel incentivise output and may encourage environmentally harmful practices. Contrary to some other G7 countries, the United Kingdom is not tracking support measures with potential environmentally harmful impact.

Recommendations on green growth

Addressing environmental challenges

- Use the legislation, including the Environment Act, to set ambitious quantitative interim and long-term targets on air quality, biodiversity, water (including marine), waste reduction and resource efficiency and develop plans for achieving them to operationalise the goal of leaving the environment in a better state within a generation.
- Swiftly implement the Net Zero and related sectoral strategies, and ensure that resources allocated are in line with the needs identified; detail the expected mitigation impact of measures adopted and planned.
- Further mainstream biodiversity in land use: accelerate the transition from practice-based payments to farmers to results-based payments; strengthen market-based incentives for carbon sequestration as a means of leveraging private finance for forests and their biodiversity; combine public financial support and the land offset market to direct the net gain in biodiversity towards land with high biodiversity value; consider combining the taxation of building permits with the land offset market to ensure a floor price on the market.

Improving environmental governance and management

- Strengthen co-ordination and peer learning between environmental authorities of the four UK nations in setting and implementing environmental policies and laws.
- Secure human and financial resources necessary to maintain and further develop the good regulatory practices in permitting and compliance assurance.
- Reinforce the environmental aspects of regulatory impact assessment; expand the application of strategic environmental assessment to non-environmental policies, plans and programmes.
- Accelerate implementation of variable administrative monetary penalties; in determining such penalties, put more emphasis on recovering economic benefits of non-compliance.

Promoting investment and economic instruments for green growth

- Systematically screen actual or proposed subsidies, including tax provisions to identify those that are not justified on economic, social and environmental grounds and, on the basis of this assessment, develop a plan to phase out fossil fuel and other environmentally harmful subsidies. Clarify the role of taxes in achieving environmental targets.
- Pursue efforts to consider environmental impacts (including on the natural environment) in cost-benefit analysis of public investment and ensure it is systematically considered in decision making. Foster the use of natural capital valuation tools.
- Carry on with plans to set a net zero consistent trajectory for the annual cap of the UK ETS and to explore expanding the system to sectors not subject to explicit carbon prices, as part of a broader fiscal reform that addresses potential adverse impacts on households and competitiveness.

- Consider how to gradually replace declining fuel duty revenues in the context of the transition to electric vehicles, including looking at policy options such as distance-based charges that may vary with vehicle emissions on national roads, and charge differentiation by place and time in the most congested urban areas. Consider increasing first licence vehicle excise duty for more polluting vehicles and green vehicle excise duty after first registration and abolishing the favourable tax treatment of company cars. Ensure the cycle to work scheme meets its objectives, with consideration of low income, self-employed workers and SME employees.

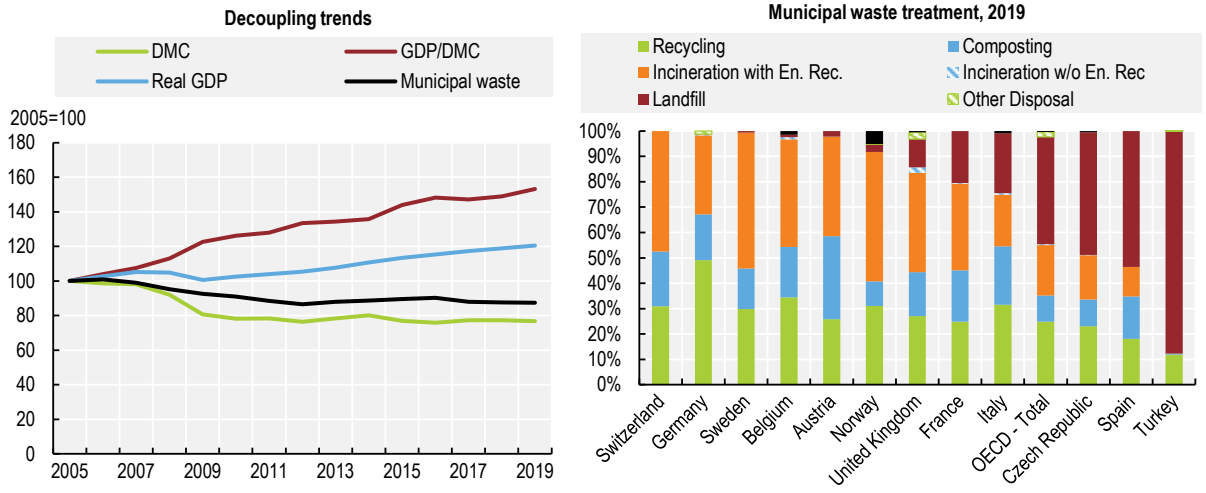
2. Promoting circular economy

The United Kingdom has decoupled domestic material consumption and municipal waste generation from economic growth

The United Kingdom has a highly service-oriented economy, and its domestic material productivity is the third highest among OECD countries. Domestic materials consumption (DMC), which remained flat from 2010 to 2019, exhibited absolute decoupling from GDP growth, resulting in improved material productivity (Figure 5). Consumption of fossil fuel carriers fell steadily with the shift from coal to renewables. However, there was increased consumption of non-metal minerals (used largely in construction) and of biomass. The UK's material footprint, which includes materials processed abroad for products consumed domestically, increased over 2010-17.

Municipal waste generation fell between 2005 and 2019, although both GDP and population grew in this period (Figure 5). Municipal waste generation per capita is below both OECD and OECD Europe averages. Some of the decline in municipal waste generation (as well as the comparatively low level per capita) may be due to statistical factors. However, new policy measures and greater public awareness influenced the trend. By contrast, other waste streams grew, notably construction waste, which represented half of all primary waste in 2018. As a result, generation of primary waste increased by 13% from 2010 to 2018.

Figure 5. Material productivity and waste treatment have improved



Note: Real GDP at 2015 prices. DMC refers to the amount of materials directly used in the economy, or the apparent consumption of materials. DMC is computed as domestic extraction used minus exports plus imports. Material productivity designates the amount of GDP generated per unit of materials used (GDP/DMC).
Source: OECD (2021), Environment Statistics (database).

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Landfilling of municipal waste fell while incineration increased – and recent policies set out further efforts to strengthen recycling and composting

From 2005 to 2019, the United Kingdom sent a steadily decreasing share of municipal solid waste to landfills, while the share of incineration grew from about 10% to 40% in 2019 (Figure 5). The shares of recycling and composting have grown. However, since 2010, their growth on a UK-wide basis has been slow.

A steadily rising landfill tax played a key role by establishing a strong incentive for these shifts: the current rate (GBP 96.70/tonne) is among the highest in the world. With this economic instrument and further measures to restrict landfilling, the United Kingdom has implemented the recommendations in OECD's 2002 review to revise landfill-related measures and reduce landfilling. Unlike many other OECD Europe countries, however, the United Kingdom does not have incineration taxes.

In Northern Ireland, Scotland and Wales, waste plans and strategies early in the past decade called for greater recycling, which has increased steadily along with composting in these devolved nations. In Wales, 65% of household waste was recycled or composted in 2019, meeting the EU's 2020 target (50%) that has been transposed into legislation for all parts of the United Kingdom. Northern Ireland also met this target, although Scotland did not. Nor did England, where recycling did not increase strongly. In England and Scotland, recycling rates vary greatly across local authorities. The 2020 target was not met for the United Kingdom as a whole.

Local authorities throughout the United Kingdom organise kerbside collection of recyclables and residual waste. About half of local authorities in England collect food waste separately, as do nearly all those in Northern Ireland, reaching almost all households, and all authorities in Wales. In Scotland, local authorities are required to collect food waste separately in urban areas, and some do in rural areas as well. Independent organisations – the Waste and Resources Action Programme (WRAP) and Zero Waste Scotland (ZWS) – have supported waste goals by, among others, advising local authorities and co-ordinating public awareness campaigns.

Several factors, however, have limited the effectiveness of separate collection. In England, about half of local authorities give households a single bin for all their dry recyclable waste. This must then be separated in sorting plants, which can lead to losses in recyclable material. The types of plastics and other waste that should be separated vary across local authorities (including across the boroughs in Greater London), creating confusion for some households. Moreover, many local authority budgets fell in the first half of the last decade, leading to cuts in their public awareness activities to support separate collection.

The United Kingdom has exported large volumes of refuse-derived fuel for incineration with energy recovery (principally to EU member states) and of waste for recycling. Large volumes of plastic scrap have been exported for recycling to the People's Republic of China (until its ban on imports), to Southeast Asian countries and to Turkey. While trade can move waste to foreign markets for recycling, there have been cases of improper disposal. The United Kingdom has recently stepped up efforts to tackle illegal waste exports; moreover, the UK government has pledged to end exports of plastic scrap to non-OECD countries.

England's 2018 Resources and Waste Strategy and its 2021 Waste Management Plan call for major reforms; the 2021 Environment Act establishes a common approach for collection of recyclables in household waste in England, food waste collection in all local authorities, and a UK-wide electronic waste tracking system to inform more targeted action on waste prevention and recycling and to help tackle waste crime, including illegal exports. These policy documents, together with ambitious policies already in place or planned by devolved governments, set the stage for higher levels of recycling and composting in England and across the United Kingdom.

These reforms will need to be designed and implemented carefully to ensure that local authorities receive adequate resources to strengthen waste management. At present, UK local authorities do not directly

charge households for waste collection and treatment as council taxes lack a line item for waste management. The United Kingdom should consider promoting, where appropriate, pay-as-you-throw approaches that could link household costs to residual waste levels and thus encourage waste reduction and recycling. This would follow a recommendation in the 2002 OECD Review for waste charges to encourage minimisation of household waste.

Extended producer responsibility (EPR) has supported recycling, but EPR schemes need reform

The United Kingdom has EPR schemes for packaging waste, end-of-life vehicles, batteries and accumulators, and waste electrical and electronic equipment (WEEE). While most EPR targets have been met, the performance of the EPR schemes has been hindered by several shortcomings: the UK National Audit Office has raised concerns, for example, that packaging waste data are not accurate (the forthcoming electronic waste tracking system is expected to improve data accuracy). Moreover, in this EPR scheme, mechanisms create greater incentives for export of plastic scrap than domestic recycling. EPR schemes do not support local authorities in their collection of packaging recyclables from households.

The UK government and the devolved governments are preparing a series of reforms to strengthen EPR schemes, starting with packaging waste and to establish deposit-refund systems for beverage containers. Reforms for the WEEE scheme will go for consultation in 2022; a proposal for a new EPR scheme for textiles and reforms to the existing EPR scheme for batteries and accumulators are also in preparation. England's 2018 Resources and Waste Strategy calls for new EPR schemes for bulky household waste such as furniture, certain construction waste streams, vehicle tyres and commercial fishing gear. The United Kingdom and the devolved governments will need to design these reforms carefully to ensure they reduce waste generation and increase waste recycling and reuse. For example, the United Kingdom could explore adapting the forthcoming deposit-refund schemes to promote beverage container reuse.

Despite progress, contaminated sites and illegal waste dumping need further attention

The United Kingdom, birthplace of the Industrial Revolution, has a high number of contaminated sites. However, there are no registers of potentially contaminated land and no common system of assessment. In 2005, it was estimated that 325 000 sites in England and Wales were affected to some degree by contamination. In 2008, 67 000 sites were estimated as contaminated in Scotland.

Local authorities have primary responsibility for identifying contaminated land sites and requiring clean-up if they find unacceptable risks to human health (England's Environment Agency and its counterparts in the devolved governments take responsibility for special sites). From 2000 to 2013, local authorities inspected just under 39 000 sites in England, Scotland and Wales, about two-thirds of the sites where inspection was considered necessary. Over 2000-18, about 600 sites were determined to have contaminated land in England; of these, almost 500 were undergoing clean-up in 2018. England and the devolved administrations have followed the recommendation in the 2002 OECD Review to implement legislation for remediation of contaminated land. However, progress in the inspection of potentially contaminated sites and in clean-up actions has slowed since 2013. Renewed efforts are needed to increase the pace of site identification and clean-up.

Across the United Kingdom, illegal waste dumping has been an important concern. Just under 1 million incidents on public land were reported in the fiscal year that ended in April 2020. Illegal dumping reportedly increased in 2020 during the COVID-19 pandemic. In England and Scotland, new measures tackle this issue, increasing fines and strengthening local authority powers. In 2020, environment agencies and police forces across the United Kingdom formed a unit for waste crime to address the problem of organised crime groups operating in the waste sector. The United Kingdom has implemented the 2002 OECD recommendation to strengthen measures against illegal disposal; however, further efforts are needed.

England's 2018 Resources and Waste Strategy sets out a range of measures, and the 2021 UK Environment Act strengthens powers against waste crime.

Current initiatives for the circular economy provide a basis for further actions across the United Kingdom

UK policies have set long-term ambitions to improve resource efficiency and move towards a circular economy: England's 2018 Resources and Waste Strategy, for example, calls for doubling resource efficiency (measured in terms of GDP per DMC) by 2050; Scotland's 2016 circular economy strategy, Making Things Last, supports zero waste objectives; the 2021 Welsh circular economy strategy, Beyond Recycling, includes zero waste and net zero carbon objectives for 2050.

In 2020, the United Kingdom and the devolved governments jointly published a Circular Economy Package that underlines the benefits of the transition to a circular economy. In 2022, the United Kingdom will introduce an innovative tax on plastic packaging containing less than 30% recycled content.

The UK government is integrating circular economy goals into industrial and economic policies. The NZS includes the transition to the circular economy, and the UK government is exploring opportunities to integrate circular economy into its industrial policy approach. The 2021 Energy-related products policy framework calls for products that can be more easily repaired, remanufactured and recycled, and the UK government is working on a broader products policy that will include circular economy goals. However, the UK's 2021 Build Back Better Plan contains few references to circular economy goals. Until 2014, a National Industrial Symbiosis Programme sought to strengthen material flows among industrial enterprises, but little information is available on its results.

Local governments, including Glasgow and the Greater London Council, have launched circular economy initiatives, with further measures in preparation. Independent organisations such as the Ellen MacArthur Foundation, WRAP and ZWS have promoted circular economy initiatives in industry. WRAP has brought together industry stakeholders in voluntary agreements to tackle plastic waste, food waste and textiles waste. Signatories of the Sustainable Clothing Action Plan, for example, reduced waste throughout clothing lifecycles by 2.1% between 2012 and 2020.

Current government and private actions provide a strong basis for further work on circular economy and resource efficiency. However, further initiatives will be needed to achieve the UK's ambitious long-term objectives. In the construction sector, for example, use of materials such as aggregates and other non-metal minerals and the generation of construction and demolition waste rose from 2010 to 2018, in parallel with the sector's output. This increase occurred despite government policies and actions to increase the sector's resource productivity.

Further co-ordination will be needed to ensure the effectiveness of waste and circular economy policies

Until EU exit, EU policy and legislation provided a common approach and a driver for waste and circular economy policies across the United Kingdom. Joint Ministerial Committees between the UK government and devolved administrations are used to share information and discuss common issues, and informal contacts among officials have been strong. A sectoral policy board and management group have brought together officials for joint planning on packaging waste reforms. In 2021, the United Kingdom and the devolved governments were preparing a Common Framework for Resources and Waste that should provide a context for formal co-operation structures. Devolution has allowed the nations to undertake ambitious policy actions in areas where they have powers: one example is the high level of municipal waste recycling achieved in Wales and, in Scotland, the ban on landfilling biodegradable municipal waste from 2025.

Nonetheless, to achieve long-term waste management and circular economy goals and to maintain high policy ambitions, formal co-operation mechanisms will need to be strengthened, both among the four nations and also among local authorities. In addition, regular reviews and independent evaluations are needed to strengthen policy implementation and development.

Recommendations on waste management and circular economy

Policy ambition, coherence and co-ordination

- Continue and strengthen the integration of circular economy policies with industrial and carbon reduction policies.
- Consider how promoting greater domestic recycling and reprocessing capacity and increasing industrial symbiosis can support circular economy goals while ensuring greater economic resilience. Strengthen policy goals and initiatives for the repair, reuse and remanufacturing of products while creating local jobs.
- Continue development of a UK product design strategy that supports circular economy goals. This could draw on current work in the European Union and other OECD economies for product standards on durability, reuse, repair and recyclability, together with co-ordination with other advanced economies, including via OECD working parties.
- Expand resource efficiency goals to incorporate the reduction of the UK's worldwide material footprint.
- Strengthen formal and informal mechanisms for co-ordination, peer learning and policy development among environmental authorities of the four UK nations in setting, implementing and evaluating waste management and circular economy policies.
- Provide additional funding to support local authorities, catalyse private sector action, and promote innovative waste and circular economy initiatives, including via independent organisations such as WRAP and Zero Waste Scotland.

Policy instruments

- Ensure effective implementation of England's waste management reforms, including the kerbside collection of household food waste and national guidance for separate collection of a core set of recyclable waste streams to reduce co-mingling.
- Ensure that local authorities have adequate capacity and resources to put reforms in place and reach minimum recycling rates. Strengthen financing of waste management at local level where needed. Consider the use of pay-as-you-throw mechanisms that can provide incentives for waste reduction, as well as moving to full financing of waste collection and treatment costs via user fees, in line with the polluter pays principle.
- Carry out public information campaigns to support successful implementation of the new requirements.
- Develop mechanisms to increase resources and capacity for local authorities for the identification and clean-up of contaminated sites to accelerate progress.
- Continue and strengthen actions to tackle illegal waste dumping and illegal waste exports, including the introduction of an electronic waste tracking system, and fulfil policy goals to end exports of plastic scrap to non-OECD countries.
- Put in place planned reforms to extended producer responsibility schemes to improve the performance of existing systems, extend EPR to new waste streams, and establish co-operation

between EPR schemes and local authorities. Consider options to use the new deposit-refund schemes to promote beverage container reuse and consider opportunities for new deposit-return systems for waste streams with hazardous components such as portable batteries.

- Consider further use of economic instruments to promote waste management and circular economy goals, in particular introduction of incineration taxes to provide further incentives for recycling and avoid a "lock-in" of incineration capacity, plus an increase in aggregates tax to encourage further resource efficiency and recycling in construction. After monitoring the results of the plastics tax, to be introduced in 2022, consider the feasibility of increasing the minimum recycled content and of introducing taxes to promote recycled content in other products.
- Continue and enhance initiatives for private sector action on circular economy, including support for voluntary agreements, innovative research and co-operation with local authorities and civil society.
- Use the UK's innovative work on measures of the carbon footprint of waste streams and waste treatment to identify opportunities to further reduce the direct and indirect carbon emissions of each economic sector. Develop and implement methods to track the results of circular economy initiatives on domestic materials consumption, material footprint and carbon emissions, including in the construction sector.

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Notes

[1] Integration principle, prevention principle, precautionary principle, rectification at source principle and polluter pays principle.

[2] The Climate Change Act requires consideration of the "differences in circumstances between England, Wales, Scotland and Northern Ireland". Each of the devolved administrations is committed to the UK net zero commitment in the Climate Change Act, but the level of ambition through the carbon budgets and individual targets set by the nations can vary. Collectively, Scotland, Wales and Northern Ireland accounted for 22% of UK emissions in 2019.

[3] Excluding international aviation and shipping emissions, in line with the United Nations Framework Convention on Climate Change.

[4] As set in the fifth carbon budget.

[5] In 2021, the guideline value was reduced from 10 µg/m^3 to 5 µg/m^3.

[6] In Scotland, 63% of surface waters achieved a « good ecological status » in 2020.

[7] The JNCC did not assess progress towards Target 18, relating to Indigenous peoples and local communities, as it was deemed not relevant to the United Kingdom.

[8] The IUCN protected area management categories, classify protected areas according to their management objectives but do not provide any indication of whether protected areas are managed or enforced effectively. IUCN categories are not truly hierarchical; however, sites designated as the "stricter" categories (I-II in particular) are likely to be more restrictive in the sorts of permitted activities. Different approaches are likely explained by varying national priorities but also by factors such as local geography, ecology and pre-existing patterns of human settlement.

[9] OEP coverage of Northern Ireland remains subject to agreement from the Northern Ireland Assembly.

[10] Of which GBP 3.7 billion for flood defences and GBP 0.5 billion for biodiversity.

[11] As set out in the Environment Act, ministers have to take due regard of environmental principles when making policy.

[12] The devolved governments are also developing new agricultural policies.

[13] Effective carbon rates summarise how countries price carbon through fuel excise taxes, carbon taxes and ETS.

[14] The UK ETS is jointly managed by all four nations. CPS, CCL, fuel duty and tax treatments are reserved to the UK government.

[15] Emitting less than 75 g of CO_2 from the tailpipe for every kilometre travelled. Includes battery electric, plug-in hybrid electric and fuel cell EVs.

[16] The arrangement allows employers to buy or lease bicycles and related equipment for their employees who pay back this amount through a salary sacrifice for an agreed period. It provides income tax and social contributions savings for employees whose benefit is not taxable.

Annex 1. Actions taken to implement selected recommendations from the 2002 OECD environmental performance review of the United Kingdom

Recommendations	Actions taken
Chapter 1. Towards green growth	
Continue efforts to reduce NOx, particulate and NMVOC emissions, in light of persistent problems with high concentrations of NO_2, PM_{10} and ozone in some areas.	Emissions of nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOC) and particulate matter (PM) have declined over recent decades with the shift from coal to gas and renewable energy, and stricter emission standards and regulations. The 2017 UK Air Quality Plan for nitrogen dioxide (NO_2) set out the government approach for reducing roadside NO_2 concentrations and meeting the statutory limits. In 2020, 5 of 43 zones exceeded the annual mean limit value for NO_2, down from 33 in 2019, due to reduced traffic flows associated with COVID-19 restrictions. The 2019 Clean Air Strategy and National Air Pollution Control Programme (to be revised in 2022) detailed policies and measures to meet the 2020 and 2030 emission reduction targets. The 2021 Environment Act provides for two legally binding targets for $PM_{2.5}$ to be set in 2022.
Implement area-wide emission control more consistently, providing more precise guidance to local authorities and taking measures to reinforce their management capacity where necessary.	As of mid-2021, about two-thirds of local authorities had one or more "Air Quality Management Area" (AQMAs) in areas exceeding objectives. Most AQMAs are in urban areas and have been established to address air pollution from traffic emissions of NO2, PM10 or both. Action plans set out the measures (such as congestion charging, traffic management, planning and financial incentives) the local authorities propose to meet the air quality objectives. The Department of Environment, Food and Rural Affairs (Defra) advises local authorities on how to prepare their action plan through a dedicated website.
Strengthen transport demand management measures, including through the use of local authorities' new powers to set road use charges and workplace parking levies.	London has introduced low emission and ultra-low emission zones and congestion charges that have reduced congestion and air pollution. Bath, Birmingham and Portsmouth have introduced Clean Air Zones, charging entry to the most polluting vehicles. However, private cars are not always charged.
Improve integration of air management concerns into transport policies and plans, particularly at the local level through better land use planning.	The 2021 Transport Decarbonisation Plan aims to deliver significant benefits from improved air quality; and to embed transport decarbonisation principles in spatial planning. Efforts are being made to align the climate and well-being agendas through street redesign and management.
Continue to integrate local, regional and global atmospheric management concerns into energy policies.	UK's commitment to end coal use by 2024, EU air quality regulations and EU Emissions Trading System (replaced by the UK ETS in 2021), support to renewables and increased carbon price support rates have contributed to significant reductions in greenhouse gas (GHG) emissions from electricity generation. The 2021 Net Zero Strategy calls for fully decarbonising electricity by 2035, subject to security of supply, and rapidly electrifying transport, heating and industry. These actions would be supplemented by low-carbon hydrogen, carbon capture and land-use change.
Increase the number of designated sensitive areas and complete urban waste water treatment infrastructure, especially that needed to reduce pollutant discharges to coastal waters.	In 2016, 398 sensitive areas and 233 catchments of sensitive areas covered 45% of the national territory. The United Kingdom complied with the collection and secondary treatment targets of the EU Urban Waste Water Treatment Directive, and was close to achieving the more stringent target. However, pollution from sewer overflows is of particular concern.
Fully implement the biodiversity action plan through local action plans, and improve monitoring of the condition of individual species and habitats.	The 2021 Environment Act calls on local authorities to develop local nature recovery strategies in their spatial planning, encourages landowners to sign up, on a voluntary basis, to long-term conservation covenants; and introduces Biodiversity Net Gain to property developers. The Royal Society for the Protection of Birds improved species monitoring through its 2019 state of nature report. A UK Habitat Classification was released in 2018 to improve habitat monitoring.

Continue to encourage the expansion of woodland and forest cover and to promote sustainable forestry in line with the UK forestry standard.	The United Kingdom has allocated GBP 750 million to England's Nature for Climate Fund to support the creation, restoration and management of woodland and peatland habitats from 2020 to 2025. The devolved administrations have also published plans for woodland creation and peatland restoration.
Further promote agri-environmental programmes, as allowed for under the EU Common Agricultural Policy (CAP). Further extend the shift of CAP resources towards integrated rural development programmes, including through agri-environmental measures.	The United Kingdom has devoted a large share (70%) of the CAP Rural Development Programme (RDP) 2014-20 to ecosystem protection, particularly England (81%). Scotland is spending 18% of its RDP on forest carbon sequestration (3% for Northern Ireland and Wales, 0% for England). Little is spent on practices meant to mitigate GHG and ammonia emissions. In 2020, UK agricultural support included GBP 2.7 billion in payments that may incentivise outputs and increase environmental pressure through on-farm investments and input use. This is four times the agricultural support for environmental protection under the RDP. Most of the payments inherited from the CAP will gradually be replaced by payments for public goods through environmental land management schemes.
Develop and implement comprehensive legislative and institutional mechanisms for marine nature conservation, fully implementing the EU Habitats Directive in the 200-mile exclusive economic zone.	The countries have jointly developed the UK Marine Strategy (between 2012 and 2015, updated in 2019 and 2021) to achieve good environmental status in their marine waters by 2020. The extent of marine protected areas has increased by 30 million hectares over 2010-20.
Continue to promote measures to conserve wildlife species that are in decline, and regularly monitor their status as a basis for establishing related conservation measures.	Priority species for conservation action have been identified for each UK country on the basis of their threatened status or population trends. Measures implemented to prevent species extinction and improve the conservation status of species in decline include protected areas, species reintroductions and reinforcement programmes, together with a suite of broader conservation measures intended to improve land management, promote habitat recovery or restoration, and reduce pollution through, for example, agri-environment schemes and legal protection.
Strengthen inspection and enforcement and related monitoring efforts, as necessary to implement revised environmental regulations.	The risk-based approach, together with the emphasis on compliance promotion, has helped UK environmental authorities to improve permit compliance levels over the years. Over the last decade, the United Kingdom has emphasised administrative response to non-compliance, as the number of criminal prosecutions has declined steadily. The decriminalisation of less severe violations has made enforcement more proportionate to non-compliance, more expedient and more efficient. Enforcement undertakings have been increasingly used.
Continue to integrate environmental concerns into land use planning.	Strategic environmental assessment is widely used, particularly in land-use planning. For example, it is integrated into the broader sustainability assessment, which is a legal prerequisite for the adoption of local spatial plans in England and Wales.
Reflect sustainable development objectives more systematically in public service agreements and through integrated analysis (e.g. extended cost benefit analysis) of policy measures.	The United Kingdom has made progress in integrating environmental objectives into departmental plans. The 2021 Autumn Budget and Spending Review outlines the public spending contribution to net zero and other green objectives. The Green Book provides guidance on how to appraise the costs and benefits of policies, projects and programmes. It has been updated to include stronger guidance on establishing clear objectives; to account for the effects of climate change even where net zero is not the primary objective of a proposal; to embed a natural capital approach in appraisal, and to better value unmonetisable costs and benefits.
Amend the Building Act to address the operational energy efficiency of existing buildings, and launch a comprehensive policy, with clearly defined targets, to substantially upgrade energy efficiency in existing buildings.	Building Regulations have been amended many times and are under review. Despite progress in improving energy efficiency of buildings in the past decade, the United Kingdom is not on track to meet targets set in the 2017 Clean Growth Strategy (prior to its net zero commitment). The 2021 Heat and Buildings Strategy provides for standards and regulations to improve buildings performance and phase out the installation of high-carbon fossil fuel boilers off the gas grid. It also provides public funding to support energy efficiency and low-carbon heat for social housing, those in fuel poverty, local authorities and public sector buildings, plus a small number of heat pumps and some heat networks. There are concerns about insufficient funding to backup the strategy and the lack of mechanisms to improve energy efficiency of owner-occupied homes.
Strengthen the incentive role of economic instruments in inducing targeted modal shifts in transport, with appropriate phasing and consultation.	Fuel duties have been frozen since 2011, reducing the incentive to shift to public and active transport. The cycle to work scheme has successfully supported biking. See above on low emission and Clean Air Zones. See below on other economic incentives.
Work to increase public perception of fuel- and vehicle-related taxes as tools for achieving environmental goals, improving public transport and promoting low-emission vehicles and their refuelling infrastructure.	Although the UK government has recognised taxes as an important instrument for environmental policy, the exchequer departments have limited understanding of their environmental impact. The government has yet to clarify the role of taxes in achieving UK climate targets.
Review and adjust, if appropriate, economic incentives in the energy and transport sectors to facilitate full implementation of the climate change programme.	Carbon emissions are priced through the UK ETS, fuel duties and a climate change levy (CCL). In addition, since 2013, a carbon price floor taxes fossil fuels used in electricity generation via carbon price support (CPS) rates on top of the ETS allowances price. The increase in CPS rates has helped drastically reduce the share of coal in electricity

	generation. The complex system of explicit and implicit carbon prices sends inconsistent signals across sectors and fuels. In the past decade, tighter emission performance standards and vehicle excise duty (VED) based on CO_2 emissions have helped reduce average CO_2 emissions per km of new vehicle sales. However, average emissions of new cars have risen over 2016-19, due to the rising share of larger vehicles. The 2017 VED reform reversed the upward trend in diesel car registrations by introducing a criterion on NOx emissions. However, it weakened the link between VED liabilities and CO_2 emissions after a vehicle is first registered, reducing the incentive to choose low-polluting second-hand vehicles. The United Kingdom encourages the use of passenger cars through favourable company car tax taxation.
Study and develop the extension of the climate change levy into a broader based tax on greenhouse gas emissions.	The CCL applies to solid fossil fuels, liquefied petroleum gas, natural gas and electricity when supplied to business and public sector users. It is not based on fuels' carbon content. Energy-intensive businesses with a climate change agreement with the Environmental Protection Agency are entitled to discount CCL rates.
Increase official development assistance towards the Rio commitment of 0.7% of GNI and establish clear procedures for mainstreaming environmental objectives into projects.	The United Kingdom allocated 0.7% of its gross national income (GNI) to official development assistance (ODA) over 2013-20. In 2019, it committed GBP 11.6 billion in dedicated climate finance over the 2021/22–2025/26 period equally split between mitigation and adaptation. This is double the level of support over the previous five-year period and is protected at this level against the announced temporary cuts in ODA from 0.7% to 0.5% of GNI. The funding is additional to the contribution to large multilateral development banks, some of which will be used to support climate-related projects. The United Kingdom has also committed to align the full extent of its ODA spending with the Paris Agreement.
Chapter 2. Promoting a circular economy	
Establish a systematic data collection and information system concerning the generation, recovery and disposal of non-municipal waste.	The National Packaging Waste Database compiles data on this waste stream, as well as on batteries, and waste electrical and electronic equipment. England's 2018 Resources and Waste Strategy underlines the need to improve waste data from business. It calls for an electronic waste tracking system that would cover all types of waste. The 2021 Environment Act provides the legal basis for creating this system, which will be UK-wide.
Introduce effective measures to encourage waste minimisation (e.g. waste charges for household waste, material resource efficiency standards) and accelerate efforts to increase material recovery rates.	Local authorities in the United Kingdom do not directly charge households for waste collection and treatment as council taxes lack a line item for waste management. General council taxes partially cover municipal waste management costs. UK governments have established ambitious long-term goals for resource efficiency. For example, the 2018 England Resources and Waste Strategy calls for doubling resource efficiency by 2050. Beyond Recycling, the 2021 Circular Economy Strategy for Wales, highlights the role of social enterprises for product repair and reuse. The 2021 Environment Act provides a legal basis to set product resource efficiency requirements, including for durability, recyclability and reparability.
Review present systems of charging users for waste, identifying opportunities to strengthen economic incentives for resource efficiency.	Households do not pay direct waste charges (except for uncommon waste streams, such as bulky waste), though business users do. The council tax system has not changed since OECD's 2002 Review.
Increase investment in waste treatment facilities.	UK governments and the private sector have increased investment in waste treatment facilities. For example, the Waste Infrastructure Delivery Programme supported 27 public-private projects in England in the period to 2013. The Waste Infrastructure Procurement Programme secured over GBP 740 million in new infrastructure in Wales over 2010-19. Total UK public investment in waste management increased from 2010 to 2017 but decreased slightly in 2018 and 2019.
Strengthen measures to prevent and discourage illegal disposal of waste, with emphasis on inspection and enforcement.	The United Kingdom has increased inspection and enforcement of illegal waste dumping, as well as illegal waste exports. The 2021 Environment Act strengthens authorities' powers to tackle waste crime and provides a legal basis for a waste tracking system to better monitor waste movements: the system is intended to be a key tool to address illegal waste disposal.
Review and revise landfill-related measures (e.g. landfill tax rates, exemptions; inspection and enforcement) so as to more effectively support objectives related to reduction of landfilling and diversion of waste to unlicensed sites.	The United Kingdom has significantly increased landfill taxes, which has been one of the main drivers for reducing landfilling of municipal waste.
Accelerate measures to ensure that treatment and disposal of hazardous waste are organised in an environmentally sound and economically efficient manner (e.g. eliminating "co-disposal"), and clearly identify infrastructure needs.	The United Kingdom has transposed the EU's 2008 Waste Framework Directive, which bans mixing of hazardous waste with non-hazardous waste. Defra's 2010 Strategy for Hazardous Waste Management in England set out principles, actions and guidance to implement the directive's provisions on hazardous waste and identified facility needs.

Assure implementation of new legislation on remediation of contaminated land.	The United Kingdom has implemented its legislation for the remediation of contaminated land, although in England the pace of remediation has slowed in recent years.
Continue efforts to improve resource efficiency and conservation through increased recycling and reuse of construction materials and sites, and strengthen control of illegal disposal of construction and demolition waste.	UK government policies including England's 2018 Resources and Waste Strategy and Scotland's 2016 circular economy strategy, *Making Things Last*, call for improved resource productivity, reduced waste and increased waste recycling and reuse in the construction sector. Independent initiatives with construction companies include the Waste and Resources Action Programme's "Halving Waste to Landfill" (2008 to 2015). In 2021, The UK Green Construction Board published a *Routemap for Zero Avoidable Waste in Construction*. Inspection and enforcement of illegal waste dumping have been strengthened and further actions are planned.

Source: Findings of the 2022 EPR.

Chapter 1. Towards green growth

This chapter provides a brief overview of key environmental trends in the United Kingdom and progress towards climate change and biodiversity targets. It assesses the environmental effectiveness and economic efficiency of the environmental policy mix, including regulatory and voluntary instruments, fiscal and economic instruments and public and private investment in environment-related infrastructure. It examines the interaction between the environment and other policy areas with a view to highlighting the opportunities and barriers to environmentally friendly and socially inclusive growth.

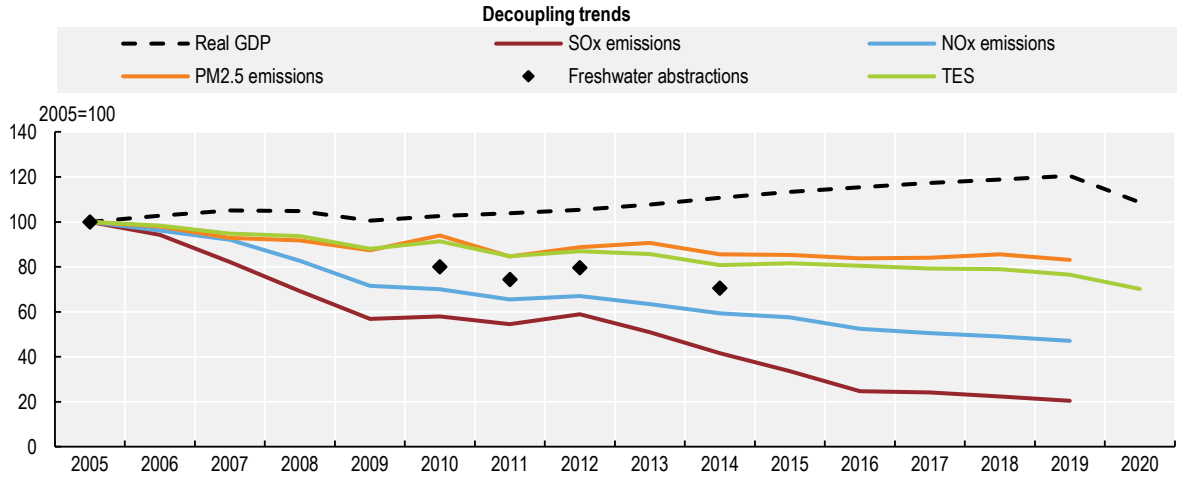
1.1. Addressing environmental challenges at the time of EU exit and COVID-19[1]

Over the past decade, progress has been made across the United Kingdom in decoupling several environmental pressures from economic growth (e.g. greenhouse gas [GHG] and air pollutant emissions; municipal waste generation; energy and material consumption; water abstractions) (Figure 1.1); in improving wastewater treatment; and in expanding the network of protected areas. However, air pollution, including from domestic heating and road traffic, remains a health concern. Agricultural management, climate change and infrastructure development continue to put pressure on the natural environment, causing habitat loss, fragmentation and degradation (Hayhow et al., 2019). Further efforts are needed to achieve net zero GHG emissions by 2050, address the growing risks of climate change, reverse the loss of biodiversity and ensure a more resource-efficient circular economy.

The UK government has devoted a great deal of time and effort to ensuring EU environmental law was adequately retained in the national legislation after exit from the European Union (EU exit) on 31 January 2020. The Environment Act 2021 lays out a domestic framework for environmental governance post-EU exit (most provisions apply to England only). It puts environmental principles[2] into law; introduces legally binding long-term targets on air quality, water, biodiversity, resource efficiency and waste reduction; and establishes a new Office for Environmental Protection (OEP). The implementation of the Act, the setting of targets and the operation of the OEP will tell whether the UK government's ambition is commensurate with the challenge of protecting and enhancing the environment for future generations.

The United Kingdom has been hard hit by the coronavirus pandemic, with the largest gross domestic product (GDP) contraction (-9.7%) in the G7 in 2020 (OECD, 2021a). A fast initial roll-out of COVID-19 vaccines has weakened the link between new COVID-19 cases, hospitalisations and deaths, allowing a broad reopening of the economy. Activity rebounded quickly driven by consumption growth, and GDP is expected to reach its pre-pandemic level at the beginning of 2022. It is estimated that the long-run GDP will be reduced by 4% by the EU exit and a further 2% by the pandemic (OBR, 2021a).

Figure 1.1. The United Kingdom has made progress in decoupling several environmental pressures from economic growth



Note: GDP at 2015 prices. TES: Total energy supply.
Source: OECD (2021), Environment Statistics (database).

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1.1.1. *Progress towards climate targets*

Objectives

The United Kingdom is at the forefront of global climate action. Ahead of its presidency of the 2021 UN Climate Change Conference of the Parties (COP26) in Glasgow, it has led the way by raising its national ambition. In 2019, it was the first G7 country to legislate for net zero GHG emissions by 2050[3] to deliver on the Paris Agreement, a step up from its previous 80% reduction target. In 2020, it submitted a new Nationally Determined Contribution committing to reduce GHG emissions[4] by at least 68% by 2030 from 1990 levels. This is a clear progress from the previous commitment of 57%[5] and the highest reduction target set by a major economy (Cuming, 2021). The 2008 Climate Change Act has been the key driver of the UK's climate policy (Box 1.1).

Box 1.1. The 2008 Climate Change Act: A gold standard for climate action

The 2008 Climate Change Act was adopted on the basis of cross-party consensus. It provided for the establishment of a long-term emissions goal and interim targets expressed in five-year carbon budgets (CB), which the government is legally obliged to achieve. The Act directed that these targets should be established on the basis of advice from an independent expert body – the Climate Change Committee (CCC), which reports on progress to Parliament rather than to the government. The CCC's mandate extends beyond parliamentary elections, which has helped ensure the UK's direction on climate change remains focused on the long-term target.

Originally, the Act committed the United Kingdom to reduce its GHG emissions by 80% by 2050, compared to 1990 levels. The first five CBs were set to achieve this goal. CB1, 2, 3 (2008-12, 2013-17 and 2018-22) were set in 2009. CB4 (2023-27) and CB5 (2028-32) were set in 2011 and 2016.

In 2019, to reflect the government's net zero ambition, the headline target of the Act was amended. In 2021, following the CCC's recommendations, the government set CB6 (2033-37), which would cut emissions (including international aviation and shipping emissions) by approximately 78% by 2035. This is the first CB setting the path to the UK's net zero target.

The Act also requires the government to publish a UK-wide climate change risk assessment (CCRA) every five years and to develop a National Adaptation Programme to respond to climate risks across England. CCRA also informs the corresponding programmes of the devolved governments.

The Act has served as a model for the development of climate laws in a number of countries (e.g. Denmark, France, Germany, Mexico, New Zealand, Sweden).

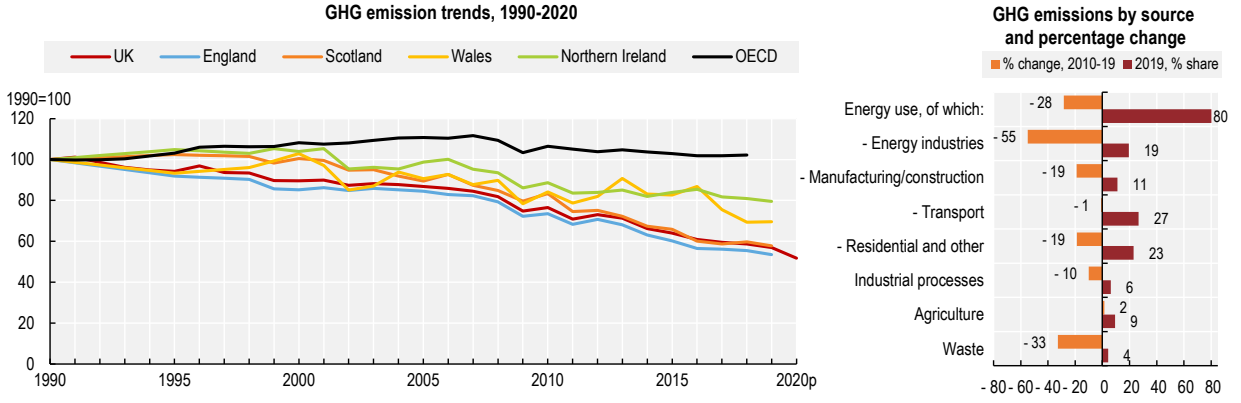
Source: CCC (2020), CCC Insights Briefing 1: The UK Climate Change Act.

Mitigation

The UK's GHG emission intensities per capita and per GDP (excluding emissions from land use, land-use change and forestry) are low compared to other OECD countries. However intensity per capita is above the OECD Europe average when emissions embedded in imported goods and services are included (OECD, 2021b). The country has one of the strongest records of emission reductions in the OECD over 1990-2019 (-44%) (Figure 1.2). Energy industries have been the largest source of emission reductions, with the shift in electricity generation from coal to gas and, in the past decade, to renewable energy. With the COVID-19 crisis, GHG emissions are estimated to have decreased by 9% in 2020, primarily due to the decline of road transport during the lockdowns and the reduction in business activity. Compared to the

OECD average, the UK's emissions structure has a higher share of transport (2019: 27% vs 24%), residential and commercial sectors (21% vs. 11%) and a lower share of energy industries (19% vs. 29%) (OECD, 2021b).

Figure 1.2. GHG emissions have fallen significantly, especially in the power sector



Note: Excluding emissions from land use, land-use change and forestry. 2020 data are preliminary. Right panel: "other" includes emissions from fuel combustion in the commercial/institutional and agricultural sectors and fugitive emissions from fuels.
Source: BEIS (2021), 2020 UK greenhouse gas emissions, provisional figures; BEIS (2021), National Inventory Report 2021; NAEI (2021), Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019; OECD (2021), Environment at a Glance Indicators, Climate change.

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The United Kingdom met its emissions reductions target for the first commitment period of the Kyoto Protocol (2008-12) (Figure 1.3). Under the terms of the Withdrawal Agreement, it remains committed to its shared target with the European Union under the Kyoto Protocol as part of the Joint Fulfilment Agreement (BEIS, 2021a). The United Kingdom had to reduce emissions not covered by the EU Emissions Trading System (ETS) by 16% over 2005-20. It surpassed this target. It met its first and second CB and is on track to meet its third budget (2018-22). The 2007-08 financial crisis and the COVID-19 crisis have played a significant role in meeting these budgets (CCC, 2020a).

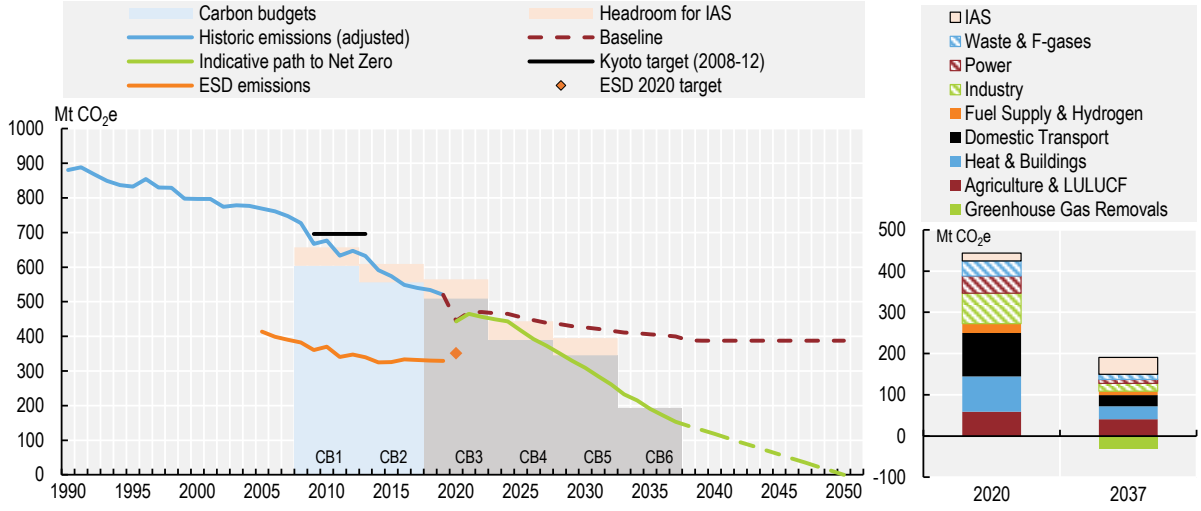
As provided by the 2008 Climate Change Act, the government outlined its plan for reducing emissions in the 2021 Net Zero Strategy (NZS) (HM Government, 2021). It builds on the 2020 Ten Point Plan for a Green Industrial Revolution and sectoral plans including the 2020 Energy White Paper, the 2021 Industrial Decarbonisation Strategy, Transport Decarbonisation Plan and Hydrogen Strategy, as well as the Heat and Buildings Strategy. The NZS outlines indicative emission reductions by sector, to meet the sixth carbon budget (2033-37) and ultimately net zero by 2050 (Figure 1.3). It calls for fully decarbonising electricity by 2035, subject to security of supply, and rapidly electrifying transport, heating and industry. These actions would be supplemented by low-carbon hydrogen, carbon capture and land-use change (CCC, 2021a). The vision is backed by key milestones sending strong signals to investors and consumers, including 40 gigawatts (GW) of offshore wind capacity by 2030; 5 GW of hydrogen production capacity by 2030; 600 000 heat pump installations a year by 2028; ending the sale of new petrol and diesel cars and vans by 2030 and hybrid vehicles by 2035; ending the sale of new gas boilers by 2035; planting 30 000 hectares (ha) of trees per year by 2024; and deploying carbon capture, utilisation and storage in four industrial clusters by 2030.

Baseline projections show the United Kingdom would not have reached the fourth and fifth budgets (2023-27; 2028-32) set to achieve the 80% reduction target with the policies in place until mid-2019 (Figure 1.3). As of mid-2021, before the NZS was adopted, only 20% of the emission savings for the sixth

budget (2033-37), which sets the path to net zero, had policies "potentially on track" for full delivery (CCC, 2021b). The NZS put forward credible policy proposals to put the United Kingdom on track to net zero (CCC, 2021a). However, it is not yet clear how it will deliver on this ambition. The impact of individual measures is not quantified and some, notably in the agriculture and building sectors, remain to be developed. The government will report on its progress annually.

Figure 1.3. Policies must be implemented quickly to put the United Kingdom on a net zero path

Past performance against climate objectives and indicative path to net zero



Note: The sixth carbon budget (CB6) includes international aviation and shipping (IAS) emissions, but the previous ones do not. Historic emissions are adjusted for accounting changes, including wetlands brought in under the 2019 inventory and IAS emissions; and converting the projections into Global Warming Potential values with climate-carbon feedbacks of the IPCC Fifth Assessment Report. The Kyoto target should be compared to lower emissions. Baseline: based on policies implemented, adopted or planned as of August 2019. ESD: GHG emissions in Effort Sharing Decision sectors (not covered by the ETS). LULUCF: land use, land-use change and forestry.
Source: BEIS (2021), Net Zero Strategy-charts and tables; Eurostat (2021), Greenhouse gas emissions in ESD sectors.

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Adaptation

The United Kingdom is experiencing widespread changes in the climate (CCC, 2021c). Average temperature is around 1.2°C warmer than the pre-industrial period, UK sea levels have risen by 16 cm and episodes of extreme heat are becoming more frequent. By 2050 (relative to a 1981-2000 baseline), average winter temperatures are projected to increase by around 1ºC and rainfall by 5% (central estimates) with increasing risk of flash floods. Average summer temperatures are projected to increase by 1.5ºC and rainfall to decrease by 10% with increasing risks of flooding and excess deaths from heat. Continuing sea level rise of around 10-30 cm with possible rises extending up to 30-40 cm across the United Kingdom will increase the risks of flooding and affect the functioning of coastal infrastructure.

The United Kingdom has undertaken three comprehensive assessments of its climate risks, and the government published adaptation plans in 2013 and 2018 (CCC, 2021c). There have been some actions in response, notably in tackling flooding and water scarcity, but overall progress in planning and delivering adaptation is not keeping up with increasing risk. The CCC identified eight priority risk groups in the following areas: i) viability and diversity of terrestrial and freshwater habitats and species from multiple hazards; ii) soil health from increased flooding and drought; iii) natural carbon stores and sequestration from multiple hazards, leading to increased emissions; iv) crops, livestock and commercial trees from

multiple climate hazards; v) supply of food, goods and vital services due to climate-related collapse of supply chains and distribution networks; vi) people and the economy from climate-related failure of the power system; vii) human health, wellbeing and productivity from increased exposure to heat in homes and other buildings; viii) the United Kingdom itself from climate change impacts overseas. The third National Adaptation programme due in 2023 is an opportunity to set an ambitious vision with measurable targets to assess progress. Policies are being developed without sufficient recognition of the need to adapt to the changing climate. This undermines their goals, locks in climate risks, and stores up costs for the future.

Climate finance

In 2019, United Kingdom committed GBP 11.6 billion in dedicated climate finance over the 2021/22–2025/26 period split equally between mitigation and adaptation (CCC, 2021b). This figure is double the level of support over the previous five-year period. The commitment is protected at this level against the announced temporary cuts in UK official development assistance (ODA) from 0.7% to 0.5% of gross national income. The GBP 11.6 billion funding is additional to the contribution to large multilateral development banks, some of which will be used to support climate-related projects. The United Kingdom has also committed to align the full extent of its ODA spending with the Paris Agreement and to end export finance for overseas fossil fuel investments.

1.1.2. *Atmospheric emissions and air quality*

Emissions of most major air pollutants have declined significantly over recent decades with the shift from coal for domestic heating and power generation and stricter emission standards (Figure 1.1); (Defra, 2021a). In 2019, sulphur oxide (SOx), nitrogen oxides (NOx) and fine particulate matter ($PM_{2.5}$) emission intensities per capita and per GDP were among the lowest in OECD countries. However, the rate of reduction has slowed down for some pollutants in recent years. Industrial and domestic combustion (heating) are major sources of SOx, CO and $PM_{2.5}$, while road transport is the main emitter of NOx, and non-methane volatile organic compound (NMVOC) emissions mainly come from solvent use. Emissions of ammonia (NH_3) are largely driven by agricultural activity, primarily linked to herd sizes and farming practices. They decreased between 2005 and 2013, then rose until 2017 and have stabilised since 2018. The United Kingdom had legally binding targets to reduce air pollutant emissions through the National Emission Ceilings Regulations 2018 and 2012 amended Gothenburg Protocol to the Convention on Long-range Transboundary Air Pollution. In 2019, it published a Clean Air Strategyand a National Air Pollution Control Programme to limit emissions in accordance with national emission reduction commitments. This plan will be revised in 2022. In 2019, the United Kingdom had already met its 2020 reduction targets for SOx, NOx and NMVOC. However, further efforts were needed to meet 2020 targets for NH_3 (from agriculture) and $PM_{2.5}$, as well as to meet 2030 targets for all pollutants except NMVOCs (Defra, 2021a).

Population exposure to $PM_{2.5}$ has steadily decreased since 2005 but remained in 2019 above the new World Health Organization guideline value[6] of 5 microgrammes per cubic metre (μ/m^3) (OECD, 2021b). People in Scotland are least exposed to air pollution (6.7 μ/m^3), while people living in Greater London are exposed to levels twice as high. In 2020, concentrations of NO_2 decreased with the reduction in road traffic due to COVID-19 lockdown restrictions. Five zones (out of 43) exceeded the annual mean limit value for NO_2, down from 33 in 2019 (Defra, 2021b). Urban background ozone pollution has an overall long-term increasing trend. Air pollution continues to be the largest environmental risk to the public's health in the United Kingdom. Each year, between 28 000 and 36 000 deaths are attributed to human-made air pollution (PHE, 2019).

1.1.3. *Progress towards biodiversity targets*

The metropolitan United Kingdom (England, Scotland, Wales and Northern Ireland) has a diverse mix of habitats and species for its small size (approximately 240 000 km^2) with a marine area approximately 3.5 times the size of the land area. The diversity of geology, landforms and sea floors, the long history of land management, the warming effect of the Gulf Stream, and a large tidal range result in a wide biodiversity range.

The key drivers of change across terrestrial biodiversity, as identified in the 2011 National Ecosystem Assessment, are habitat change (land use/condition) and pollution. Other threats are over-exploitation, invasive species and climate change. The main threats to the marine environment are fishing pressure, climate change, acidification, hazardous substances and eutrophication (JNCC, 2019).

The development and implementation of biodiversity policy in the United Kingdom is largely devolved and delivered through country plans and strategies. Over 2010-20, action was co-ordinated through the UK post-2010 Biodiversity Framework. This framework set out how the countries worked together to contribute to the Strategic Plan for Biodiversity 2011-20 and meet the Aichi targets of the United Nations Convention on Biological Diversity. The countries have also jointly developed the UK Marine Strategy to achieve good environmental status in their marine waters by 2020.

Biodiversity indicators show progress in several assessed measures, including agri-environment schemes, reducing air and marine pollution, extending marine protected areas and improving knowledge, but many present mixed or negative trends (Table 1.1). In particular, the abundance of UK priority species, and common farmland and woodland birds is in long-term decline while pressure from invasive species is increasing. Most UK habitats and species of European importance are in unfavourable condition.

Table 1.1. Biodiversity loss continues

UK Biodiversity Indicators 2021

Indicator / measure(s)		Long-term change	Short-term change
A1. Awareness, understanding and support for conservation		..	..
A2. Taking action for nature: volunteer time spent in conservation		☺ 2000-19	☺ 2014-19
A3. Value of biodiversity integrated into decision making		Under development	Under development
A4. Global biodiversity impacts of UK economic activity/sustainable consumption		Experimental – under review	Experimental – under review
A5. Integration of biodiversity considerations into business activity		..	..
B1. Agricultural and forest area under environmental management schemes	B1a. Area of land in agri-environment schemes	☺ 1992-2020	☺ 2015-20
	B1b. Area of forestry land certified as sustainably managed	☺ 2001-21	≈ 2016-21
B2. Sustainable fisheries	B2a. Percentage of marine fish stocks harvested sustainably	☺ 1990-2019	☺ 2014-19
	B2b. Biomass of marine fish stocks at full reproductive capacity	☺ 1990-2019	☹ 2014-19
B3. Climate change adaptation		Under development	Under development
B4. Pressure from climate change (Spring Index)		Not assessed	Not assessed
B5. Pressure from pollution			
B5a. Air pollution	B5a (i). Area affected by acidity	☺ 1996-2018	☺ 2013-18
	B5a (ii). Area affected by nitrogen	☺ 1996-2018	☺ 2013-18
B5b. Marine pollution		☺ 1990-2019	☺ 2014-19
B6. Pressure from invasive species	B6a. Freshwater invasive species	☹ 1960-2020	Not assessed
	B6b. Marine (coastal) invasive species	☹ 1960-2020	Not assessed
	B6c. Terrestrial invasive species	☹ 1960-2020	Not assessed

B7. Surface water status		≈ 2009-20	≈ 2015-20
C1. Protected areas	C1a. Total extent of protected areas: on land	☺ 1950-2021	≈ 2016-21
	C1b. Total extent of protected areas: at sea	☺ 1950-2021	☺ 2016-21
	C1c. Condition of Areas/Sites of Special Scientific Interest	☺ 2005-21	☹ 2016-21
C2. Habitat connectivity		Experimental – under review	Experimental – under review
C3. Status of European habitats and species	C3a. Status of UK habitats of European importance	☹ 2007-19	☹ 2013-19
	C3b. Status of UK species of European importance	☹ 2007-19	☹ 2013-19
C4. Status of UK priority species	C4a. Relative abundance	☹ 1970-2019	≈ 2014-19
	C4b. Distribution	≈ 1970-18	≈ 2013-18
C5. Birds of the wider countryside and at sea	C5a. Farmland birds	☹ 1970-18	☹ 2013-18
	C5b. Woodland birds	☹ 1970-18	☹ 2013-18
	C5c. Wetland birds	☹ 1975-2018	≈ 2013-18
	C5d. Seabirds	Not assessed	Not assessed
	C5e. Wintering waterbirds	☺ 1975/76-2017/18	≈ 2012/13-2017/18
C6. Insects of the wider countryside (butterflies)	C6a. Habitat specialists	☹ 1976-2020	≈ 2015-20
	C6b. Species of the wider countryside	≈ 1976-2020	≈ 2015-20
C7. Plants of the wider countryside		Experimental – under review	Experimental – under review
C8. Mammals of the wider countryside (bats)		☺ 1999-2019	☺ 2014-19
C9. Genetic resources for food and agriculture			
C9a. Animal genetic resources – effective population size of Native Breeds at Risk	C9a(i). Goat breeds	☺ 2004-20	≈ 2015-20
	C9a(ii). Pig breeds	☹ 2000-20	☹ 2015-20
	C9a(iii). Horse breeds	☹ 2000-20	☹ 2015-20
	C9a(iv). Sheep breeds	☺ 2000-20	☺ 2015-20
	C9a(v). Cattle breeds	☺ 2000-20	☺ 2015-20
C9b. Plant genetic resources – Enrichment Index		☺ 1960-2018	☺ 2013-18
D1. Biodiversity and ecosystem services	D1a. Fish size classes in the North Sea	☹ 1983-2019	☹ 2014-19
	D1b. Removal of GHGs by UK forests	☺ 1990-2019	☺ 2014-19
	D1c. Status of pollinating insects	☹ 1980-2017	≈ 2012-17
E1. Biodiversity data for decision making	E1a. Cumulative number of records	☺ 2004-21	☺ 2016-21
	E1b. Number of publicly accessible records at 1 km² resolution or better	☺ 2008-21	☺ 2016-21
E2. Expenditure on UK and international biodiversity	E2a. Public sector expenditure on UK biodiversity	☺ 2000/01-2019/20	☹ 2014/15-2019/20
	E2b. Non-governmental organisation expenditure on UK biodiversity	..	☺ 2014/15-2019/20
	E2c. UK public sector expenditure on international biodiversity	☺ 2001/02-2019/20	≈ 2014/15-2019/20

Note: ☺: improving, ☹: deteriorating, ≈ little or no overall change, "..": insufficient or no comparable data. Long-term – an assessment of change since the earliest date for which data are available, although if the data run is for less than ten years a long-term assessment is not made; Short-term – an assessment of change over the latest five years, six years for C3a and C3b.
Source: Defra (2021), UK Biodiversity Indicators 2021 Revised.

In 2019 the United Kingdom reported it was on track to meet 5 of the 20 Aichi Biodiversity Targets:[7] mainstreaming, protected areas, implementation of the Nagoya Protocol, National Biodiversity Strategy, and mobilisation of information and research (JNCC, 2019). However, according to the Royal Society for the Protection of Birds (RSPB), most assessments point towards ongoing loss of UK biodiversity or no recovery from depletion (HoCs, 2021a). The United Kingdom is one of the most nature-depleted countries in the world (NHM, 2020). According to the Natural Capital Committee, an independent advisory committee which ran from 2012 to 2020, most natural assets are deteriorating (NCC, 2020a).

Habitat and species

The UK Species Inventory contains 59 210 species of animals, plants and fungi known to occur in the United Kingdom (including native, naturalised and non-native species). Knowledge gaps remain in the number and trends of threatened species, but progress has been made in assessing the threat of extinction and with monitoring indicator species. Overall, only 14% of UK species have had their conservation status assessed; 21% of these are threatened (JNCC, 2019).

Only 8 041 species have been assessed against International Union for Conservation of Nature (IUCN) Red List criteria. The taxa with the highest proportion of species assessed nationally above Least Concern include birds (49%) and terrestrial mammals (55%). Insects, and in particular beetles and moths, have experienced the highest proportion of national extinctions in Great Britain across taxa, with 5% of insect species assessed being classified as extinct. In all, 207 species have been assessed as nationally extinct in Great Britain in recent history. However, no species is known to have gone nationally extinct since 2010. A significant proportion of the UK's fish (27%), reptiles (46%), birds (22%) and marine mammals (19%) that have been assessed globally are threatened (JNCC, 2019) (OECD, 2021b).

There has been progress in improving the status of some nationally and internationally threatened species. These include successful re-introductions of the white-tailed eagle, short-haired bumblebee and beaver in Scotland, and the chequered skipper in England, as well as recovery programmes for red kite and natterjack toad. However, overall progress is insufficient to halt widespread and significant ongoing declines across many species (e.g. for priority species as a group and for groups such as farmland birds, specialist butterflies and other pollinating insects) (JNCC, 2019). In 2019, only 39% of UK species of European importance were in favourable conservation status (Defra, 2021c).

Protected areas

Within the United Kingdom, the law protects sites that are nationally important for plants, animals or geological or physiographical features as Sites of Special Scientific Interest – or in Northern Ireland as Areas of Special Scientific Interest. In the marine environment, a number of regional marine protected areas are designated, including Marine Conservation Zones in England, Wales and Northern Ireland, and Nature Conservation Marine Protected Areas in Scotland. The United Kingdom also contributes to international networks of protected sites created under the Ramsar, World Heritage and OSPAR Conventions. Special Protection Areas (SPAs) and Special Areas of Conservation protect habitats and species of European importance.

The total extent of protected areas has increased significantly since 2015 to cover 29% of land area and 42% of the economic exclusive zone (EEZ) in 2020 (OECD, 2021b). This is well above the Aichi 2020 targets of protecting at least 17% of land and 10% of marine and coastal areas. It is also close to the G7 targets of protecting at least 30% of land and sea by 2030. However, only 0.5% of land area has strict management objectives (IUCN management categories[8] I and II), compared to 7.4% on average in OECD countries. About 9% of land area and 1% of the UK's EEZ are designated under IUCN categories III and IV, compared to 1.5% and 4% respectively on average in OECD countries. The RSPB estimates that only around 5% of the UK's land is both protected and managed effectively for nature (HoCs, 2021a).

The recent increase is almost entirely down to the designation of inshore and offshore marine sites under the EU Habitats Directive; the designation of Marine Conservation Zones in English, Welsh and Northern Irish waters; and designation of Nature Conservation Marine Protected Areas in Scottish waters. The extent of protected areas on land has increased by 14 462 ha since 2015. Protected area designation has continued, notably for marine birds. This has resulted in the designation of new marine SPAs in 2020, with more expected shortly in Northern Ireland and Scotland. These efforts have not yet translated into results. In 2019, only 5% of UK habitats of European importance were in favourable conservation status (Defra,

2021c). Bogs, mires and fens, and grasslands show the worst conservation status, while rocky habitats and dune habitats are in most favourable status (EEA, 2019).

Water management

The United Kingdom abstracts less than 5% of its internal and renewable resources. It is therefore under low water stress (OECD, 2021b), although risks of water shortages are projected due to climate change (CCC, 2021c). In 2019-20, England had a low intensity of freshwater abstraction for public water supply per capita compared to other OECD countries (CCC, 2021c). In 2019, only 16% of surface waters in England met the "good ecological status" standard under the EU Water Framework Directive. However, a higher percentage met this standard in the devolved nations, especially in Scotland where 63% of surface waters achieved a "good ecological status" in 2020 (Defra, 2021c). The most common pressures impacting water bodies are physical modification (affecting 41% of water bodies in England), diffuse pollution from rural areas (affecting 40%), waste water (affecting 36%), and related to cities and transport (affecting 18%). The number of designated bathing waters in England meeting at least the minimum standard increased considerably from 46% in 1995 to 98% in 2019. The number of bathing waters achieving "excellent" status has also increased in the past decades, with 71% meeting this standard in 2019. That same year, 85% of surface bodies supported required flow standards and 73% of groundwater bodies were sustainable compared to objectives of achieving sustainable levels for 90% of surface water bodies and 77% for groundwater bodies by 2021. In 2016, the United Kingdom complied with the collection and secondary treatment targets (Articles 3 and 4) of the EU Urban Waste Water Treatment Directive, and was close to achieving the more stringent target (Article 5) (EC, 2020a). However, pollution from sewer overflows is of particular concern (Environment Agency, 2021a).

1.2. Improving environmental governance and management

1.2.1. *Institutional framework for environmental governance*

The responsibility for environmental policy and regulation is devolved in Scotland, Wales and Northern Ireland to the Scottish government, the Welsh government and the Northern Ireland Executive. There is no devolved government for England; the UK government makes decisions and proposes legislation that concerns England. Indeed, many UK government policies, such as its 25 Year Environment Plan (25 YEP), published in 2018, are intended to apply to England only. Scotland, Wales and Northern Ireland enjoy varying degrees of autonomy, but each has responsibilities for the environment, agriculture, fisheries and energy. The legal frameworks are similar in all the administrations, but the powers are different in each jurisdiction's acts, regulations and orders.

Devolved administration and horizontal co-ordination

In England and Northern Ireland, dedicated government departments define overall environmental policy and establish the legal framework: the Department of Environment, Food and Rural Affairs (Defra) in England and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland. Defra has lead responsibility for all environmental policy areas apart from climate change mitigation, for which the Department for Business, Energy and Industrial Strategy has the policy lead. In addition, the Department for Transport promotes sustainable mobility.

The Environment Agency in England and the Northern Ireland Environment Agency (NIEA) are executive bodies with regulatory and advisory functions.[9] The Scottish Environment Protection Agency (SEPA) and Natural Resources Wales[10] are regulatory authorities that report directly to the Scottish and Welsh governments, respectively. In England, Scotland and Wales, flood prevention and management are part of the agencies' remit along with environmental regulation.

Natural England is responsible for land management and wildlife and habitat conservation, while Forestry England oversees forest management. In Scotland, all these functions fall under the remit of NatureScot. Natural Resources Wales takes care of these issues along with the rest of environmental management in the country. In Northern Ireland, the NIEA is in charge of nature protection, but the Forest Service manages forests.

The devolution agreements were created when the United Kingdom was an EU member state. The intersection of the devolution settlements with EU membership has allowed for "upward divergence" in environmental policy across the four UK nations. In particular, the Scottish and Welsh governments have aspired to pursue environmental policies that would go beyond the European Union's minimum requirements. However, Northern Ireland has historically been lagging in terms of environmental governance (Burns et al., 2018).

Environmental agencies across the United Kingdom have mechanisms for institutional co-operation with the other UK nations, but stakeholders perceive that they do not function well (Burns et al., 2018). The Joint Nature Conservation Committee brings together representatives from conservation bodies of the UK's four nations. This body establishes common standards across the United Kingdom for monitoring and researching nature conservation and analyses the resulting information. Its recommendations are then left to be implemented by the competent legislative authorities in each country. The UK-wide CCC operates on a similar basis. It is the statutory advisory body on climate change to both the Scottish and Welsh governments.

These policy co-ordination mechanisms were until recently operating within the EU framework. In the absence of this unifying platform, reinforced co-operation mechanisms are necessary to prevent the divergence between the environmental policy approaches of the four nations from compromising the level playing field for UK businesses.

The new arrangements for policy cohesion and managing divergence are covered by a programme of common policy frameworks that is led jointly by the UK and devolved governments. For example, a new UK Biodiversity Framework is being elaborated. The Inter-Ministerial Group for Environment, Food and Rural Affairs is a forum for environment ministers from across the UK nations to regularly discuss current issues in these areas. A review of intergovernmental relations in 2021 has made changes to the structures and ways of working that will strengthen engagement across the four UK nations. However, the focus so far has been primarily on matters crucial to facilitating trade (Chloe, 2021).

Government effectiveness and regulatory quality in the United Kingdom decreased slightly (from a very high level) over 2014-19 (World Bank, 2020). This decline could be attributed to a long period of uncertainty over EU exit. EU exit has affected the capacity of the country's environmental institutions in particular. The National Audit Office ranked Defra second among UK government departments most affected by EU exit. Defra recruited over 1 300 new staff members to work on EU exit issues (Burns et al., 2018).

EU exit followed a long period of austerity and significant staffing cuts for the environment in all four nations. For example, government funding for the Environment Agency's functions other than flood defence was nearly halved between fiscal years 2009/10 and 2018/19 (NAO, 2020). The budget cuts were partly offset by the increased subsistence charges for permitted installations (Section 1.2.3) and improved efficiency of administrative procedures. Still, the persistent lack of resources has weakened policy implementation, including environmental quality and compliance monitoring and reporting. Compliance assurance activities with regard to installations not covered by a permitting regime (and hence not paying subsistence fees) have been particularly affected.

SEPA's capacity has also been undermined by a significant cyber-attack on 24 December 2020, carried out by organised crime to extort money. Most of SEPA's information technology systems, including backups, were encrypted or content was deleted. As a result, staff had no access to e-mail, data or

systems. Since then, SEPA has focused on renewing and upgrading its systems and infrastructure. Full recovery is expected to take around 18-24 months.

Local government and vertical co-ordination

Local authorities (which usually have an Environmental Health Department) are responsible for spatial planning and waste management. In addition, in England and Wales local authorities perform a number of environmental regulatory functions, including permitting, inspecting and enforcing against some medium- and low-risk installations, in most cases with respect to air emissions only. They also manage local air quality, including emissions from mobile sources. They have administrative enforcement and prosecutorial powers with respect to "statutory nuisance" – noise, odour, dust and smoke. Local authorities also have permitting responsibilities in Northern Ireland.

Vertical co-ordination usually consists of guidance from the national environmental regulator to local governments. For example, Defra produces guidance notes for each of the 80 sectors regulated by local authorities. Developed in collaboration with business organisations by technical working groups, these guidance notes contain the descriptions of relevant best available techniques and emission limit values. They are generally quite prescriptive so as to maintain a level playing field between local authorities across England.

1.2.2. *Regulatory and policy evaluation*

The United Kingdom continues to emphasise evidence-based policy making. Regulatory and policy evaluation, *ex ante* and *ex post*, plays an important role in environmental governance. The country has long been a frontrunner in performance measurement with regard to both policy implementation and corporate results of environmental authorities.

Regulatory impact assessment

Regulatory impact assessment (RIA) is carried out for all regulations except for deregulatory and low-cost measures, which are eligible for a fast-track procedure. The Regulatory Policy Committee, a non-departmental advisory body, provides the government with external, independent scrutiny of evidence and analysis supporting new regulatory proposals in RIAs. It also scrutinises the quality of *ex post* evaluations of legislation. The Better Regulation Executive within the Department for Business, Energy and Industrial Strategy is responsible for better regulation policy. It is also the lead unit in the UK government for promoting and delivering changes to the regulatory policy framework (OECD, 2018).

RIAs have been required for significant policy changes and new policies for at least the last two decades, although requirements have changed progressively. The latest standard format for RIAs in England is significantly slimmed down, allowing under 50 lines to summarise the problem under consideration and the need for intervention; the policy objectives and intended effects; alternative options considered; and a description of the monetised and non-monetised costs and benefits identified, by main target groups. Further information can be provided in a separate "Evidence base" document. However, the current RIA template focuses primarily on the regulatory burden on businesses. It does not appear to allow sufficient space to identify potential environmental risks or tackle environmental impacts if these are not a primary concern of the draft regulation. Guidance on environmental aspects of RIA is also cursory in the other three nations (Nesbit, 2019).

Strategic environmental assessment

Strategic environmental assessment (SEA) is widely used, particularly in land-use planning. For example, SEA is integrated into the broader sustainability assessment, which is a legal prerequisite for adoption of local spatial plans in England and Wales. Beyond the land-use planning sphere, SEA has been used for

local air quality action plans, local transport plans, municipal waste management strategies, water resources (river basin) management plans, waste management plans, etc. The UK government Green Book provides guidance on how to appraise and evaluate policies, projects and programmes. However, SEA is rarely used for non-environmental plans and programmes such as regional economic strategies.

SEA legislation in Scotland (Environmental Assessment [Scotland] Act 2005 and its implementing regulations) is more robust than that in the other jurisdictions of the United Kingdom. Scottish SEA covers some of the highest-level strategies, plans, programmes and policies, including legislation. These include, for example, the Climate Change Act, energy policy, national transport infrastructure strategies and the national planning framework. A database provides a record of all public plans, programmes and strategies that have been subjected to SEA.

Ex post policy evaluation

The Environment Act 2021 lays out a domestic framework for post-EU exit environmental governance (primarily for England) and introduces regulatory changes in the areas of air, water, waste, biodiversity and chemicals. It sets legally binding long-term targets on air quality, water, biodiversity and resource efficiency and waste reduction, as well as statutory Environmental Improvement Plans (EIPs). EIPs set interim targets for each five-year period and lay out steps to improve the natural environment. Both medium- and long-term targets are supported by a new statutory cycle of monitoring, planning and reporting.

The law establishes the OEP to hold the government accountable on progress towards achieving targets. The OEP can make annual recommendations to which the government must respond. However, the OEP will only operate in England and likely in Northern Ireland. In addition, it will be required to consider guidance from the government, raising concerns about its independence.

Environmental Standards Scotland (ESS) is a similar independent watchdog body set up in Scotland in 2021. It aims to ensure the effectiveness of environmental law and prevent enforcement gaps arising from the United Kingdom leaving the European Union. The ESS can examine the implementation and effectiveness of environmental laws, including international obligations. It can prepare improvement reports to which the ministers must respond with an improvement plan, subject to parliamentary approval. It can also serve compliance notices on public authorities, which can be enforced through the courts. Wales has only appointed an interim Environmental Protection Assessor until it completes a review of its environmental governance framework.

Policy evaluation is also done through performance indicators. The 25 YEP outcome indicator framework in England is made up of 66 indicators. These indicators are arranged into ten broad themes related to the goals of the 25 YEP and commitments to protect and improve the global environment. The themes are environmental topics that people will generally recognise (e.g. air, freshwater, seas and estuaries, wildlife). Indicator frameworks are also used in other jurisdictions to evaluate corporate performance of environmental authorities. For example, SEPA uses 17 corporate performance measures. In addition, the National Audit Office reports on the effectiveness of the regulatory policy framework as a whole through value-for-money studies. Welsh ministers publish a State of Natural Resources Report every five years to evaluate the performance of government policy.

1.2.3. *Environmental regulation and compliance assurance*

During the 47 years of the United Kingdom's membership in the European Union, the gradual penetration of environment-related EU directives into national policy and legal systems was profound. Consequently, a rapid and sudden disentanglement risks legal uncertainty and policy gaps. The UK government has devoted a great deal of time and effort to ensuring adequate retention of EU environmental law. However, this process is taking longer than expected: specific changes are still being made through a multitude of statutory instruments, particularly on air quality, chemicals and nature protection. In January 2022, the UK

government announced its intention to bring forward a Brexit Freedoms Bill to end the special status of EU law and ensure it can be more easily amended or removed to reduce regulatory burden on businesses.

The COVID-19 pandemic has created additional challenges for environmental regulation. SEPA, for example, issued Principles for Regulatory Approach to EU exit and COVID-19 in 2020 to provide clarity on temporary regulatory positions (e.g. on waste management) in relation to these unusual circumstances. Temporary positions enabled regulated businesses to continue operating within the COVID-19 restrictions, while also protecting the environment.

Environmental impact assessment and permitting

Environmental impact assessment (EIA) conclusions must be considered in issuing a development consent (in England, by a local authority) or a planning permission (in Scotland, by a local planning authority or the Scottish government). The environmental regulator is a statutory stakeholder in the development/planning consent process. It must consider any relevant information or conclusions from the EIA when making the subsequent permitting decision.

Operators applying for a bespoke environmental permit in England must conduct a site-specific risk assessment if their activity exceeds certain thresholds of environmental impact. This risk assessment is different from an EIA and includes identification of risk sources, pathways and receptors, as well as actions to control these risks. For example, operators of industrial installations and waste management facilities must assess risks related to their air emissions (including those of GHGs) and discharges into surface water and groundwater.

UK environmental regulators diversify permitting regimes based on the regulated activity's level of environmental impact. This approach makes the procedural burden proportionate to the risk. The Environmental Authorisations (Scotland) Regulations 2018 establish four types of authorisations:

- permits for higher risk and/or non-standard activities that require rigorous assessment (permits may contain a mixture of standard and bespoke conditions)
- general binding rules (GBRs) – a set of mandatory rules that cover specific low-risk activities
- registrations for activities where a simple assessment or screening can determine whether to allow the proposed activity
- notifications of low-risk activities (which may be associated with GBRs) to let the regulator know the activity is carried out.

In England, the Environment Agency issues "standard rules permits" for installations in 21 sectors where activities are sufficiently uniform to make this approach suitable. General legal requirements cover all businesses that do not require a permit. For example, they are required to fulfil their "duty of care" with respect to waste management, to prevent water pollution and to use best practicable means to prevent statutory nuisances.

Cost recovery is a key principle of environmental regulation in the United Kingdom, one of the few OECD member countries to impose service-based environmental fees. The Environment Agency must recover all costs (but without additional revenue) associated with its permitting, compliance assessment and enforcement activities – from staff employment to support services. The Environment Agency's charging scheme was integrated across different regulatory regimes in 2019. It covers a permit application charge and an annual subsistence charge to cover the costs of compliance monitoring. Local authorities also charge fees, albeit at much lower rates, for their permitting and compliance and enforcement activities. Under similar arrangements in Scotland, SEPA recovered 98% of its costs through charging schemes in 2019-20 (SEPA, 2021).

Sectoral approach and promotion of green practices

SEPA's 2016 One Planet Prosperity Regulatory Strategy declared a new approach to regulation: working with businesses to go beyond compliance is the best way to deliver the ambitious goals. It recognises multiple influences on environmental performance of a business: consumer demand for environmental credentials; investor and supply-chain requirements for environmental performance; assessment by external ratings bodies; trade association membership standards; expectations of employees about environmental performance; and social scrutiny by residents, non-governmental organisations (NGOs) and via social media. Businesses more often view environmental and social issues as a market driver of business success than as a compliance issue involving concerns about cost and business disruption. The strategy built on the agency's prior efforts to target promotion of compliance and green business practices at key economic sectors.

SEPA develops a plan for its interactions with each sector it regulates. The sector plans are developed via engagement with the sectors, internal experts, relevant regulators and other key stakeholders. Sector plans focus on practical ways of delivering environmental, social and economic outcomes. They specify levels of compliance, the market context and key social issues. The latter include recognising the importance of creating local jobs in rural communities and any issues that non-compliance is creating in the communities the sector is operating in. This approach seeks to ensure systemic tackling of remaining compliance issues for the sector, mapping out most promising "beyond compliance" opportunities, and identifying and harnessing the key levers that influence that particular sector. As of June 2021, SEPA had published 15 sector plans.

The Environment Agency uses a similar sectoral approach. It systematically produces five-year strategies and annual intervention plans for a range of regulated sectors in England. The 2016-20 strategies covered 14 sectors, including food and drink, cement, chemicals, paper, pulp and textiles, oil and gas, metals, landfills and hazardous waste.

UK environmental regulators use a variety of tools to help businesses to reach and go beyond compliance. The Environment Agency provides "retailer" compliance assistance through direct contacts with businesses; inspectors advise operators as part of their regular activities. In addition, the agency gives limited free assistance as part of the permit application process. This advice allowance is included in the basic application charge. Additional pre-application advice is chargeable at a moderate fee of GBP 100 per hour.

NetRegs – one of the first web-based environmental compliance promotion tools in Europe – was created in partnership between the UK environmental regulators in 2002. In 2011, the Environment Agency (then also covering Wales) withdrew from NetRegs to integrate environmental guidance to businesses into one multi-theme hyper-portal. NetRegs was then revived as a partnership between SEPA and the NIEA. It provides free environmental guidance on a wide variety of environmental topics for businesses in dozens of sectors throughout Scotland and Northern Ireland. The tools include online guidance, an e-mail newsletter, e-learning courses, an environmental self-assessment tool and a mobile app that delivers checklists specific to each sector.

Farmers are a key segment of the regulated community in need of compliance assistance. They are given high-quality, easy to use information on best practices in fertiliser use to comply with requirements in nitrate-vulnerable zones (EC, 2019). In 2018, for example, the NIEA signed a Memorandum of Understanding with the Ulster Farmers Union to build a stronger and more effective working relationship between the NIEA and the farming community, support sustainable farming and deliver improved legislative compliance.

Much of the assistance focuses on good practices that offer win-win environmental and business solutions. Zero Waste Scotland – a not-for-profit environmental organisation fully funded by the Scottish government – uses a variety of tools to help small businesses to achieve cost savings, new sales, reduced risk and

competitive advantage through improvements in resource efficiency. SEPA's nine Sustainable Growth Agreements with individual companies or groups of businesses also target win-win solutions. Examples of sectors covered are construction (a 2017-18 agreement with Superglass) and wastewater management (with Scotland Water, 2018-20). These agreements seek to achieve specific environmental outcomes, and results are monitored annually.

Environmental regulators encourage companies to use effective environmental management systems (EMSs), e.g. through a 5-10% reduction in administrative fees. The British national environmental management standard, BS8555, that governs EMS for small and medium-sized enterprises (SMEs), allows them to implement the system in individual modules rather than as a whole. This makes an EMS more attractive to small businesses by reducing its implementation costs.

UK governments also use public relations incentives to promote environmentally friendly business behaviour. Scotland's VIBES initiative (Vision in Business for the Environment of Scotland) has been recognising businesses of all sizes and sectors employing environmental best practices in their daily activities since 2010. The award programme is a partnership between SEPA, several other government institutions and business groups. There are many award categories, including energy, climate change adaptation and circular economy. A case study is produced for each winning business and published on the VIBES website.

Environmental inspections

The United Kingdom has historically championed risk-based management of environmental compliance monitoring, the approach taken up by many OECD member countries. For many years, the Environment Agency used the Operational Risk Appraisal (Opra) system as a key tool for risk assessment of sites, inspection planning and charge setting. However, Opra was withdrawn in favour of a simpler performance-based approach as part of the Environment Agency's strategic review of charges in 2019. Compliance assessment plans still prioritise permitted installations based on several criteria such as their sector, compliance scores, enforcement activity, incidents, complexity and location. Under a performance-based system, lower-risk, well-managed activities are charged less than higher-risk or poorly managed activities.

In Scotland, the Dynamic Regulatory Effort Assessment Model (DREAM) used by SEPA for the last decade distinguishes three ranges of low-risk installations. It draws on 35 risk factors, with corresponding frequencies of walk-through inspections of every two, three or five years. SEPA is revising the DREAM model as it does not contain the levels of data needed to enable the shift to sector-based regulation. A new mechanism will set priorities within and across sectors while still maintaining a focus on high hazard activities, sites of community concern and those with a history of non-compliance.

In addition to regular site inspections, the Environment Agency carries out audits (in-depth evaluations) to identify root causes of non-compliance. Audits usually review the effectiveness of an operator's management system. In addition, an audit could be used to assess whether the permit still provides an appropriate level of environmental protection, i.e. by benchmarking it against up-to-date best practices. Audits are always planned, and the operator is notified to provide information or attendance of certain personnel. Regular site inspections can be unannounced so that normal operations can be observed. Inspection and audit reports are available to the public upon request.

The Environment Agency has adopted a standard approach to classify permit breaches and score environmental permit compliance known as the Compliance Classification Scheme (CCS). CCS is organised around performance bands, providing a reactive way of tracking operators' conduct. The compliance rating is based on CCS events over the previous calendar year. It allocates points for each permit breach recorded in the CCS under one of the four categories based on potential environmental impact (from Category 1 corresponding to most serious offences). The points from each event are added to produce an annual total non-compliance score,[11] which is then converted into a compliance rating.

In an excellent practice, UK environmental regulators make compliance indicators a key part of their performance management. For example, the Environment Agency sets targets for the number and percentage of sites to be compliant across a range of activities and industry sectors. These are aggregated for corporate reporting as well as reported and analysed separately by industry sector. The number of serious and significant pollution incidents (Categories 1 and 2 according to the agency's classification) is used in England as a surrogate measure of environmental impact. An interesting supplementary measure is the number of serious pollution incidents per 100 permits in a sector, which shows the proportion of incidents in each sector and highlights sectors that cause a disproportionate number of incidents.

The risk-based approach, together with the emphasis on compliance promotion, has helped UK environmental regulators to improve permit compliance levels over the years. As of 2019, 90.5% of Scottish regulated businesses were in compliance. Over 2015-20, SEPA was reducing the number of operators found in non-compliance for two years or more by about 40% annually (SEPA, 2021). However, the percentage of permits in the worst-performing bands in England has remained largely unchanged (around 3%) since 2010, as has the number of serious pollution incidents (Environment Agency, 2021b).

Enforcement

Over the last decade, the United Kingdom has put increasing emphasis on administrative rather than criminal response to non-compliance. Figure 1.4 illustrates this trend for England, where administrative sanctions range from cautions (warnings) to compliance/enforcement notices to fixed or variable monetary penalties (VMPs). The Environment Agency decides on the basis of investigation and according to criteria laid out in its guidance on offence response options whether to use an administrative penalty or resort to criminal prosecution. The decriminalisation of less severe violations has made enforcement more proportionate to non-compliance, more expedient and more efficient. Distancing administrative penalties from criminal justice also increases the impact of the system of sanctions overall.

Fixed monetary penalties (in England, GBP 300 for businesses) may be applied to minor offences. The Regulatory Enforcement and Sanctions Act (2008) introduced VMPs in England and Wales. They became operational in 2010.[12] The amount of a VMP may not exceed the maximum amount of the fine that can be imposed by a criminal court or in any event GBP 250 000 per offence. According to the Environment Agency's latest (2019) Enforcement and Sanctions Policy and the 2018 calculation methodology, the penalty can cover any obvious financial benefit unlawfully gained by the offender as long as the total VMP does not exceed the statutory maximum. This represents progress in the possibility to recover economic benefits of non-compliance – the deterrence approach practised by the United States Environmental Protection Agency since the 1980s. However, the Environment Agency imposed VMPs only three times in 2020-21, with an average penalty of less than GBP 4 200 per case. VMPs are not yet available under the Environmental Permitting Regulations that cover most permit breaches.

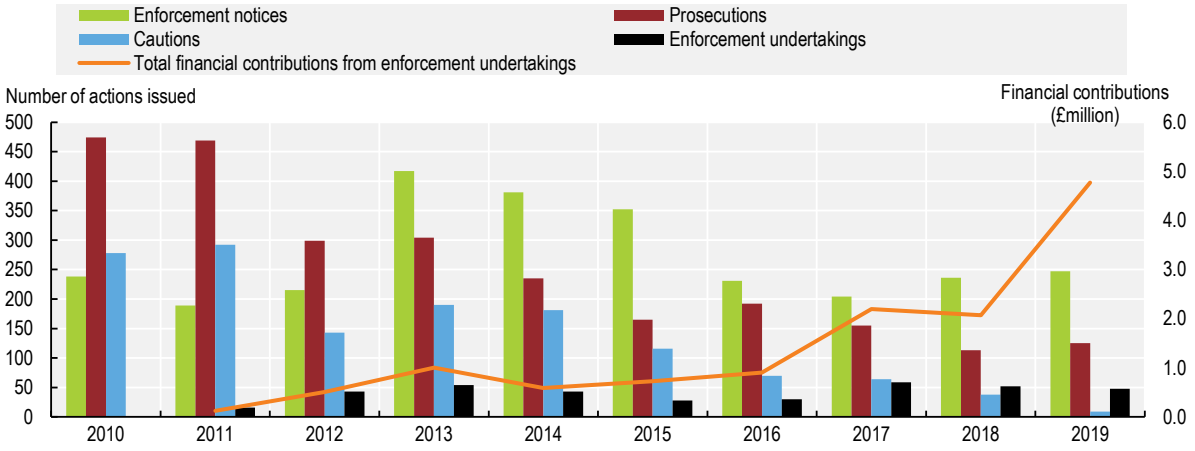
In Scotland, fixed fines of GBP 600 (in most cases) are imposed for first-time offences without significant environmental harm. SEPA plans to introduce VMPs in 2021, based on a 2015 regulation, after an implementation delay caused in part by the 2020 cyberattack on the agency. VMPs will not be available for all offences, but removal of financial gain from the offence is envisaged. The maximum penalty is set out in the legislation defining that offence, whereas the minimum VMP in Scotland will be GBP 1 000. According to SEPA's Guidance on the use of enforcement action (2016), once an administrative fine has been imposed, the offence can no longer be prosecuted.

Another possible non-compliance response is an enforcement undertaking. In this case, the offender makes a voluntary offer, accepted by the regulator, to restore and remediate the local environment and prevent repeated non-compliance. The agency then decides whether financial resources towards remediation or upgrading of equipment would be more appropriate than monetary penalties. Enforcement undertakings, first introduced in England and Wales, were more recently introduced in Scotland. Since put

into practice in England in 2011, their total monetary value has increased sharply (Figure 1.4). Indeed, the Environment Agency views enforcement undertakings as the main enforcement alternative to prosecution.

Figure 1.4. Enforcement in England shifts from prosecution to administrative sanctions

Enforcement actions used for environmental offences by businesses in England, 2010-19



Note: Environmental offences for the purpose of this analysis are waste, water quality and emissions offences.
Source: Environment Agency (2020).

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For more serious offences, as defined in the regulatory agency's enforcement and prosecution policy, agencies consider prosecution. In England and Wales, the Environment Agency, Natural Resources Wales or a local authority can prosecute directly. In Scotland, SEPA must make recommendations to the public prosecutor – the Procurator Fiscal – who decides and then conducts any prosecution proceedings. In Northern Ireland, the NIEA refers prosecution cases to the Public Prosecution Service. In setting penalties for environmental crimes, courts consider guidance developed by the UK Sentencing Council.

In an interesting practice, the Environment Agency often uses a formal administrative "caution" as an alternative to prosecution. This caution is a written acceptance by the violator that it has committed the offence. The agency only uses a formal caution where it considers it could bring a prosecution and the offender consents to be cautioned. The Environment Agency keeps a record of the formal caution. It is produced in court only if the offender is later prosecuted for a different offence. If the offender does not accept the formal caution, the agency then prosecutes for the original offence.

Fighting environmental crime beyond significant permit breaches requires broad interagency efforts across the United Kingdom. For example, the National Wildlife Crime Unit supports police forces across the country in dealing with wildlife crime. The UK Partnership for Action against Wildlife Crime brings together a number of statutory and voluntary bodies to improve co-operation. These bodies include the police, UK Border Agency, Defra, Home Office, Natural Resources Wales, Scottish Natural Heritage, the Joint Nature Conservation Committee, Royal Botanic Gardens Kew, the NIEA, and environmental and animal welfare NGOs.

Public transparency of enforcement is another good practice demonstrated by UK environmental regulators. The Environment Agency maintains a public register of enforcement actions, searchable by offender's name, action or offence type, and date. SEPA publishes a list of penalties imposed and

undertakings accepted. Making enforcement actions public increases pressure on violators to improve their performance.

1.3. Promoting investment and economic instruments for green growth

In March 2020, the United Kingdom swiftly introduced a massive package of measures to respond to the COVID-19 emergency and support businesses, households and public services (OECD, 2020a). From the summer onwards, in addition to extending support measures, the government introduced new ones to support demand and jobs. Successive packages totalled GBP 315 billion by October 2021 or 15% of 2020 GDP, one of the largest fiscal responses to the COVID-19 crisis globally (OBR, 2021) (IMF, 2021).The March 2021 budget added virus-related support in 2021-22, designed measures to stimulate economic recovery over 2021-23, and planned fiscal consolidation from 2023. Alongside the budget, the government wants to level up investment across the United Kingdom, to create an outward-looking, net zero, high-tech economy through the 2021 plan to Build Back Better (Plan for Growth) (HM Treasury, 2021a). It introduced a temporary 130% capital allowances super deduction for investment in 2021-23 and launched the UK Infrastructure Bank to increase investment, notably in green infrastructure. As fiscal policy moves from rescue to recovery, the general government deficit is projected to decline from 12.9% of GDP in 2020 to 5.4% in 2022 and 4.0% in 2023. (OECD, 2021a).

1.3.1. *Green elements in the UK's 2020 recovery package*

In the summer of 2020, as part of its COVID-response package, the UK government announced investment in cycling and public transport and energy efficiency in buildings to support jobs and reduce GHG emissions (HM Treasury, 2020a). In November 2020, the Prime Minister outlined the Ten Point Plan for a Green Industrial Revolution to build back better (Table 1.2). The plan seeks to mobilise GBP 12 billion of government investment to create and support up to 250 000 green jobs by 2030 and reduce UK emissions by 180 Mt CO_2e between 2023 and 2032 (40% of 2019 emissions) (HM Government, 2020). It was followed by the 2020 Spending Review and National Infrastructure Strategy setting out how the UK government intends to fund the Ten Point Plan. The plan was generally welcomed by stakeholders but was criticised for bringing forward previously announced spending commitments and for being insufficient for the net zero target (IISD, 2020); (CCC, 2021b).

Table 1.2. The 2020 Ten Point Plan for a Green Industrial Revolution

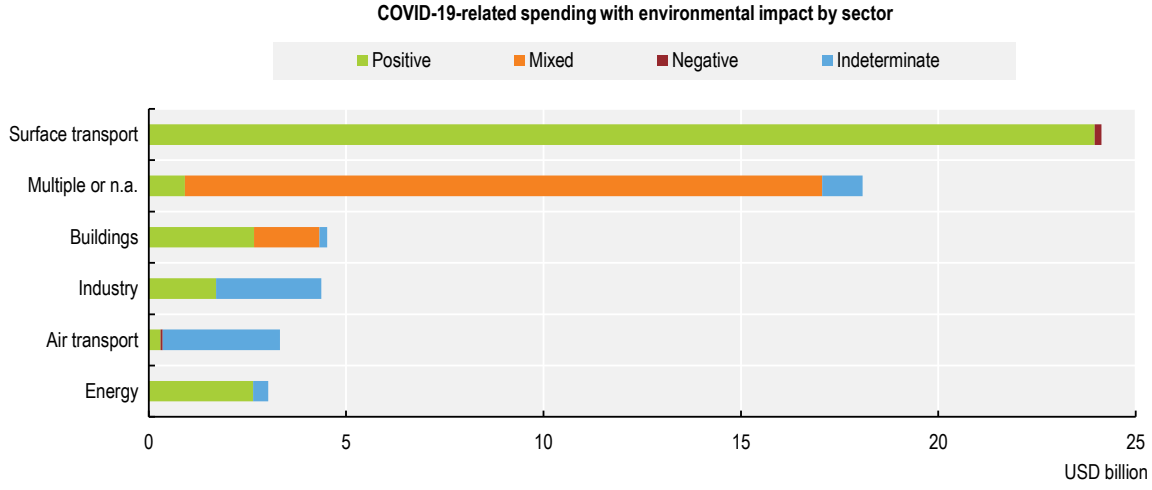
Targets	Expected impacts
Offshore wind Quadruple offshore wind capacity to 40 GW by 2030	Support for up to 60 000 jobs in 2030 Savings of 21 Mt CO_2e between 2023 and 2032 (5% 2018 UK emissions)
Hydrogen 5 GW of low-carbon hydrogen production capacity by 2030	Support for up to 8 000 jobs by 2030 Savings of 41 Mt CO_2e between 2023 and 2032 (9% 2018 UK emissions)
Nuclear Pursuing large-scale nuclear and developing small and advanced reactors	A large-scale nuclear power plant will support a peak of around 10 000 jobs during construction
Electric vehicles End the sale of new petrol and diesel cars and vans by 2030 and hybrid cars and vans by 2035	Support for around 40 000 new jobs in 2030 GBP 2.8 bn package (incl. GBP 0.5 bn for purchasing grants and GBP 1.3 bn for charging infrastructure) Savings of around 5 Mt CO_2e to 2032
Public transport, cycling and walking Accelerate the transition to more active and sustainable transport with at least 4 000 more British-built zero-emission buses	Up to 3 000 jobs by 2025 Government investment of GBP 5 bn in buses, cycling and walking over this parliament Savings of around 2 Mt CO_2e from green buses, cycling and walking between 2023 and 2032
Jet zero and green ships	Up to 5 200 jobs supported by a domestic sustainable aviation fuels industry

Make the United Kingdom the home of green ships and planes	Savings of up to 1 Mt CO_2e by 2032 from clean maritime
Greener buildings 600 000 heat pump installations per year by 2028 and moving away from fossil fuel boilers	Up to 82 500 jobs GBP 1.5 bn for the Green Homes Grant Voucher Scheme Savings of 71 Mt CO_2e between 2023 and 2032 (16% 2018 UK emissions)
Carbon capture, utilisation and storage (CCUS) Capture 10 Mt of carbon dioxide a year by 2030 and establish CCUS in four clusters	Support for around 50 000 jobs by 2030 Up to GBP 1 bn of public investment by 2025 Savings of around 40 Mt CO_2e between 2023 and 2032 (9% 2018 UK emissions)
Protecting our natural environment Planting 30 000 ha of trees every year by 2024	Up to 20 000 jobs from improving flood defences by 2027 Up to GBP 5.2 bn of investment for flood defences
Green finance and innovation Raise total R&D investment to 2.4% of GDP by 2027	Unlock the potential for 300 000 jobs in exports and domestic industry by 2030 GBP 1 bn of government funding in net zero innovation

Note: Greener buildings: the Green Homes Grant Voucher Scheme was ended in March 2021 with GBP 314 million spent and 47 500 homes upgraded. CCUS: the 2021 NZS aims to store 20-30 Mt CO_2 per year by 2030.
Source: HM Government (2020), The Ten Point Plan for a Green Industrial Revolution; NAO (2021), Green Homes Grant Voucher Scheme.

It is difficult to determine whether a measure is exclusively related to COVID-19 and to distinguish between rescue and recovery measures. However, the United Kingdom is reported to have allocated USD 57 billion (2.1% of 2020 GDP) to measures with environmental implications as part of its recovery efforts (Figure 1.5). More than half of this total (1.2% of GDP) was allocated to measures with a likely positive environmental impact. These were mostly grants or loans tagged for their climate mitigation effect, supporting in particular public transport services (rail, transport services in London, bus and light rail services across the rest of England) whose use declined during the pandemic. Environment-related measures represent a small share of the COVID-19 response package due to the importance of rescue measures. The 2020 Ten Point Plan for a Green Industrial Revolution, the 2021 plan to Build Back Better, the NZS and the Fairer, Greener Scotland Programme for Government 2021-22 aim to mobilise green private investment and to promote green finance through the new UK Infrastructure Bank and the Scottish National Investment Bank.

Figure 1.5. Most green spending related to COVID-19 is on public transport



Note: Airline and car manufacturer bailouts with no green conditions are reported as indeterminate in the figure.
Source: OECD (2021), *OECD Green Recovery Database* (database).

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Among the 50 largest economies covered by the Global Recovery Observatory, the United Kingdom invested the most on green transport (O'Callaghan and Murdock, 2021). This reflects efforts to align the climate and the wider well-being agendas through street redesign and management (Box 1.2) (OECD, 2021c). Budgets were also announced for promoting electric vehicles (EVs) (Section 1.3.3), renewables (Section 1.3.2), woodland creation and peat restoration (Section 1.3.3). However, the hasty implementation of the Green Homes Grant Voucher Scheme has been detrimental to results. It was ended after reaching fewer than 10% of the homes it was set out to upgrade, and had limited impact on job creation (NAO, 2021a). Other measures ran counter to the climate objectives. For example, the Bank of England has granted COVID Corporate Financing Facility loans to UK-based car manufacturers and airlines with no environmental conditions. There are also concerns the super deduction announced in the March 2021 budget could encourage high-carbon investment.

The United Kingdom has made progress in integrating environmental objectives into departmental plans. The 2021 Autumn Budget and Spending Review outlines the public spending contribution to net zero (GBP 26 billion) and other green objectives[13] (GBP 4 billion) over 2021-25 (HM Treasury, 2021b). However, it has not published the potential negative contribution of programmes. Despite progress in updating the Green Book (Box 1.3), government departments do not always consider it on a consistent basis when appraising programmes (HoCs, 2021a). Some countries, such as France, have classified budget lines according to their impact (positive or negative) on environmental objectives. The United Kingdom could follow the same approach to ensure public spending is consistent with environmental objectives. The Environment Act exempts HM Treasury from being bound by environmental principles[14] by exempting taxation, central spending and resource decisions from their application. This is intended to ensure the Treasury Minister's ability to alter the UK's fiscal position but goes against the recommendation of the House of Commons Environmental Audit Committee (HoCs, 2021a).

Box 1.2. Recovery measures to accelerate active travel

In 2019, journeys below 2 miles (3.2 km) represented 43% of all urban and town journeys; 58% of car trips were shorter than 5 miles and 25% were shorter than 2 miles. Switching short car journeys to cycling and walking can contribute to achieve net zero, improve air quality, health and well-being, and address inequalities, congestion and noise pollution. The UK government aims for half of journeys in towns and cities to be cycled or walked by 2030.

In 2020, the Department for Transport has fast-tracked a pre-existing national agenda to overhaul bus, cycle and walking links, as well as to promote electrification. The GBP 2 billion package is focused on stimulating the shift to active modes through providing additional incentives to individuals (e.g. GBP 50 bike-repair voucher estimated at EUR 28 million) and support for local authorities to make temporary pop-up infrastructure permanent (e.g. 240 km of protected bicycle tracks estimated at EUR 300 million). Well-being aspects are mainstreamed as general practitioners are enabled to prescribe cycling as a health-improving measure, a new national rental e-cycle scheme will enable access to e-cycle for those with pre-existing conditions, and employers are encouraged to take on the cycle-to-work scheme (Section 1.3.3).

The Fairer, Greener Scotland Programme for Government 2021-22 commits that 10% of all transport spending will be devoted to active travel by 2024-25.

Source: Buckle et al. (2020), Addressing the COVID-19 and climate crises: Potential economic recovery pathways and their implications for climate change mitigation, NDCs and broader socio-economic goals; Dft (2021), Decarbonising Transport: A Better, Greener Britain.

1.3.2. *Investing in environmental and low-carbon infrastructure*

Low investment and innovation rates have been key factors behind the weak productivity performance of the United Kingdom in recent years (OECD, 2020a). The government aims to increase public investment from 1.9% of GDP in 2019-20 to 2.7% by 2025-26. The 2020 National Infrastructure Strategy seeks to boost growth and productivity across the whole of the United Kingdom, levelling up and strengthening the Union; put the United Kingdom on the path to net zero; and support private investment (HM Treasury, 2020b). It provides for GBP 27 billion investment (equivalent to 1.2% of GDP) in economic infrastructure (transport, energy and digital communications) in 2021/22. The 2020 and 2021 Spending Reviews also include multi-year capital funding commitments for infrastructure projects such as high speed rail, strategic roads, flood defences and broadband. However, there are questions about whether infrastructure programmes sufficiently consider regional disparities and environmental objectives (Box 1.3).

Box 1.3. Assessing environmental impacts of public investment

The United Kingdom has a robust framework for monitoring and evaluating public spending programmes, including a Green Book to appraise the costs and benefits of policies, projects and programmes. However, an HM Treasury review (2020) concluded that appraisal practice was likely to undermine the government's objectives in areas such as "levelling up" the regions and reaching net zero. Selection of projects is heavily reliant on benefit-cost ratio. Too much weight is placed on benefits that can easily be assigned a monetary value and insufficient weight on addressing strategic policy priorities.

The Green Book was revised to include stronger guidance on establishing clear objectives from the start and clearer advice on what constitutes value for money, as well as new guidance on appraising transformational impacts and place-based analysis. The updated version requires all projects to consider their impacts on carbon emissions, whether or not they directly target the net zero objective. It provides further guidance on assessment of emissions. The government has also developed guidance on accounting for the effects of climate change, valuing projects' impacts on the natural environment, accounting for natural capital stocks, and valuing costs and benefits that cannot be measured in monetary terms.

The 2020 National Infrastructure Commission's (NIC) design principles seek to deliver a net biodiversity gain and contribute to large-scale restoration of wildlife. The government has committed to embedding the environmental net gain principle for development, including housing and infrastructure, in its 25-year environment plan. It has legislated for biodiversity net gain though the Environment Act. Existing planning regimes also require some consideration of the impact of development on natural capital, and the infrastructure industry has begun to adopt approaches that support natural capital. However, despite the increasing availability of tools and resources, the National Infrastructure Assessment has largely considered the environment as a constraint. Challenges remain relating to planning policy and practice and to measurement and valuation of natural capital. At the end of 2021, the government added the objective to support climate resilience and the transition to net zero to the NIC's remit.

Source: HM Treasury (2020), Green Book Review 2020: Findings and response; NCC (2020), State of Natural Capital Annual Report 2020; NIC (2021), Valuing natural capital in infrastructure.

Environmental protection

Public expenditure on environmental protection (mostly on waste management, Chapter 2) steadily decreased over 2010-19 from 1% of GDP to 0.6%, below the EU average of 0.8%. Spending on biodiversity

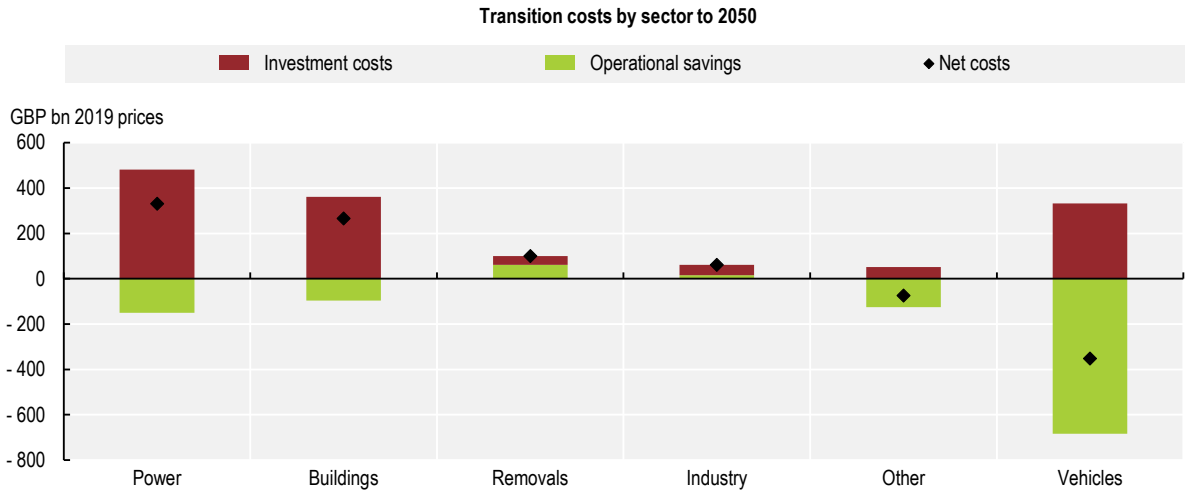
fell by more than a quarter to reach only 0.02% of GDP in 2019. The situation is changing with increased recognition of the potential of nature-based solutions (NbS) (OECD, 2021d); the government has allocated GBP 750 million to England's Nature for Climate Fund to support the creation, restoration and management of woodland and peatland habitats from 2020 to 2025 (Section 1.3.3).

Low-carbon transport and energy infrastructure

The NZS estimates that additional annual investment must grow to GBP 50-60 billion by 2030 (HM Government, 2021). With operational savings generated through reduced reliance on fossil fuels, the net cost of the transition is estimated at 1-2% of GDP by 2050, depending on the sources (CCC, 2020b) (HM Government, 2021). The power and buildings sectors are expected to contribute most to investment costs due to the increase in electricity generation and high costs of decarbonising buildings, while vehicles are anticipated to dominate net operating savings (Figure 1.6). The NZS and 2021 Spending Review commit GBP 26 billion in total public investment for net zero to 2025. This appears generous in some areas (e.g. innovation, EV charging infrastructure) but low in others (e.g. heat pumps and heat networks) (CCC, 2021a).

Figure 1.6. Net costs of the net zero transition are projected to be small over 2020-50

Capital investment and operating costs savings in the CCC balanced pathway to net zero



Note: The CCC has used scenarios to identify a Balanced Pathway to Net Zero, which forms the basis of the sixth carbon budget. The Balanced Pathway makes moderate assumptions on behavioural change and innovation. It takes actions in the coming decade to develop multiple options for later roll-out (e.g. use of hydrogen and/or electrification for heavy goods vehicles and buildings).
Source: CCC (2020), The Sixth Carbon Budget - The UK's path to Net Zero; OBR (2021), Fiscal risks report, July.

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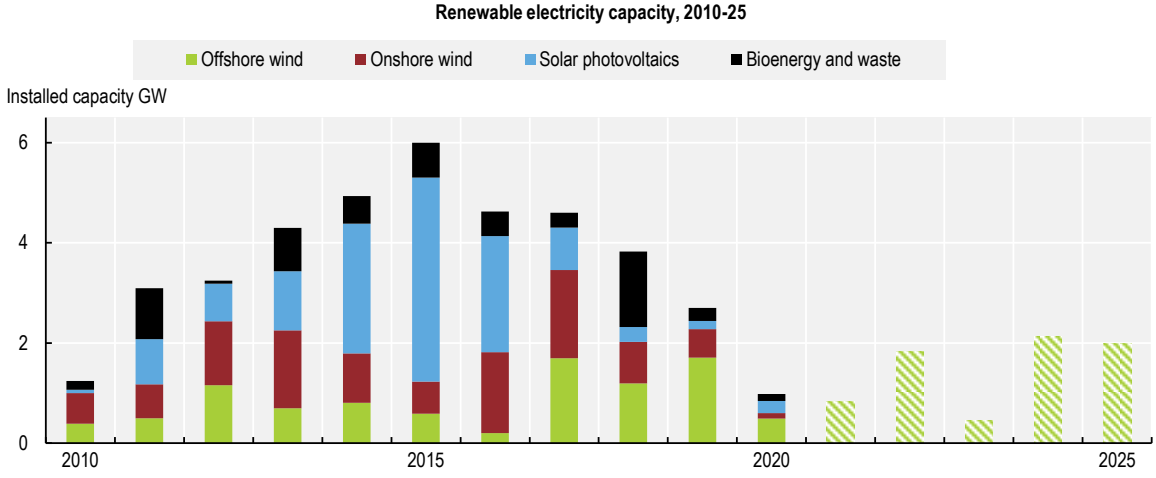
Renewable energy

Over the past decade, the United Kingdom has achieved remarkable growth in renewable electricity thanks to renewable obligations, feed-in tariffs and contracts for difference (CfD) (Figure 1.7) (IEA, 2019). CfD is now the main mechanism for supporting large-scale renewable electricity generation. Through competitive auctions, it provides 15-year contracts to new renewable generation at a guaranteed strike price. CfDs have led to strong cost reductions and significant investments since they were introduced in 2014 –

particularly in offshore wind where the United Kingdom is a world leader. The government aims to accelerate deployment of low-cost renewable generation through CfDs by reviewing the frequency of CfD auctions. The fourth CfD round (held at the end of 2021) aims to double the capacity achieved in the 2019 round to 12 GW with a record budget of GBP 285 million. It was opened to established technologies such as onshore wind and solar photovoltaics, as well as offshore wind and less established technologies such as floating offshore wind and tidal stream. In 2020, renewables accounted for 14% of total energy supply and 43% of electricity generation, above the respective OECD averages of 12% and 30% (IEA, 2021). The country missed the overall binding target of 15% share of renewables in gross final energy consumption, set for the United Kingdom by the EU Renewable Energy Directive for 2020. However, it met the 2020 sub-targets on electricity and transport of the National Renewable Energy Action Plan, although it was below the objective for heating.

Despite the doubling of public budget on energy research, development and deployment (RD&D) since 2014, the United Kingdom remained behind leading countries in 2020. Spending on nuclear energy expanded significantly, while increasing less for cross-cutting technologies and energy efficiency. As a share of total public budget on energy RD&D, the United Kingdom spends more on nuclear power than the IEA average (33% vs. 21%) and less on energy efficiency and renewables (23% and 13% vs. 26% and 15%, respectively).

Figure 1.7. The United Kingdom has achieved remarkable growth in renewable electricity



Note: Offshore wind 2021-25: contracted capacity under the Contracts for Difference scheme as of 1 November 2021.
Source: BEIS (2021), Renewable energy statistics; LCCC (2021), CfD Contract Portfolio status.

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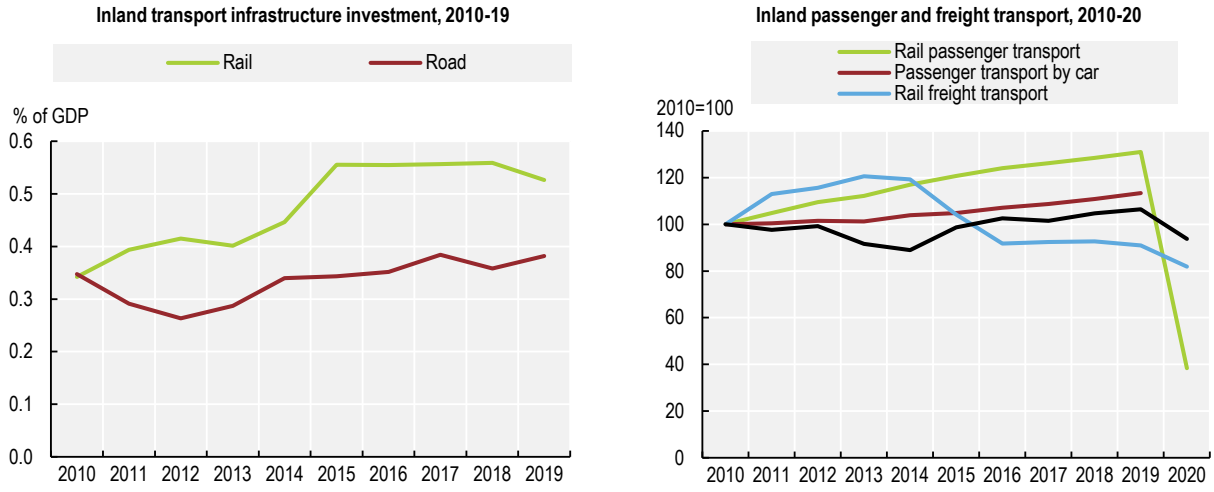
Transport

Transport is the largest GHG emitter and a major source of local air pollution; related infrastructure development is among the main causes of habitat loss (Hayhow et al., 2019). In 2019, road transport accounted for 90% of passenger and freight transport. Over the past decade, public investment in transport infrastructure has increased, especially in rail (Figure 1.8). In 2019, the United Kingdom had one of the highest rail investment rates per unit of GDP in the OECD (OECD, 2021e). Planned investment suggests continued high rates to 2025 with the construction of the high speed rail (IPA, 2021). However, the rail system suffers from long standing issues such as poor passenger service performance; fragmentation and lack of accountability; concerns around increasing costs and financial sustainability (HoCs, 2021b). The

2021 Williams-Shapps Plan for Rail was designed to address these issues. Some question whether regional links are sufficiently prioritised to maximise the economic and social benefits of rail investment (HoCs, 2021c). Meanwhile, major programmes have fallen behind schedule and are over budget. The 2021 Transport Decarbonisation Plan aims at building extra capacity on the rail network to support significant shifts from road to rail. It commits to invest GBP 12 billion in local transport systems to 2024. However, there are concerns around the size of the road-building budget compared to these funding pots (CCC, 2021b). It was estimated that the Road Investment Strategy (GBP 24 billion investment over 2020-25) will add 20 Mt CO_2 from construction, increased vehicle speed and extra traffic (Transport for Quality of Life, 2020).

Figure 1.8. Transport investment has increased, especially in rail, but road remains the dominant transport mode



Note: Investment: England, Scotland and Wales. Passenger and freight transport: Great Britain only. Rail infrastructure expenses include investment in all urban and suburban railways, Underground, Metrolink and Tramlink. Until 2014, rail infrastructure expenses include only the government grant to Network Rail. Since 2015, they have included investment of Network Rail.
Source: ITF/OECD (2021), Transport Infrastructure and Transport Measurement (databases).

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Buildings

Buildings account for 23%[15] of total GHG emissions. Over 2010-19, public support contributed GBP 9.3 billion to finance residential energy efficiency investments in the United Kingdom (Dobrinevski and Jachnik, 2021). The bulk of this support was provided through mandating energy companies to help households adopt energy efficiency measures (Energy Company Obligation replacing previous schemes in 2013). Incentives were also provided through payments to households and small businesses that generate heat through low-carbon sources (Renewable Heat Incentive), building standards and tax reliefs.

Despite progress in improving energy efficiency of buildings in the past decade, the United Kingdom is not on track to meet targets set prior to its net zero commitment. The 2017 Clean Growth Strategy objective was to reach at least Energy Performance Certificate band C[16] in as many houses as possible by 2035 and in as many fuel poor homes as possible by 2030. In 2019, existing houses in England and Wales were mostly rated in band D and rating bands have not changed in recent years (ONS, 2020). Owner-occupied homes, which account for 64% of England's homes, are the worst performing. Only 47 500 heat pump were installed in 2021, compared with 600 000 planned by 2028 in the Ten Point Plan (NAO, 2021a). The 2021 Heat and Buildings Strategy provides for standards and regulations to improve buildings performance

and phase out the installation of high-carbon fossil fuel boilers off the gas grid. It also provides public funding to support energy efficiency and low-carbon heat for social housing, those in fuel poverty, local authorities and public sector buildings, plus a small number of heat pumps and some heat networks. However, there are concerns about insufficient funding to backup the strategy and the lack of mechanisms to improve energy efficiency of owner-occupied homes, while several proposals are still being discussed (CCC, 2021a).

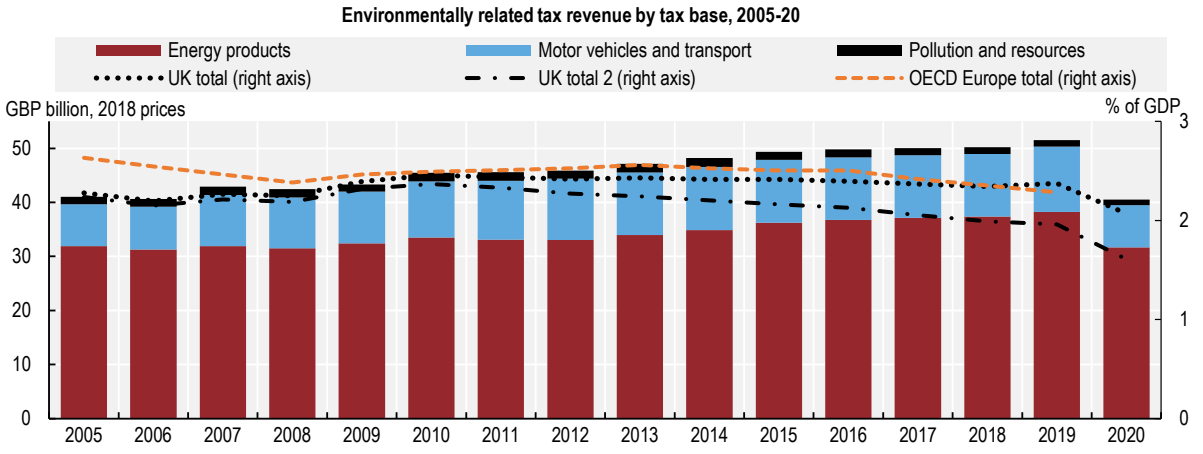
1.3.3. *Greening the system of taxes and charges*

Overview

Although the UK government has recognised taxes as an important instrument for environmental policy, the exchequer departments[17] have limited understanding of their environmental impact (NAO, 2021b). The NZS plans to strengthen and expand the UK ETS, but the role of taxes in achieving the UK's targets remains to be clarified. Recent decisions on taxation run counter to climate objectives. These include, for example, a renewed freeze of fuel duty and vehicle excise duty for heavy goods vehicles (HGVs), suspension of the HGV road user levy and a reduced rate for air passenger duty for domestic flights.

Revenue from environmentally related taxes, which had risen to 2.5% of GDP in 2010, decreased slowly to 2.3% in 2018 before dropping sharply to 2.1% in 2020 (Figure 1.9) (ONS, 2021). The COVID-19 crisis largely explains this drop, as travel restrictions reduced revenue from fuel duty and air passenger duty. Between 2010 and 2019, fuel duty revenue – the largest source of energy tax revenue – did not keep pace with GDP growth. This was due to a reduction in the tax base (fuel consumption remained broadly stable) and effective tax rates (freeze of duty rates since 2011). Expressed as a share of GDP, revenue from environmentally related taxes has fallen faster than the OECD Europe average over the past decade. As in many countries, most receipts come from taxes on energy products and, to a lower extent, on motor vehicles' purchase and use and transport. Taxes on pollution and resource management such as landfill taxes and aggregate levy do not raise much revenue. However, high landfill tax rates have played a key role in diverting waste from landfills and a plastic packaging tax will take effect from 2022 (Chapter 2).

Figure 1.9. Revenue from environmentally related taxes did not keep pace with GDP



Note: the ONS includes Renewables Obligation, Contracts for Difference, Carbon Reduction Commitment (phased out in 2019) and Emissions Trading System (green and white certificates and carbon permit auctions) in energy taxes, the equivalents of which are often not included in other European countries' data. In UK total 2, energy taxes only include fuel duty, climate change levy and carbon price support.
Source: OECD (2021), OECD Environment Statistics (database); ONS (2021) Environmental Taxes (dataset).

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Taxes on energy use and carbon pricing

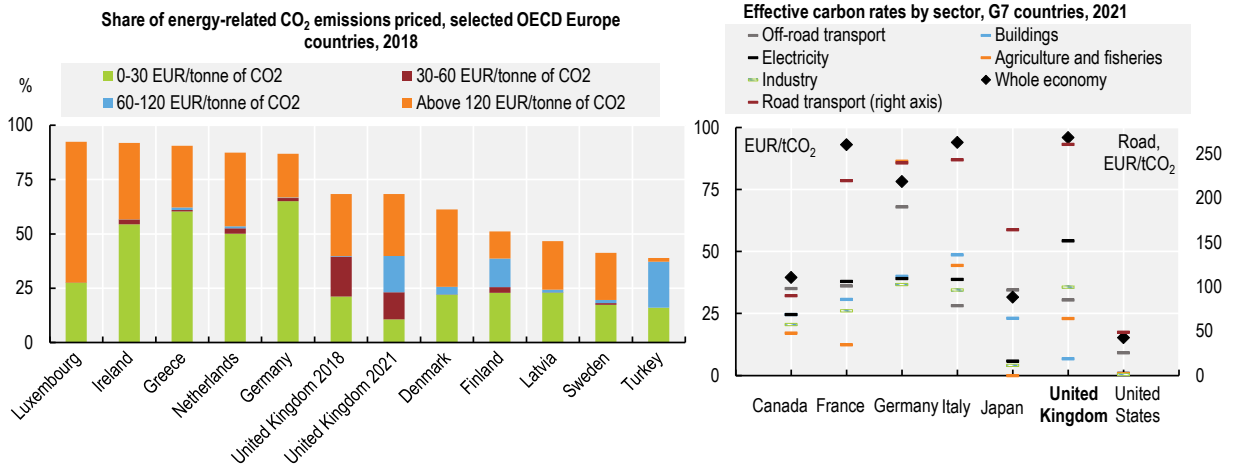
Until 2020, energy taxes were levied in the framework of the EU Energy Tax Directives. In 2020, the rates applied in the United Kingdom were well above the minimum rates of the directive (EC, 2020b), and they remained unchanged in 2021. There are three main taxes on energy use. First, a fuel duty applies to liquid fuels (including bioethanol and biodiesel), as well as to liquefied petroleum gas (LPG) and natural gas (including biogases) when used as motor fuels. In addition, a climate change levy (CCL) applies to solid fossil fuels, LPG, natural gas and electricity when supplied to business and public sector users. The CCL is not based on fuels' carbon content; energy-intensive businesses with a climate change agreement with the Environmental Protection Agency are entitled to discount CCL rates. Finally, in 2013, the United Kingdom introduced a carbon price floor that taxes fossil fuels used in electricity generation via carbon price support (CPS) rates on top of the ETS allowances price.[18] CPS rates were increased from GBP 4.9 /t.CO_2 in 2013 to GBP 9.6 /t.CO_2 in 2014 and GBP 18.0 /t.CO_2 in 2016. Combined with the UK's commitment to end coal use by 2024 and EU air quality regulations, increased CPS rates helped reduce the share of coal in electricity generation from 40% in 2012 (the year before the CPS was introduced) to 2% in 2019.

In 2021, the four governments of the United Kingdom launched the UK ETS to replace the EU ETS in which the United Kingdom had participated since 2005 (ICAP, 2021). The design features of the UK ETS largely mirror those of the EU ETS Phase 4. It covers energy-intensive industries, the power sector and aviation. The UK ETS has a tighter emissions cap (5% lower than what would have been the UK's expected notional share of the EU ETS cap), which will be reduced annually by 4.2 Mt. Mechanisms to adjust supply and contain costs, as well as a transitional allowance reserve price of GBP 22 (EUR 25), aim to ensure market stability. To minimise the risk of carbon leakage, a share of allowances is freely allocated to emissions-intensive sectors exposed to trade as in Phase 4 of the EU ETS. The UK ETS authority (made up of the four governments) has committed to implement a net zero consistent trajectory for the annual ETS cap. It will also explore expanding the ETS to sectors not subject to an explicit carbon price as is planned by the European Union. The authority is open to linking the UK ETS internationally to other systems but has not decided on preferred linking partners (HM Treasury, 2021c).

The complex system of explicit (ETS, CPS) and implicit carbon prices[19] (CCL, fuel duty and preferential tax treatments [Section 1.3.4]) sends inconsistent signals across sectors and fuels (Figure 1.10). They do not reflect the environmental damages from energy use and are not aligned with the net zero target.[20] Compared with other OECD European countries, effective carbon rates[21] are high in the road and electricity sectors but low in others, especially in the residential and commercial sector. In 2021, 45% of carbon emissions from energy use were priced above EUR 60 per tonne of CO_2, the midpoint benchmark for carbon costs in 2020. Emissions priced at this level were primarily emitted by road transport and electricity.

As in other countries, high effective carbon rates in road transport are justified by non-climate external costs (e.g. air pollution, congestion) associated with petrol and diesel use. The United Kingdom is one of the few OECD members to tax diesel and petrol at the same nominal rate. This is positive as diesel has higher carbon content than petrol and diesel engines generally generate higher local air pollution cost. However, continued freezes of fuel duty rates undermine carbon prices and do not encourage the shift to public and active transport, and to EVs. The freeze until 2026/27 announced in autumn 2021 will cost GBP 7.9 billion in revenue loss.

Figure 1.10. Carbon prices vary by sector and fuel



Note: Includes emissions from the combustion of biomass. Left panel: top 5 and bottom 5 OECD Europe countries. Price levels have increased in EU countries in 2021 due to the significant increase in EU-ETS prices. This increase is not reflected in the left panel.
Source: OECD (2021), Carbon Pricing in Times of COVID-19: What Has Changed in G20 Economies?; OECD (2021), "Effective carbon rates", OECD Environment Statistics (database).

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While electricity consumption is subject to a carbon price under the ETS and the carbon price floor, gas consumption faces no or low carbon prices (CCC, 2020c). CCL imposed on business and public sector users is higher for electricity than for gas, although the government plans to align rates in 2025. In addition, the costs of support to renewables (such as the renewables obligation and CfD) is passed through to consumers and weight on electricity bills, encouraging use of gas over electricity for household and business customers and slowing the transition to cleaner energy. Expanding carbon pricing to gas and reducing policy costs in electricity bills would improve price incentives. The UK government committed to delivering cheaper electricity by rebalancing policy costs from electricity bills to gas bills this decade in the 2021 Heat and Buildings Strategy and NZS.

Transport-related taxes and charges

The share of taxes on motor vehicles and transport (excluding fuel duty) in revenue from environmentally related taxes dropped from 24% to 19% over 2019-20, mostly due to reduced revenue from air passenger duty (APD).[22] The United Kingdom applies taxes on purchase and use of motor vehicles. The vehicle excise duty (VED) is the largest source of revenue from taxes on motor vehicles. Other tax incentives and subsidies encourage the purchase of EVs.

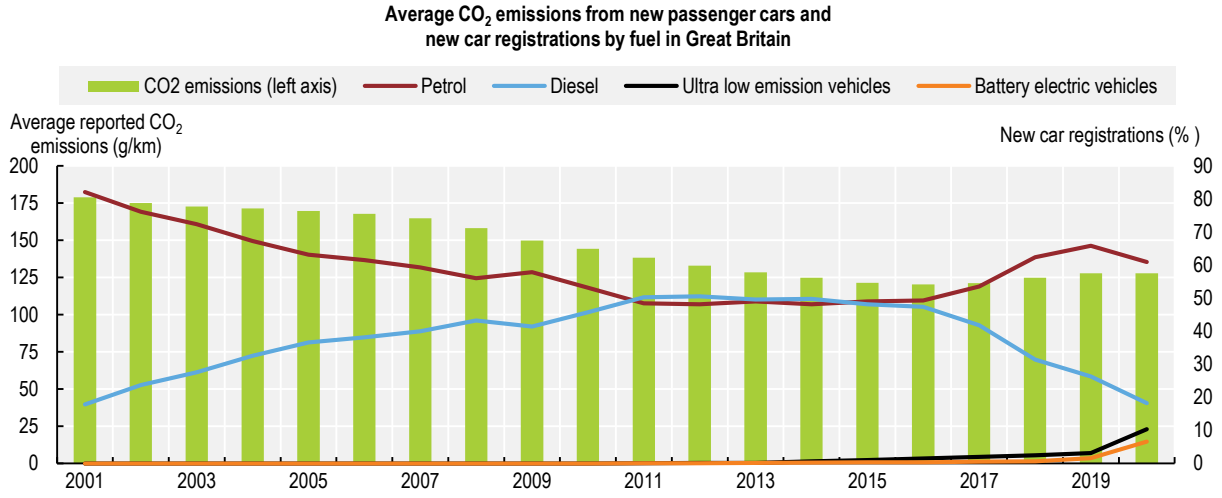
Vehicle taxes

Since 2001, VED has been based on a car's CO_2 emission band. Since 2017, VED due in the first year has been based on CO_2 emission band and fuel type. Higher rates are charged for diesel cars not meeting real driving NOx emission standard; lower rates are charged for alternative fuel vehicles (hybrids, bioethanol and LPG); and EVs are exempt. After a new car has spent a year on the road, VED is charged at a flat rate with a premium for cars with a list price over GBP 40 000, a slightly reduced rate for alternative fuel vehicles and exemption for EVs (including those over GBP 40 000, since 2020).

The 2001 VED reform has been a key factor in nearly tripling the number of diesel cars over the past two decades; the 2017 reform was welcome to revert this trend. (Figure 1.11). However, despite tighter CO_2

emission performance standards, average CO_2 emissions per kilometre of new cars have risen over 2016-19, due to the rising share of larger vehicles (SUVs).[23] In addition, the 2017 reforms weakened the link between VED liabilities and CO_2 emissions after a vehicle is first registered (HM Treasury, 2020c). This affects second-hand car sales, reducing the incentive to choose lower emitting cars. The UK government ran a Call for Evidence on i) increasing first licence VED for more polluting vehicles or introducing a more granular system whereby rates vary with every gramme of CO_2[24] and ii) greening VED after first registration.

Figure 1.11. Electric vehicles account for a rising but modest share of new car registrations



Note: New car registrations fell by 29% in 2020 due to the COVID-19. Ultra low emission vehicles: reported to emit less than 75g of CO_2 from the tailpipe for every kilometre travelled. Includes battery electric, plug-in hybrid electric and fuel cell electric vehicles.
Source: DfT (2021), Vehicle licensing data tables.

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APD is levied on a per-passenger basis on all flights departing UK airports. Rates vary by destination and by class of travel with higher rates on long-haul flights and on business and first-class tickets. However, rates have been too low to discourage the growing demand for air travel (until the COVID pandemic) and are only loosely linked to flights' emissions: emissions are taxed most heavily for short-haul, economy-class flights (Adam et al., 2021). In the 2021 Autumn Budget, the UK government increased APD for the longest long-haul flights. At the same time, it also decreased the rate for domestic flights with an overall net expected increase of 387 000 passengers annually (OBR, 2021a). A study has shown that a frequent flyer levy would be more effective in limiting demand and would have less impact on low-income earners (Chapman et al., 2021).

Tax treatment of company cars

The United Kingdom encourages use of passenger cars through favourable company car tax taxation. The private use of a company car by employees (72% of which are males) is taxed as an in-kind benefit with a further tax if free or subsidised fuel is provided (ACEA, 2021). The taxable value is based on discounts from the standard 37% rate of the car's list price, CO_2 emissions and fuel type. The imputation rate does not vary with private mileage. Overall, employees are taxed on an estimated in-kind benefit that is less than the real value of using a company car (22% less in 2015, which was in line with the EU average) (Princen, 2017). The company car tax has encouraged people to drive more: the private mileage of

company cars increased over 2002-19 and was nearly triple that of private cars in 2019 (DfT, 2021c). Combined with fuel car benefit, it has also led to choosing larger, diesel cars.

Zero-emission cars attract a reduced percentage of 0% in 2020-21, 1% in 2021-22, before returning to the planned 2% rate in 2022-23.[25] Changes in rates have sent contradictory signals: electric cars, which had been exempted from 2010, were taxed from 2015 with increasing rates to 2019-20 before being exempted again in 2020-21. These changes have reduced incentives and delayed decisions to purchase EVs (HoCs, 2018). While the 2020 reform promotes cleaner cars, favourable company car taxation will continue to contribute to car use, congestion and non-exhaust air emissions (e.g. from tyres and brakes).

Incentive for cycling

The cycle to work scheme allows employers to buy or lease bicycles and related equipment for their employees. Employees pay back this amount through a salary sacrifice for an agreed period. The scheme provides income tax and social contributions savings for employees. This in-kind benefit is not taxable. Employees can save up to 40% of the cost of a new bicycle. Over the past ten years, more than 1.6 million people participated in the scheme, including nearly 200 000 during the COVID-19 pandemic between March and September 2020 (Cycle to Work Alliance, 2021). Building on this success, the cycle to work scheme could be further promoted for low income, self-employed workers and employees of SMEs.

Support to EVs

Since 2011, the UK government has provided a range of subsidies to incentivise uptake of low emission cars. By March 2020, it had spent GBP 1.1 billion, including GBP 1 billion on the plug-in car grant paid to the car manufacturer to reduce the up-front purchase costs of qualifying cars (NAO, 2021c). The initial grant was GBP 5 000 per car until 2016. The eligibility rules have been tightened over time and in December 2021, the grant was GBP 1 500 and only available for zero-emission cars priced under GBP 32 000. Although its importance to consumers is regularly analysed, the additional impact of the plug-in car grant has not been demonstrated (NAO, 2021c). The number of electric car registrations increased in recent years (Figure 1.11), but their share in newly registered cars and in the total fleet remains well below that of OECD leaders (EAFO, 2021). Support was also provided to install charging points and to raise consumer awareness. The UK government has committed to spend up to GBP 3.5 billion for cars and vans to 2025. This includes GBP 1.3 billion for charging points, GBP 0.6 billion for the plug-in vehicle grants and an additional GBP 0.6 billion for charging infrastructure and plug-in vehicle grants announced in the 2021 Spending Review; and up to GBP 1 billion for the development and mass-scale production of EV batteries and EV supply chain (Dft, 2021a; HM Treasury, 2021b).

Road pricing

Fuel taxes are well-suited to reflect external costs from CO_2 emissions. However, differentiated kilometre charge by time and place is the best option to address congestion, the main external cost of transport (GBP 59.4 billion a year) (van Dender, 2019) (Lord and Palmou, 2021). There are several individual toll roads, bridges and tunnels (e.g. Mersey Crossings, M6 toll road). In addition, a fee is charged to enter certain areas with certain vehicles (in many cases based on emissions) (Butcher and Davies, 2020). These include the London low emission and ultra-low emission zones and congestion charge, which have reduced congestion and air pollution. Bath, Birmingham and Portsmouth have introduced Clean Air Zones that charge entry to the most polluting vehicles. However, private cars are not always charged.

Since 2014, there has been a road user levy for HGVs using UK roads. However, in practice only non-UK hauliers pay the charge as UK hauliers receive an equivalent reduction in their VED. The levy is based on weight, number of axles and Euro emissions standards since 2019. It was suspended from August 2020 to help the haulage industry recover from the effects of the global pandemic. There has been some discussion over the years about introducing a network-wide road pricing system, which would make differential charges based on time and distance travelled. However, it has never been implemented. As

EVs develop, road pricing will be needed to address transport externalities and loss of fuel and vehicle duty revenue. It will be key to achieving Scotland's target of reducing car miles by 20% by 2030 (elementenergy, 2021).

Economic instruments for biodiversity

Financing biodiversity through carbon sequestration services

Woodland creation for GHG removal will be required to achieve net zero by 2050. Scotland, and to a lesser degree Northern Ireland and Wales, rely on public financial support (Section 1.3.4) to finance forest carbon sequestration. The England Trees Action Plan 2021-24 aims to meet the UK's target of planting 30 000 ha of trees per year by 2024 for their many benefits (carbon sequestration, biodiversity habitats, landscapes, recreation, rural development, timber). Over GBP 500 million of the GBP 750 million Nature for Climate Fund will be mobilised to achieve this target (UK Government, 2021). Devolved administrations have also published plans for woodland creation and peatland restoration. The Scottish government has raised its tree planting ambition to 18 000 ha per year by 2024/5, with ambition in Wales of at least 5 000 ha per year (CCC, 2021a).

England has also taken steps to mobilise private finance to support forest creation. Since its launch in 2018, the GBP 50 million Woodland Carbon Guarantee (WCaG) scheme has supported the potential planting of 2 314 ha. WCaG gives forest landowners the opportunity to sell captured carbon as verified carbon credits, called Woodland Carbon Units (WCU). They can be sold to the government at a guaranteed price every five or ten years up to 2055/56 or on the open market. By offering a guaranteed price for carbon credits indexed for the duration of the contract, WCaGs reduce the financial risk associated with long-term investment. This is important given the low open market price for carbon credits from national forests (GBP 5-15/tCO_2), which does not encourage the creation of woodlands, especially in areas of high land value. In addition, profits from commercial logging of WCaG forests are exempt from income tax and corporate tax, and the value attributable to the trees is exempt from capital gains tax. The sale of voluntary carbon credits is not subject to value added tax (VAT). Some countries such as New Zealand have gone further by allowing forest carbon credits in compliance markets. The UK government is exploring GHG removal methods, including NbS and the incentives needed for their short- and long-term deployment.

Land offset markets for biodiversity

The Environment Act 2021 calls on local authorities to develop local nature recovery strategies in their spatial planning; encourages landowners to sign up, on a voluntary basis, to long-term conservation covenants; and provides that all developments must demonstrate a Biodiversity Net Gain (BNG) of at least 10% as part of the planning permission. The BNG requirement also applies to Nationally Significant Infrastructure Projects. Habitat must be secured for at least 30 years via obligations/conservation covenants. When seeking a planning permission, a developer will have to calculate the number of "biodiversity units" attributable to the site in its pre-developed state, based on a Defra metric. It must then demonstrate how it will raise the total units and maintain that improvement for 30 years. To achieve BNG, development proposals must follow the "mitigation hierarchy" that requires to avoid harm first, then mitigate or finally compensate for losses on-site, off-site or via statutory biodiversity credits (on the biodiversity offset market). In England, mandatory BNG will apply by amending the Town and Country Planning Act and is expected to become law by 2023. Wales aims to publish its BNG strategy by 2023 as part of its nature recovery action plan.

Once enacted, offset markets under net gain policy could attract significant private funding (property developers) for land biodiversity services, including forests. However, they can lead to high transaction costs and miss the scientific logic of nature conservation. In particular, there is no guarantee that developers will compensate locally, based on local opportunity mapping. Providing public financial support,

combined with the price instrument, to developers wishing to compensate with land of higher marginal benefit to nature could help address this problem.

Another option would be to levy a nature tax on building permits. Building permit taxes set at a rate lower than the initial market price for land offsets would not change the overall level of offsets set by 10% BNG cap but reduce the demand for offsets. The market price will gradually align with the tax rate (if all developers are obliged under both instruments). Despite such apparent incompatibility, the combination of instruments could improve cost-efficiency when taxes are used to secure a minimum market price ("floor price"), again if all developers are obliged under both instruments. While a floor price may reduce static efficiency in situations where the land offset market would otherwise produce offset prices below the floor value, such an effect, as well as the relative price certainty it engenders, usually increases dynamic cost-efficiency compared to a "pure" tradable offset system. Since 2012, the French development tax applies to constructions, reconstructions, extensions of buildings and developments of any kind requiring a planning permit. The proceeds are partially allocated to financing the protection of sensitive natural areas (ENS), as defined by the departments. The development tax has doubled the funding of ENS since 2012. However, revenues compensated in ENS for less than 10% of artificialised land over the last 30 years.

1.3.4. *Removing potentially perverse incentives*

Support to fossil fuels

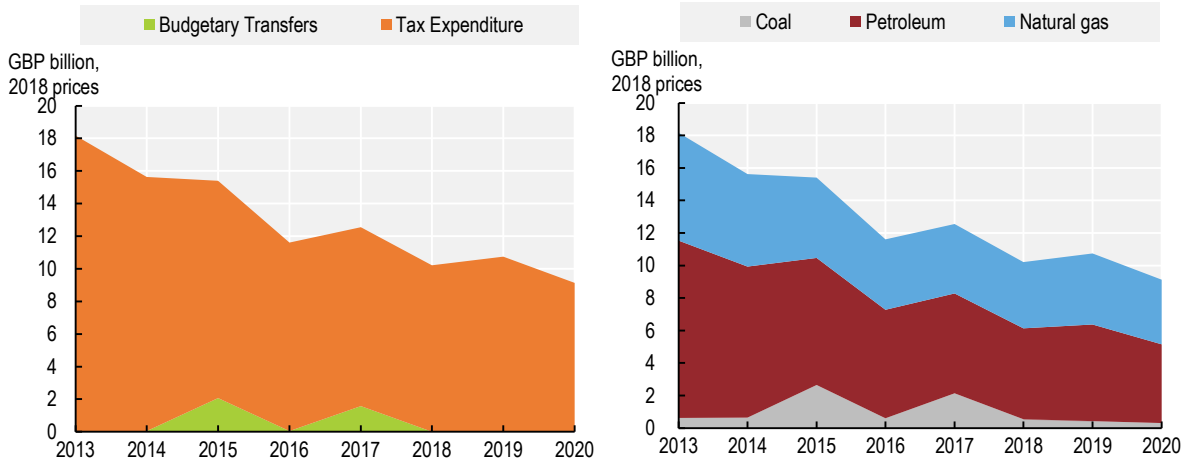
The United Kingdom has committed to rationalise inefficient fossil fuel subsidies as part of Sustainable Development Goal 12.[26] Under Aichi Biodiversity Target 3, it should aim to eliminate, phase out or reform all subsidies harmful to biodiversity. In 2020, the United Kingdom announced an end to support for fossil fuel projects overseas, including export finance, aid funding and trade promotion for new crude oil, natural gas, or thermal coal projects.

The United Kingdom defines a fossil fuel subsidy according to the IEA price gap approach,[27] and as such has no fossil fuel subsidies. The OECD Inventory of Support Measures includes both direct budgetary transfers and tax concessions that provide a benefit or preference for fossil fuel production or consumption. This definition of support[28] is deliberately broader, encompassing policies that can induce changes in the relative prices of fossil fuels.

As in other OECD countries, the United Kingdom delivers most support to fossil fuels through tax expenditures and oil and gas attract the bulk of government support (Figure 1.12). In terms of foregone revenue, larger tax reliefs supporting consumption includes reduced rate of VAT on supply of domestic fuel and power; VAT exemption of domestic passenger transport, including UK portion of scheduled flights; fuel duty not charged on kerosene used as heating fuel; and reduced rate on diesel used in off-road vehicles ("red diesel") (NAO, 2021b). These tax preferences undermine the carbon price signal and discourage an efficient use of energy resources. Budget 2020 announced that entitlement to red diesel would be removed from 2022 (excepting use for agriculture, rail and home heating), but the March 2021 budget confirmed further exceptions.

Figure 1.12. Support to fossil fuel has decreased

Composition of support by type and fuel, 2013-20



Note: Measures appearing in the Inventory are classified as support without reference to the purpose for which they were first put in place or their economic or environmental effects. No judgement is therefore made as to whether or not such measures are inefficient or ought to be reformed. Data need to be interpreted with caution because fossil fuel subsidy data may be partial and because data record tax expenditure as an estimate of revenue that is foregone due to a particular feature of the tax system that reduces or postpones tax relative to a jurisdiction's benchmark tax system, to the benefit of fossil fuels. Hence, i) tax expenditure estimates could increase due either to greater concessions, relative to the benchmark treatment, or to a raise in the benchmark itself; ii) international comparisons of tax expenditure could be misleading, due to country-specific benchmark tax treatments. It is important to note that definitions of tax expenditure, and the benchmarks used to estimate the size of the expenditure, are nationally determined and may hamper international comparisons.
Source: OECD (2021), *OECD Inventory of Support Measures for Fossil Fuels* (database).

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The largest measure supporting production is the “Ring-fence” corporate income tax related to oil and gas activities in the North Sea (enabling a 100% first-year capital allowance for capital expenditures to be deducted from corporate profits). In addition, capital expenditures associated with the decommissioning of fields can be deducted in full from corporate profits in the year in which they are incurred. The combination of tax provisions approximates a "cash-flow" tax system, equivalent to imputed-income tax systems where the objective is to levy a neutral business tax (Boadway and Bruce, 1984). Therefore, provisions such as the expensing of exploration and development costs may not be a preferential tax provision. However, these provisions encourage oil and gas investment in the United Kingdom (NAO, 2021b).

The United Kingdom is not tracking support measures with potential environmentally harmful impact (NAO, 2021b).[29] The OECD generally recommends a sequential, five-step approach to reform fossil fuel subsidies. First, the country identifies the fossil fuel subsidy measures and their policy objectives. Second, it evaluates the economic, social and environmental effects of the identified measures. Third, on the basis of this evaluation, it prioritises support measures that need reform. Fourth, it assesses the distributional implications of the reform and identifies the winners and losers of the policy change. Finally, it designs 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). The same approach is recommended for assessing subsidies harmful to biodiversity (OECD, 2020b) (Box 1.4).

Box 1.4. Tracking support with potential environmentally harmful impact

Since 2013, G20 countries have developed and implemented a methodology for voluntary, country-led peer reviews of fossil-fuel support as a "valuable means of enhanced transparency and accountability" and an important avenue for knowledge exchange. The People's Republic of China, the United States, Germany, Mexico, Indonesia and Italy have completed peer reviews. The OECD Companion to the Inventory of Support Measures for Fossil Fuels offers a sequential framework to help governments assess and address the effects of fossil-fuel support measures and their reform.

The OECD is also developing guidance on identifying and assessing subsidies harmful to biodiversity at a national level. Several countries, including France, Germany, Italy, Lithuania and Switzerland, have identified and assessed national-level subsidies harmful to biodiversity or to the environment.

Source: OECD (2021), *Update on recent progress in reform of inefficient fossil-fuel subsidies that encourage wasteful consumption 2021*; OECD (2021), *OECD Companion to the Inventory of Support Measures for Fossil Fuels 2021*; OECD (2021), *OECD work in support of biodiversity*.

Support to farming

The Common Agricultural Policy (CAP) defined support for UK agriculture until EU exit. In 2018-20, policy support for UK farmers was close to the EU-27 average, as measured by the Producer Support Estimate. It represented about 20% of gross farm receipts (OECD, 2021f). However, in 2020, UK agricultural support included GBP 2.7 billion in payments that may incentivise outputs and increase environmental pressure through on-farm investments and input use, including tax rebates for agricultural fuel. This is four times the agricultural support for environmental protection under the Rural Development Programme (RDP) inherited from the European Union.

The Agriculture Act 2020, which entered into force post-EU exit and much of which is specific to England,[30] introduces the "principle of public money for public goods". Most payments inherited from the CAP will gradually be replaced by payments for public goods through environmental land management (ELM) schemes, including the Sustainable Farming Initiative (SFI), the Local Nature Recovery Scheme and the Landscape Recovery Scheme. The shift from supporting income and market prices to paying farmers for the provision of public goods is a welcome step towards market orientation of agricultural production and protection of biodiversity.

UK agriculture has gained valuable experience in testing results-based payments. Under a pilot project in 2016-18, payments to farmers were directly linked to the level of environmental outcomes achieved, not to management inputs/actions as is the case with action-based agri-environment schemes. The project focused on four key priority biodiversity objectives in arable and grassland systems: species-rich hay meadows, habitat for breeding waders, provision of winter bird food, and provision of pollen resources for pollinators. All the results-based measures had better performance to improve biodiversity than their equivalent control sites under management based agreements (Natural England, 2019).

Pending a shift to results-based approaches, support for agricultural practices meant to protect ecosystems has been weighed against support for other environmental, economic and social objectives. The United Kingdom has devoted a large share (70%) of the CAP RDP 2014-20[31] to ecosystem protection, particularly England (81%). Scotland is spending 18% of its RDP on forest carbon sequestration (3% for Northern Ireland and Wales, 0% for England). Little is spent on practices meant to mitigate GHG and NH_3 emissions.

Recommendations on green growth

Addressing environmental challenges

- Use the legislation, including the Environment Act, to set ambitious quantitative interim and long-term targets on air quality, biodiversity, water (including marine), waste reduction and resource efficiency and develop plans for achieving them to operationalise the goal of leaving the environment in a better state within a generation.
- Swiftly implement the Net Zero and related sectoral strategies, and ensure that resources allocated are in line with the needs identified; detail the expected mitigation impact of measures adopted and planned.
- Further mainstream biodiversity in land use: accelerate the transition from practice-based payments to farmers to results-based payments; strengthen market-based incentives for carbon sequestration as a means of leveraging private finance for forests and their biodiversity; combine public financial support and the land offset market to direct the net gain in biodiversity towards land with high biodiversity value; consider combining the taxation of building permits with the land offset market to ensure a floor price on the market.

Improving environmental governance and management

- Strengthen co-ordination and peer learning between environmental authorities of the four UK nations in setting and implementing environmental policies and laws.
- Secure human and financial resources necessary to maintain and further develop the good regulatory practices in permitting and compliance assurance.
- Reinforce the environmental aspects of regulatory impact assessment; expand the application of strategic environmental assessment to non-environmental policies, plans and programmes.
- Accelerate implementation of variable administrative monetary penalties; in determining such penalties, put more emphasis on recovering economic benefits of non-compliance.

Promoting investment and economic instruments for green growth

- Systematically screen actual or proposed subsidies, including tax provisions to identify those that are not justified on economic, social and environmental grounds and, on the basis of this assessment, develop a plan to phase out fossil fuel and other environmentally harmful subsidies. Clarify the role of taxes in achieving environmental targets.
- Pursue efforts to consider environmental impacts (including on the natural environment) in cost-benefit analysis of public investment and ensure it is systematically considered in decision making. Foster the use of natural capital valuation tools.
- Carry on with plans to set a net zero consistent trajectory for the annual cap of the UK ETS and to explore expanding the system to sectors not subject to explicit carbon prices, as part of a broader fiscal reform that addresses potential adverse impacts on households and competitiveness.
- Consider how to gradually replace declining fuel duty revenues in the context of the transition to electric vehicles, including looking at policy options such as distance-based charges that may vary with vehicle emissions on national roads, and charge differentiation by place and time in the most congested urban areas. Consider increasing first licence vehicle excise duty for more polluting vehicles and green vehicle excise duty after first registration and abolishing the favourable tax treatment of company cars. Ensure the cycle to work scheme meets its objectives, with consideration of low income, self-employed workers and SME employees.

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Notes

[1] Internationally-comparable indicators presented in the OECD Environment at a Glance online platform and related UK profile support the analysis (OECD, 2021b). They should be read in conjunction with this report.

[2] Integration principle, prevention principle, precautionary principle, rectification at source principle and polluter pays principle.

[3] The Climate Change Act requires consideration of the "differences in circumstances between England, Wales, Scotland, and Northern Ireland". Each of the devolved administrations are committed to the UK net zero commitment in the Climate Change Act, but the level of ambition through the carbon budgets and individual targets set by the nations can vary. Scotland has its own climate change plan and aims to achieve net zero by 2045, with interim emission reduction targets of 75% by 2030 and 90% by 2040 compared to 1990 levels. Wales also has statutory climate targets of 63% in 2030, 89% in 2040 and net zero in 2050. Collectively, Scotland, Wales and Northern Ireland accounted for 22% of UK emissions in 2019.

[4] Excluding international aviation and shipping emissions, in line with the United Nations Framework Convention on Climate Change.

[5] As set in the fifth carbon budget.

[6] In 2021, the guideline value was reduced from 10 $\mu g/m^3$ to 5 $\mu g/m^3$.

[7] The JNCC did not assess progress towards Target 18, relating to Indigenous peoples and local communities, as it was deemed not relevant to the United Kingdom.

[8] The IUCN protected area management categories, classify protected areas according to their management objectives but do not provide any indication of whether protected areas are effectively managed or enforced. IUCN categories are not truly hierarchical; however sites designated as the "stricter" categories (I-II in particular) are likely to be more restrictive in the sorts of permitted activities. Different approaches are likely explained by varying national priorities but also by factors such as local geography, ecology and pre-existing patterns of human settlement.

[9] The NIEA is part of the Department of Agriculture, Environment and Rural Affairs, while in England the Environment Agency is independent, but "sponsored" by Defra.

[10] Natural Resources Wales was formed in 2013. Before that, the Environment Agency covered both England and Wales.

[11] For certain offences, the non-compliance score may be suspended for up to six months if the operator is actively addressing the non-compliance in line with a voluntary improvement plan. Suspended scores do not count towards calculating subsistence charges.

[12] VMPs were authorised by the Environmental Civil Sanctions (England) Order 2010 and the Environmental Civil Sanctions (Miscellaneous Amendments) (England) Regulations 2010. Note that VMPs are referred to as "civil sanctions" in the UK terminology, whereas they are classified as administrative in this report. This is because they are imposed by an administrative body (in this case the Environment Agency) and not as a result of a civil judicial decision.

[13] Of which GBP 3.7 billion for flood defences and GBP 0.5 billion for biodiversity.

[14] As set out in the Environment Act, ministers have to take due regard of five environmental principles when making policy.

[15] Including indirect emissions from electricity consumption.

[16] An EPC is required when a building is constructed, sold or let, and is valid for ten years. Domestic EPCs are banded from "A" to "G", where "A" is the most energy efficient in terms of likely fuel costs and CO_2 emissions.

[17] HM Treasury and HM Revenue & Customs.

[18] With higher prices in the United Kingdom, reduced emissions in the country may have been counteracted by an increase in emissions in other EU ETS participating countries. However, limited transmission capacity between the United Kingdom and the European Mainland's electricity grids limits this shift. The additional emission cuts in the United Kingdom may thus have rather increased the intake of emission permits into the market stability reserve of the EU ETS rather than increased emissions outside the United Kingdom (OECD, 2021g).

[19] While the UK ETS is jointly managed by all four nations, CPS, CCL, fuel duty and tax treatments are reserved to the UK government.

[20] BEIS suggests a shadow price consistent with net zero of GBP 245/tCO2 in 2021 (BEIS, 2021b).

[21] Effective carbon rates summarise how countries price carbon through fuel excise taxes, carbon taxes and ETS.

[22] Although registrations declined by 30%, the introduction of the Worldwide Harmonised Light Vehicle Test (WLTP) Procedure has led to an increase in tax liability, thereby maintaining revenue from the vehicle excise duty.

[23] From 2020, this has also been due to more accurate data on car emissions.

[24] The VED band system creates a "cliff-edge" effect that does not reward manufacturers for improving their vehicles' efficiency within bands and the differentials between band rates are uneven.

[25] With the WLTP reform, the government reduced most company car tax rates by 2% in 2020-21 for cars first registered from April 2020. Rates will return to planned levels over the following two years, increasing by 1% in 2021-22 and in 2022-23. Rates will then be frozen until 2024-25.

[26] SDG 12 calls for ensuring sustainable consumption and production patterns.

[27] The IEA estimates subsidies to fossil fuels that are consumed directly by end-users or consumed as inputs to electricity generation. It follows the price-gap approach that compares average end-user prices paid by consumers with reference prices that correspond to the full cost of supply. The price gap is the

amount by which an end-use price falls short of the reference price and its existence indicates the presence of a subsidy.

[28] The OECD definition follows the subsidy definition in the Agreement on Subsidies and Countervailing Measures under the World Trade Organization. OECD's broad definition of support was adopted in 2019 to track and measure the Sustainable Development Goal Indicator 12.c.1 on fossil fuel subsidies.

[29] As noted above, the United Kingdom defines a fossil fuel subsidy according to the IEA price gap approach.

[30] The devolved governments are also developing new agricultural policies.

[31] Related funding continues until projects are finished.

Chapter 2. Promoting circular economy

The United Kingdom has improved its material productivity. It has progressed with recovery and recycling, and the use of economic instruments to divert waste from landfilling. However, contaminated sites and illegal waste dumping remain important concerns. The United Kingdom and devolved governments have set long-term ambitions to improve resource efficiency and move towards a circular economy. Government and private actions provide a strong basis for progress. However, further co-ordination and efforts will be needed to achieve long-term waste management and circular economy goals. This chapter gives an overview of trends in material use and waste generation and of related policies. It reviews policy objectives and institutional settings and then considers the effectiveness of the policy instruments used to encourage waste prevention, reuse and recycling, as well as to manage the transition towards the circular economy.

2.1. Introduction

While the Department for Environment, Food and Rural Affairs (Defra) leads in England, the UK's devolved governments are responsible for nearly all waste management and circular economy policies as part of their overall environmental competence. Local governments play an important role, managing the collection of municipal waste and ensuring its proper treatment. Local governments also tackle low-level illegal waste dumping (fly-tipping). The national regulators in each devolved government are responsible for tackling more serious instances of illegal dumping and illegal waste operations.

From 2005, the United Kingdom has exhibited absolute decoupling of domestic materials consumption from gross domestic product (GDP) and population growth. Over the past decade, however, the UK's material footprint[1] increased slowly. The United Kingdom reduced its generation of municipal waste, although total waste generation increased due to a rise in construction waste and other waste streams.

The landfilling of municipal waste fell sharply from 2005 to 2018, due in large measure to high landfill taxes. Meanwhile, incineration, recycling and composting have all increased. While the three devolved governments have seen strong improvements in recycling and composting, progress has been slower in England. Further efforts will be needed across the United Kingdom to meet its goals to reduce waste and increase recycling.

Government strategies and plans have supported the transition to a circular economy. Scotland, for example, published a circular economy strategy in 2016, and cities including London have launched circular economy initiatives. Private sector initiatives have reduced waste and improved recycling in sectors such as food and textiles. These initiatives provide a basis for the further work on circular economy needed to achieve the UK's ambitious resource efficiency objectives.

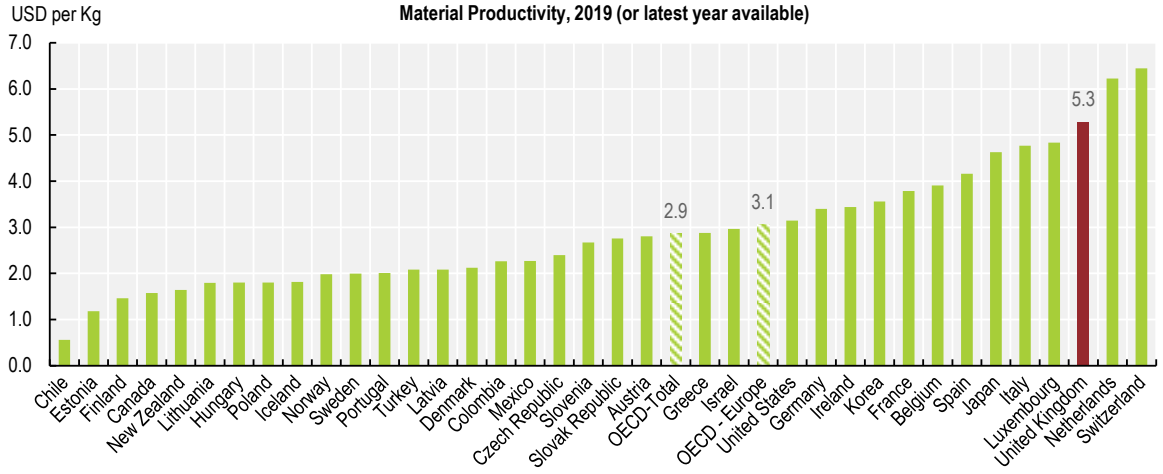
2.2. Trends in waste management and material consumption

2.2.1. *Trends in material consumption*

The United Kingdom has a highly service-oriented economy, more so than any other G7 country, and consequently derives a high share of GDP from economic activities that are not resource-intensive. As a result, the United Kingdom has the third highest material productivity among OECD countries, behind only Netherlands and Switzerland (Figure 2.1).

As of 2019, non-metallic minerals constitute the largest share (39%) of domestic material consumption (DMC) (Figure 2.2), almost all of which is used by the construction sector (34% of total DMC). Biomass (33% of total DMC) and fossil fuel carriers (26%) follow. As of 2019, imports constitute half (49%) of the UK's overall DMC. The ratio varies across materials. For example, almost all fossil fuel carriers (97%) are imported. There is much less dependence on imports for biomass (38%) and non-metallic minerals (11%). However, the United Kingdom imports almost three times the volume of metals used within the economy (38 million tonnes [Mt] imported vs.13 Mt used), and also exports large amounts.

Figure 2.1. The United Kingdom has the third highest material productivity among OECD countries



Note: Material productivity designates the amount of GDP generated per unit of materials used.
Source: OECD (2021), "Material resources", OECD Environment Statistics (database).

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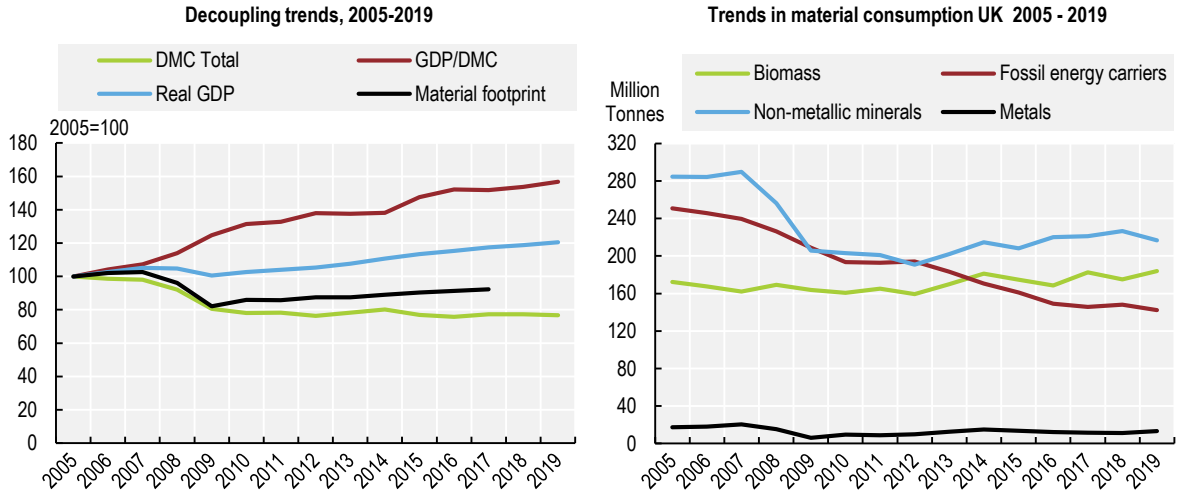
Since 2005, DMC has declined (Figure 2.2). There was a sharp decline from 2007 to 2009, in particular for non-metallic minerals, due to the fall in construction output during the financial crisis. Over 2005-19, there was a steady decline in fossil fuel carriers (-43%) due to the shift in energy supply from coal towards renewable sources. Since 2009, this decline has offset increases in biomass and non-metallic minerals consumption: as a result, DMC remained largely unchanged (Figure 2.2).

Figure 2.2. Material productivity improved as consumption of fossil energy carriers declined



Note: GDP at 2015 prices. DMC refers to the amount of materials directly used in the economy, or the apparent consumption of materials. DMC is computed as domestic extraction used minus exports plus imports. Material productivity designates the amount of GDP generated per unit of materials used (GDP/DMC).
Source: OECD (2021), " Material Resources", OECD Environment Statistics (database).

StatLink https://stat.link/sdwbpv

Overall, GDP has grown over 2005-19 and decoupled in absolute terms from DMC. Moreover, DMC has fallen in per capita terms by 23%. Nonetheless, the UK's materials footprint, which had declined from 2007 to 2009, rose to 2017 (the latest year for which data are available).

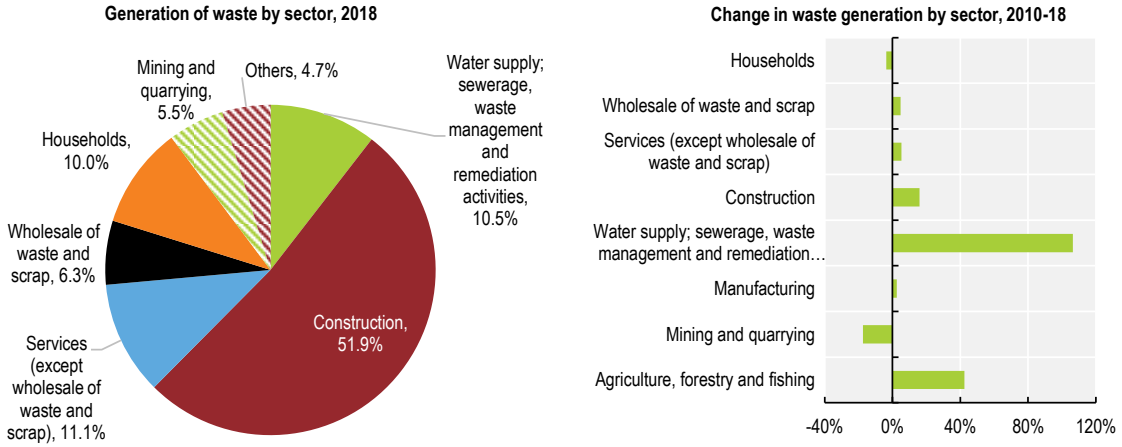
While DMC has declined, the share of imports for materials within total domestic consumption increased from 38% to 49% over 2005-19. As domestic extraction has declined, the share of imports increased for all major components of DMC (biomass, fossil fuel carriers, non-metallic minerals and minerals).

2.2.2. *Trends in waste generation and management*

Total primary waste

The construction sector generates more than half of primary waste (Figure 2.3). The next three sectors in terms of quantity of waste are services, households, and water and waste management, each producing around 10% of the total.

Figure 2.3. Construction generates half of the UK's primary waste, and its volumes of waste increased



Note: Left panel: others include electricity, gas, steam and air conditioning supply, manufacturing and agriculture, forestry and fishing. Right panel: water supply; sewerage, waste management and remediation activities.
Source: Eurostat (2021), Generation of waste by waste category, hazardousness and NACE Rev. 2 activity.

StatLink https://stat.link/ncrt02

Total generation of primary waste increased by 13% between 2010 and 2018. Primary waste from all sectors, except for households and mining and quarrying, rose in this period. Waste from the construction sector, which increased by 16%, was the main contributor to the increase in total primary waste due to this sector's large share of total generation. This sector's added value, total output and new work increased since 2010, despite short downturns between 2011-12 (ONS, 2021). Within the sector, the main contributors to growth were the construction of private housing and public infrastructure works, which both more than quadrupled in real value between 2009-19. They were followed by public housing, which doubled in the same period.[2]

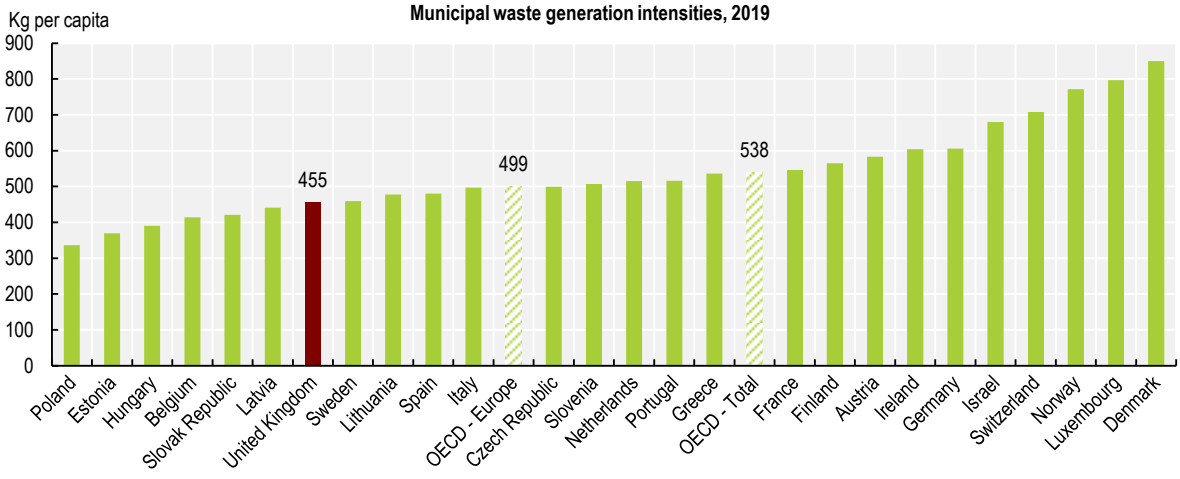
The biggest percentage increase in waste generation is observed in waste treatment operations, which more than doubled between 2010 and 2018. This is to be expected given the increase in related operations and the amount of waste collected and recovered in the country. Waste from electricity and gas supply

operations has seen a drastic fall (77%), but this sector represents only 0.26% of all waste generation in the country.

Municipal waste

The generation of municipal waste in the United Kingdom is lower than both OECD and OECD Europe averages (Figure 2.4). This is due in part to differences in definition: in the United Kingdom, municipal waste is calculated as the waste collected by local authorities (and by contractors working for them). It thus includes mainly household waste plus small shares of service sector waste, while many other OECD Europe countries include a larger share of service sector waste.

Figure 2.4. Municipal waste generation is lower than the OECD Europe average



Note: 2019 data or latest available.
Source: OECD (2021), "Municipal waste, generation and treatment", OECD Environment Statistics (database).

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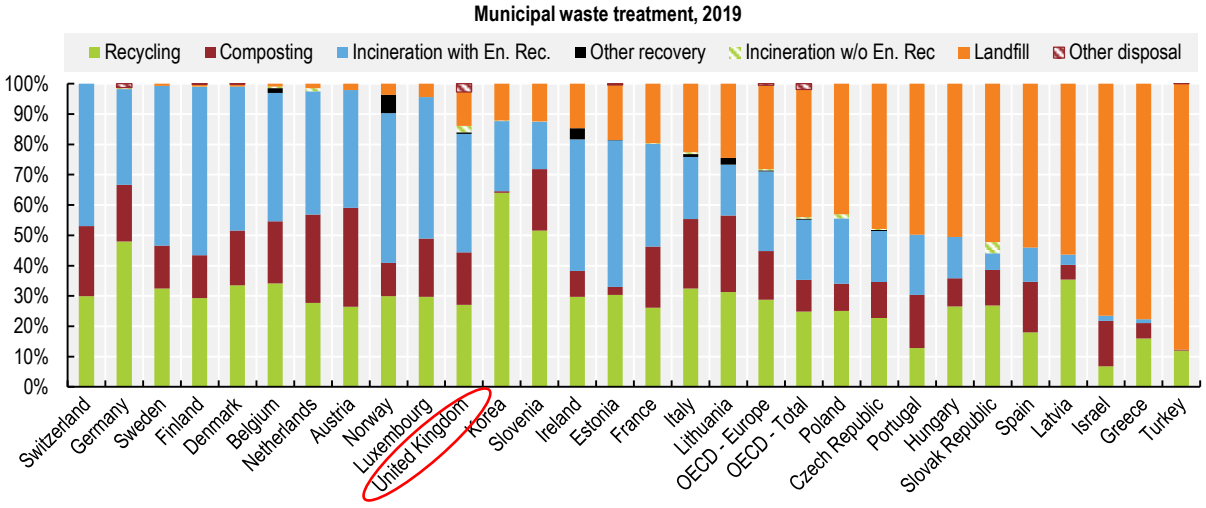
Between 2005 and 2019, the annual amount of municipal waste generated in the United Kingdom fell by 13%. With population increasing during the period, that decline represents a 22% decrease in waste generation per capita. This is partially due to the UK's definitions of municipal waste, which have varied slightly among the four nations and over time. Moreover, municipal waste data in the United Kingdom exclude waste from businesses that do not use municipal collection services. Consequently, if businesses shift from municipal to private collection, municipal waste levels decrease. Nonetheless, awareness raising for waste reduction, separate collection and greater environmental awareness may have also encouraged household waste reduction. Indeed, over the past ten years, the United Kingdom exhibited an absolute decoupling between municipal waste generation and private consumption.

In 2019, 83% of municipal waste generated was recovered, mainly through incineration. The share of incineration with energy recovery in the United Kingdom (39%) was higher than the OECD Europe average (26%) and almost twice as high as the OECD average (20%) (Figure 2.5). For other components of waste recovery, recycling (27%) was slightly below the OECD Europe average while composting (17%) was at a similar rate. Landfilling, 11% of all treatment operations, was lower than OECD Europe and OECD averages. However several OECD Europe countries, such as Netherlands and Norway, have reduced their landfilling to below 5%.

Figure 2.5. Landfilling of municipal waste is lower than the OECD Europe average



Note: Data for 2019 or latest year available. Other recovery includes refuse-derived fuel, waste used for backfilling, process loss from mechanical biological treatment, incinerator bottom ash sent for recycling and metals from incineration sent for recycling. Other disposal includes waste treated/disposed through other unspecified treatment processes, as well as process and moisture loss.
Source: OECD (2021), "Municipal waste, generation and treatment", OECD Environment Statistics (database).

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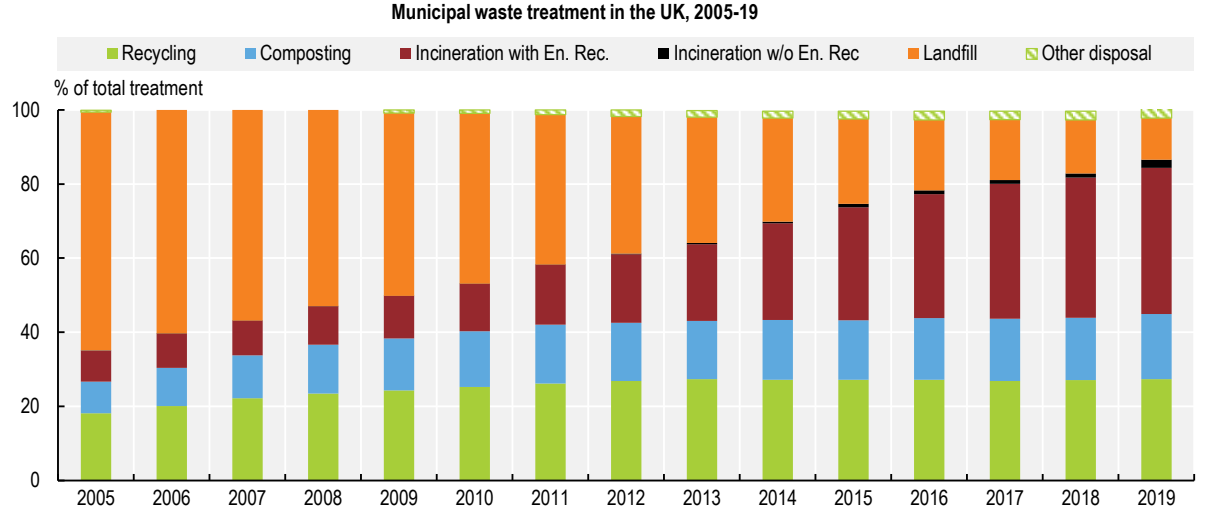
Between 2005 and 2019, the UK's recovery rate of municipal waste more than doubled (from 35% to 83%). This was mainly due to the considerable increase in the share of incineration with energy recovery operations (Figure 2.6). The share of composting operations also rose sharply. On the other hand, the share of recycling operations increased more modestly. These developments resulted in drastic declines in the share of waste going to landfills.

Figure 2.6. Landfilling of municipal waste fell steadily, and incineration rose



Note: See Figure 2.5 for the definition of other disposal.
Source: OECD (2021), "Municipal waste, generation and treatment", OECD Environment Statistics (database).

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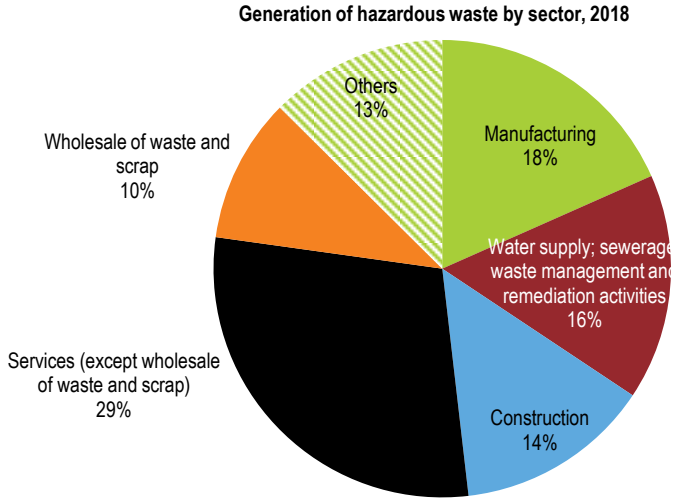
Hazardous waste

The total amount of hazardous waste generated in 2018 was 6.2 Mt. The services sector produced the largest share, followed by manufacturing, construction and water and waste management (Figure 2.7).

Figure 2.7. Services are the largest source of hazardous waste, with manufacturing second



Source: Eurostat (2021), Generation of waste by waste category, hazardousness and NACE Rev. 2 activity.

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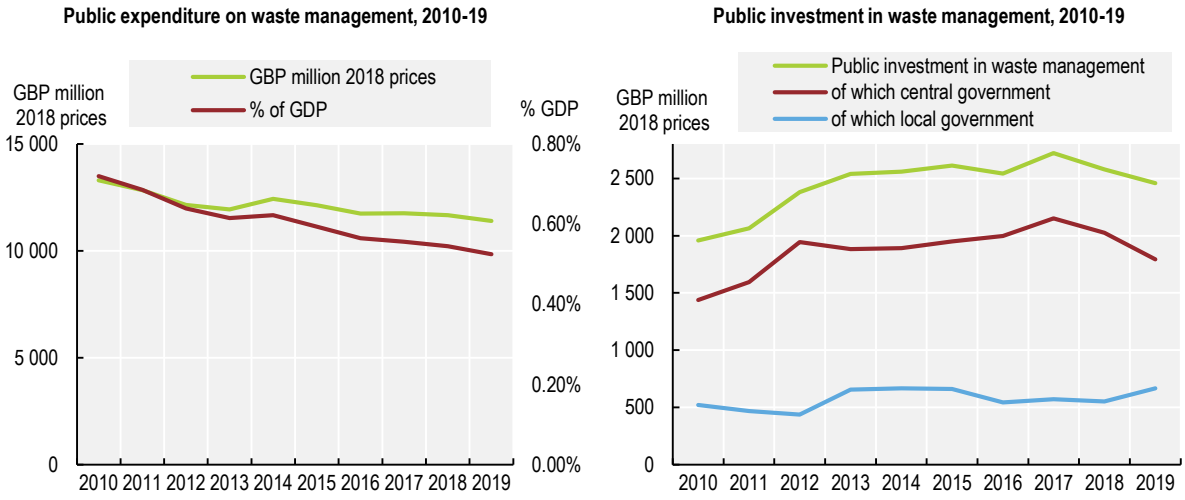
Since 2010, total hazardous waste increased by 18%, with notable differences in magnitude among the sectors. From 2010 to 2018, generation of hazardous waste in water supply and waste management increased by 62%, while volumes remained largely unchanged for the services sector. Hazardous waste from households fell by 8%.

Waste expenditures

Total public expenditure on waste management declined slowly, both in real terms and as part of GDP, over the past decade (Figure 2.8). Compared to 2010, public investment from both central and local governments in waste management increased but has been fluctuating year to year. Since 2017, local government investment increased, whereas it decreased at the central level.

Figure 2.8. Public expenditure on waste management fell in the last decade, while public investment grew



Source: ONS (2021), Environmental Accounts.

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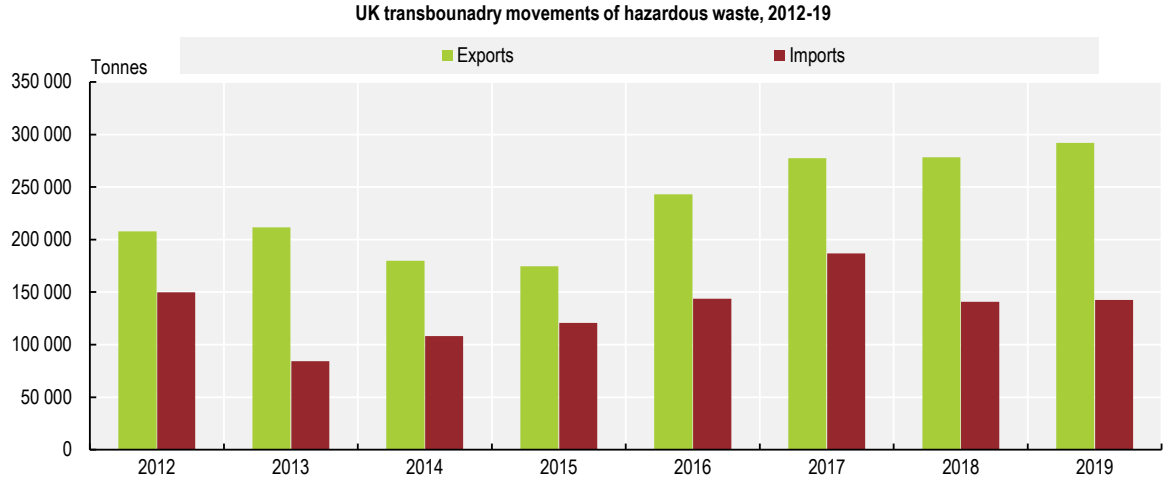
Waste shipments

The UK's hazardous waste exports and imports fluctuated between 2012 and 2019. Exports increased steadily after 2015, while imports fell from 2017 to 2018 (Figure 2.9). In terms of waste streams, waste oil and mixtures, along with battery waste, constituted the two largest shares of imports between 2015 and 2019, with a combined share of 37% in 2019. Metals containing waste were the largest stream within 2019 exports (17% of total) followed by waste oil and mixtures (14% of total) for 2019; moreover, these two streams were consistently among the main hazardous waste exports throughout 2012-19.

Figure 2.9. UK exports of hazardous waste have increased while imports fluctuated (tonnes)



Source: National submission.

StatLink https://stat.link/r9yw5l

When looking at non-hazardous waste, the United Kingdom exports a large volume of recyclable materials, about 14 Mt in 2019 (Figure 2.10). In contrast, its imports of recyclable material have been about 20 times lower, reaching just over 600 000 t in that year. Export volumes fluctuated between about 12-15 Mt between 2006 and 2019. By weight, iron and steel are the largest share (57% of the total in 2019), followed by paper and cardboard. While plastics are lightweight and thus represent a small share of the total weight, their volume increased from 360 000 t to 843 000 t over 2005-19. The destination countries have shifted for all recyclable materials: exports outside the European Union reached 82% of the total in 2019 from 64% in 2005.

Figure 2.10. Exports of recyclable materials rose

Source: Eurostat (2021), Trade in recyclable raw materials by waste.

StatLink https://stat.link/kjt53n

In addition to its exports of recyclable waste, the United Kingdom has exported large volumes of household waste for incineration with energy recovery: from 2013 to 2015, it sent about 7 Mt to countries within the European Union for this purpose (EC, 2018). When looking at all UK waste exported in 2018, the Netherlands (31%) and Sweden (22%) were the top destinations, receiving about half of total UK exports by weight (Eurostat, 2021a). Other important destinations have included Germany (11%) and Egypt (10%). Nearly all UK waste exports are sent for recovery operations such as recycling and incineration with energy recovery.

While plastic waste is light and thus represents a small share of total waste by tonne, it has been an important component in the UK's waste exports. By some estimates, the United Kingdom recently exported about two-thirds of its plastic waste (BBC, 2019). In 2017, the United Kingdom sent 37% of its plastic waste exports to the People's Republic of China (hereafter "China") for recycling. With China's ban on most plastic waste imports, shipments shifted to Southeast Asian countries such as Malaysia and Vietnam. These imports created challenges for management in those countries, which subsequently banned or restricted them. In 2020, about 40% of the UK's plastic exports were sent to Turkey, 12% to Malaysia, and smaller shares to EU member states, including the Netherlands and Poland. Non-governmental organisations (NGOs) have alleged that significant quantities of UK exports are not properly recycled or treated in destination countries (Greenpeace International, 2021).

From January 2021, several major categories of plastic waste became subject to a prior informed consent procedure under the Basel Convention to non-OECD countries. In 2019, the United Kingdom indicated its

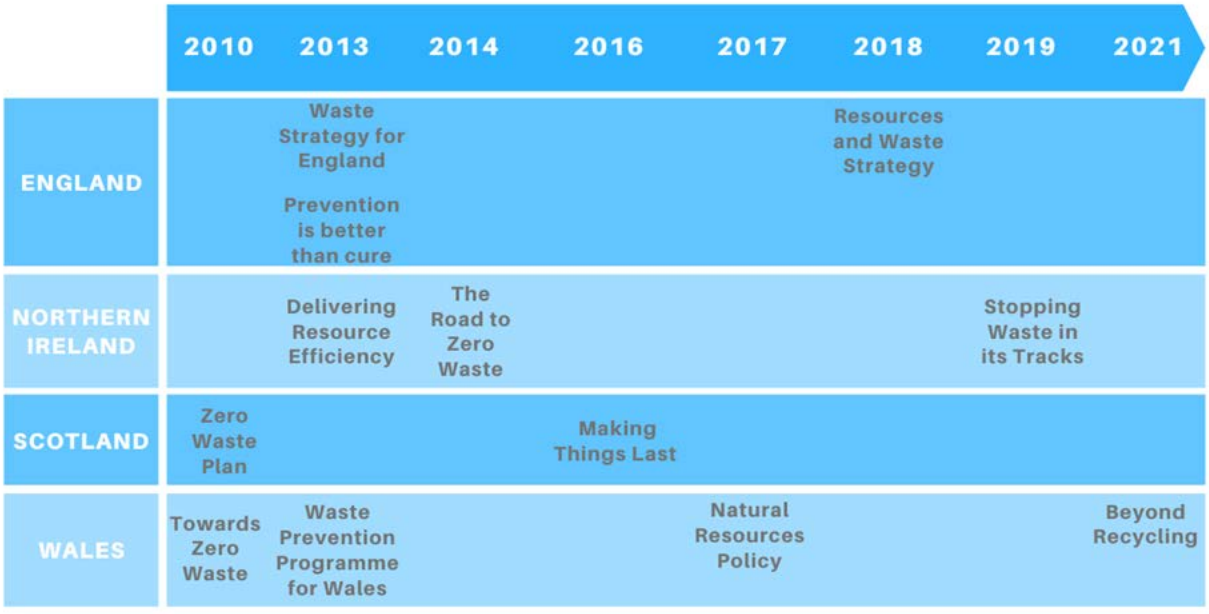
intention to ban plastic waste exports to non-OECD countries, and a consultation was planned by the end of 2022. For comparison, the European Union established a ban on plastic waste exports to non-OECD countries from January 2021 (Smith, 2021).

2.3. Objectives, policies and institutions for waste, materials management and the circular economy

2.3.1. *Policy framework and objectives*

UK-wide waste policies in the 1990s established goals to reduce landfilling and improve resource efficiency, introducing key economic instruments such as a landfill tax and an aggregates levy. By 2000, England, Northern Ireland, Scotland and Wales each had responsibility for its own waste policy and established separate waste management strategies. Since 2010, the four UK nations have put in place a succession of plans and strategies that address waste management and the circular economy (Figure 2.11).

Figure 2.11. Key policy documents for waste management and circular economy



Despite differences among them, the policies, strategies and plans of the four nations over the past decade have focused on broadly similar aims. These include continuing the shift from landfilling to waste prevention, reuse, recycling and energy recovery to implement the waste hierarchy set in the EU's 2008 Waste Framework Directive. The plans identify a range of targets, including those in EU waste legislation.

Several policy documents set more ambitious targets than those of the European Union. For example, *Towards Zero Waste, One Wales: One Planet* (2010) sets a long-term target to reduce total waste generation by 1.5% per year and household waste by 1.2% per year to help reach zero waste by 2050. This document sets stringent short-term targets, including for household waste (Table 2.1). Scotland's *Zero Waste Plan,* also from 2010, sets a long-term target to recycle 70% of all waste.

Several policy documents set out measures for waste prevention, such as the 2013 Waste Prevention Programme for England, *Prevention is better than cure: The role of waste prevention in moving to a more*

resource efficient economy. This programme includes proposals for tools to help households, schools and businesses reduce waste and calls for a charge on single-use plastic carrier bags. Northern Ireland issued its Waste Prevention Programme in 2014, *The Road to Zero Waste*. It was updated in 2019 as *Stopping Waste in its Tracks* with new actions to reduce waste generation and increase resource efficiency.

The four nations met many key targets to increase household waste recycling, composting and reuse and to reduce biodegradable waste going to landfill (Table 2.1). Nonetheless, the United Kingdom as a whole, although close, was not on track to meet the 2020 target for recycling and preparing for reuse regarding household waste. It must also travel some distance to reach the 2025 to 2035 targets for recycling and preparation of municipal waste for reuse.

Table 2.1. Selected targets for municipal and household solid waste

Waste stream (and date target was set)	2011-15	2016-20	Beyond 2020	Progress
Targets from EU legislation (transposed into legislation in the UK)				
Recycling paper, metal, plastic, glass in household waste		2020:50%		In 2019, UK at 46%; Wales and NI met target
Municipal waste: preparation for reuse and recycling			2025: 55% 2030: 60% 2035: 65%	
Municipal waste going to landfill			2035: max. 10%	On track: 14% in 2018
Biodegradable municipal waste going to landfill	2013: 50% reduction (vs. 1995 baseline)	2020: 75% reduction (vs. 1995 baseline)		Targets met
England				
Household waste not reused, recycled or composted (2007)		2020: cut to 12.2 Mt (-45% vs. 2000)		Target met: 11.9 Mt in 2016
Municipal waste recovered (2007)	2015: 67% recovery	2020: 75% recovery		Target met: 87.6% in 2020
Northern Ireland				
Recycling and composting of household wastes (2006-20)	2015: compost and recycle 40%	2020: compost and recycle 45%		2020 target met (48.1% by 2018)
Scotland				
Household waste recycled, composted or prepared for reuse (2010)	2013: recycle, compost & prepare for reuse 50%	2020: recycle, compost & prepare for reuse 60%		Targets not met: 44.9% reached in 2019
Wales				
Household waste recycled, composted or prepared for reuse (2010)	2009/10: 40% 2012/13: 52%	2015/16: 58% 2019/20: 64%	2024/25: 70%	Targets to 2020 met: 65.1% reached in 2019/20

Source: EU Waste Framework Directive 2008/98/EC; UK waste plans and strategies; Defra (2021) *UK Statistics on Waste*; Wales Statistics.

Recent waste and circular economy policies and plans have set ambitious resource efficiency and circular economy objectives. Moreover, several economic, industrial and climate change policies, as well as recent policies for recovery from the COVID-19 pandemic, have integrated resource and circular economy objectives.

The UK-wide *Industrial Strategy* and *Clean Growth Strategy* (both from 2017) identify the circular economy among the building blocks of clean economic growth and call for industrial innovation to achieve these goals. The *Clean Growth Strategy* pledges to build a "zero avoidable waste" economy by 2050. These goals are taken up in the *25 Year Environment Plan* (25 YEP), for both the United Kingdom and England. Among other goals, the 25 YEP calls for data to support industrial symbiosis for materials and sets a 2042 target for zero avoidable plastic waste. While work on the circular economy continues at UK level, the

United Kingdom cites innovation and resource efficiency in its 2021 strategy for recovery from the pandemic, *Build back better: Our plan for growth.* However, it contains few references to circular economy goals.

Policy documents for the four nations set out further circular economy objectives and actions. For England, the 2018 *Resources and Waste Strategy* and the 2021 *Waste Management Plan* take up the resource objectives of the 25 YEP and set further goals, including doubling resource efficiency by 2050.

Making Things Last: A circular economy strategy for Scotland in 2016 sets objectives and actions for the transition to a circular economy. It identifies four sectors – food, drink and bio-economy; remanufacturing; construction; and energy infrastructure – as priorities. Scotland's 2018 Climate Change Plan has a section dedicated to circular economy, setting actions and milestones for society, business and local administrations to all engage in circular dynamics by 2032 and achieve full transition by 2045. In 2021, Scotland was preparing a circular economy bill, which had been delayed due to the pandemic, as well as a *Route Map* towards long-term "zero waste" objectives.

In Wales, the *Natural Resources Policy* in 2017 identifies the transition to circular economy as one of its overarching objectives. In early 2021, Wales launched a new strategy, *Beyond Recycling*, which sets further waste management and circular economy goals. These goals include achieving the highest recycling rate in the world; reducing all waste by 33% and food waste by 60% by 2030; and reaching zero waste and net zero carbon by 2050. It focuses on six core themes, such as innovation in materials use; upscaling prevention and reuse; building on the recycling record; and promoting investments in infrastructure.

Northern Ireland's 2017 draft Economy 2030 Strategy stated that a circular economy strategy would be prepared. In 2021, it was developing an *Environment Strategy for Northern Ireland*, which is expected to include policy actions for the circular economy (DAERA, 2019).

2.3.2. *Legal framework*

Until exit from the European Union (EU exit), the regulatory framework for waste management in the United Kingdom was based on EU legislation. The EU Waste Framework Directive (2008/98/EC), for example, was transposed separately in the four nations, in the following pieces of legislation:

- Waste (England and Wales) Regulations 2011 amended by Waste (England and Wales) (Amendment) Regulations 2012 and Environmental Permitting (England and Wales) Regulations 2010
- Waste (Scotland) Regulations 2011
- Waste Regulations (Northern Ireland) 2011.

Other EU legislation was either transposed into the legislation of the four nations or into UK national legislation. The Landfill Directive (1991/36/EC), for example, was transposed into the four nations. Meanwhile, key legislation establishing extended producer responsibility (EPR), such as the EU Packaging and Packaging Waste Directive and the Waste Electrical and Electronic Equipment Directive (2012/12/EU), was transposed into UK national legislation.

With the EU exit, statutory instruments ensured that EU waste legislation would continue to operate. The Waste (Miscellaneous Amendments) (EU exit) (No. 2) Regulations 2019 apply to England, Scotland and Wales. Meanwhile, the Waste (Miscellaneous Amendments) (Northern Ireland) (EU exit) Regulations 2019 apply in Northern Ireland. The Waste (Circular Economy) (Amendment) Regulations 2020 transposed relevant parts of the EU's Circular Economy Package. These recent legal instruments amend some of the previous instruments identified above.

The Environment Act 2021 lays out a domestic framework for environmental governance post-EU exit and it introduces a range of new powers for waste management and circular economy. These include reforming

EPR schemes; introducing electronic waste tracking; and allowing national authorities to require that manufacturers provide information on the resource efficiency of their products and to set up deposit-refund schemes (DRSs) for beverage containers. Some of the Act's provisions, for example for municipal waste collection, apply only to England (Smith and Priestley, 2020).

2.3.3. *Institutional framework and governance*

In England, Defra is responsible for policies on waste management, sustainable production and consumption and the transition to a circular economy. The Environment Agency is the main waste regulator, responsible for issuing licences for waste carriers and sites.

In Northern Ireland, the Department of Agriculture, Environment and Rural Affairs Northern Ireland (DAERA-NI) is responsible for waste management policy. The Department and the Northern Ireland Environment Agency are the main waste regulators.

In Wales, the Resource Efficiency and Circular Economy Division in the Welsh government leads on policy, and Natural Resources Wales (NRW) is the main waste regulator.

In Scotland, the Environment and Forestry Directorate in the Scottish government is responsible for waste and resources policy. The Scottish Environment Protection Agency (SEPA) is the main waste regulator and is responsible for waste management. SEPA works with the Scottish government and Zero Waste Scotland (ZWS) (see below) to deliver Scotland's zero waste plan.

Joint Ministerial Committees between the UK and devolved governments have been used to share information and discuss common issues. Officials across these administrations also work together on an informal, ad-hoc basis. With EU exit, Defra and the administrations of the devolved governments are preparing a Common Framework for Resources and Waste that should provide a context for formal structures. Formal and informal co-operation will need to be strengthened to achieve long-term waste management and circular economy goals: co-operation mechanisms in other OECD countries, such as Belgium and Germany, could provide models (Box 2.1).

Box 2.1. Formal government co-operation mechanisms in Germany for waste management

In Germany, the Federation/Länder Working Group on Waste (LAGA) was established in 1963 to align the implementation of waste rules among federal states. It provides a link with the central government, a platform for information exchange and a source of common guidance. It also provides input and recommendations to improve waste legislation, as well as propositions that Germany may put forward at international level. LAGA, which is chaired by each federal state for a two-year term, has standing committees on waste law, waste technology and producer responsibility.

Source: LAGA (2021), Bund/Länder-Arbeitsgemeinschaft Abfall website.

Throughout the United Kingdom, local authorities have two key statutory roles. As Waste Collection Authorities, they collect waste or contract with private operators to collect it. As Waste Disposal Authorities, they designate treatment sites, although they can also operate facilities. While Northern Ireland, Scotland and Wales have a single level of local government, the structure varies across England. Many parts of England have two tiers, with both county councils and below them, district, borough or city councils. The county councils are responsible for waste management overall, whereas district, borough and city councils are responsible for waste collection. Other parts of England have a single tier of local government (unitary authorities) providing all services: these include the London and other metropolitan boroughs.

Consequently, in the Greater London area, each separate borough is responsible for waste management, and their approaches differ (Box 2.2).

Box 2.2. Multiple levels of governance in London

In London, 12 boroughs both collect and dispose of waste. In addition, four sub-regional partnerships jointly dispose of the waste collected by their members: the East, West, Western Riverside and North London Waste Authorities. Four boroughs provide joint waste management service through the South London Waste Partnership.

In 2018, the Mayor of London published the *London Environmental Strategy*, including a chapter on waste that calls on the boroughs to provide a minimum level of collection for dry recyclables (including glass, plastic, paper and cardboard, and metal cans), as well as food waste. The London Strategy includes goals to send no biodegradable or recyclable waste to landfill by 2026, recycle 65% of municipal waste by 2030 and halve food waste by 2030 (compared to 2015). A London-wide body, ReLondon, formerly the London Waste and Recycling Board, leads the city-wide circular economy strategy (Section 2.5.2).

Source: London Councils (2021), "About Waste Management in London", webpage; Mayor of London (2018), *London Environmental Strategy*; Mayor of London (2017), "Waste Policy", webpage.

The private sector has a significant role in waste management in the United Kingdom. A high number of private companies is involved in different stages of waste management, from collection to treatment, and about 40% of local authorities outsourced waste collection in 2019 (Sasse et al., 2020).

Several independent organisations play a key role in waste management and circular economy initiatives. The Waste and Resources Action Programme (WRAP), is an independent charity that supports waste management and the transition to a circular economy. Its work includes information for local authorities, including annual surveys of gate fee charges, management of public awareness campaigns (Section 2.4.1) and promotion of circular economy initiatives (Section 2.5). WRAP works with the UK and devolved governments and also with many local governments. It receives funding from these public sources, as well as from corporations participating in its campaigns and projects. ZWS, financed by the Scottish government and (until EU exit) EU regional funds, helps implement Scottish waste and circular economy policies. It supports local governments and carries out public awareness campaigns in Scotland. The Ellen MacArthur Foundation and other organisations such as Green Alliance and Business in the Community promote initiatives for the circular economy in the United Kingdom and around the world, working with business, governments and research institutions.

2.3.4. *Monitoring and information systems*

Most data on municipal waste management are collected by local authorities across the United Kingdom and compiled by the four governments. Local administrations collect data from the contractors that handle waste. In 2004, a web-based system, Waste Data Flow, was created to replace and streamline the data questionnaires that the central government had distributed to local authorities. Local authorities use the platform to submit data via online questionnaires that are largely similar across the four administrations (Defra, 2019). The consistency of the information is checked by Defra at UK level.

Waste Data Flow functions as the main data source for agencies, local authorities and policy makers. Its web platform publishes data accessible to the public. In addition, the UK government website publishes data sets managed by Defra and the Environment Agency. Waste statistics for Wales, Scotland and Northern Ireland are published on the websites of Wales Statistics (and Natural Resources Wales), SEPA

and DAERA, respectively. The WRAP Local Authority Portal publishes statistics combining the information from Waste Data Flow and recycling schemes at the local level.

The National Packaging Waste Database (NPWD) compiles data on this waste stream and also batteries, and waste electrical and electronic equipment (WEEE). Local authorities and waste operators, including reprocessors and importers, use NPWD to submit data on waste streams covered by EPR schemes, including amounts of waste treated by accredited operators. Defra then aggregates these submissions at UK level and publishes them on the database website.

England's 2018 Resources and Waste Strategy underlines the need to improve waste data, noting that data on waste from business come from a "patchwork" of sources. This contributes to waste crimes, including illegal dumping; unregistered waste; waste that does not reach its declared destinations (Section 2.4.4); and changes in waste descriptions to avoid regulations. The strategy calls for an electronic waste tracking system to address these problems. The 2021 Environment Act includes clauses for subsequent regulations to create this system, which is being developed with devolved administrations and will be implemented on a UK-wide basis. In January 2022, Defra launched a public consultation on the planned system.

The 2018 strategy also proposes a National Materials Datahub that would provide comprehensive data to support the transition to a circular economy. Among other sources, it would use data from the planned electronic waste tracking system. Moreover, the Strategy presents a range of indicators to measure progress, including new measures such as the carbon footprint of waste and of resources consumed, as well as future areas of work on natural capital accounting to better capture the environmental impacts of materials.

The United Kingdom addressed the call in OECD's 2002 Review to establish a systematic data collection and information system for non-municipal waste. However, experience has shown that monitoring and information systems are not adequate to tackle waste crime or support the transition to a circular economy. More recent initiatives seek to address these needs.

2.4. Strengthening waste management

2.4.1. *Promoting municipal waste reduction and recycling*

Waste collection

The United Kingdom's local authorities are responsible for municipal waste collection and treatment (Section 2.3.3). They also organise nearly all kerbside collection of recyclable and residual waste for all households. In addition, they operate household waste recycling centres for other types of waste, such as bulky waste.

In England, each local authority determines the recyclables that should be separated from residual waste. This results in differences, including between neighbouring towns and across London's boroughs. Many local authorities in England use a single bin for all dry recyclable streams: this can lead to losses due to sorting and when glass shards become embedded in paper and cardboard. In 2016, WRAP issued a voluntary framework that encourages local authorities in England to achieve greater consistency. The framework encourages the collection of the same core set of materials to help address confusion, and rationalising the range of collection approaches and how materials are presented for collection by householders. While many local authorities continue to make improvements, there is still great variation in the materials collected for recycling.

Many local authorities saw declines in their budgets following the financial crisis that began in 2008, and public information on waste collection was a common area for cuts. Lack of awareness persists. In a recent

survey, 44% of respondents said they do not receive sufficiently clear information on what they can recycle, due in part to the differences in local requirements in England (WRAP, 2020a). To tackle this problem, WRAP organises public awareness campaigns, including *Recycle Now* (Box 2.3), a campaign for England and Northern Ireland funded by Defra and by private donors; and *Wales Recycles*, supported by the Welsh government. WRAP also advises local governments on how to tailor their information and awareness raising about local collections to national campaigns.

Box 2.3. Using social media and targeting different segments of the public to raise awareness of recycling

Recycle Now comprises both annual public awareness campaigns and smaller campaigns held at other times of the year. The UK-wide National Recycle Week, for example, is held in September. Smaller campaigns take place at end-of-year holidays and for specific waste streams such as aerosols and bathroom plastics. The Waste and Resources Action Programme (WRAP) co-ordinates the campaigns, except in Scotland where Zero Waste Scotland is the lead organiser. WRAP uses a range of tools including billboards and social media. Messages are targeted to different population segments, such as those who are already well aware of recycling and those who are less interested. WRAP uses social media "influencers" to help disseminate messages. Messages can vary across the four nations: in Wales, for example, WRAP's campaign highlights both the existing high level of recycling and policy goals to reach further.

In England, local authorities collect different mixed recyclable waste: WRAP's awareness campaigns focus on the waste streams most commonly collected. They highlight its UK-wide online locator tool, which provides requirements for all UK postcodes.

WRAP follows up its campaigns with surveys to measure their effectiveness: for the most recent Recycle Week, 92% of the people who saw the campaign reported they were motivated to recycle; and 89% said they changed their behaviour because of the campaign.

Source: Recycle Now (n.d.), website; WRAP (2021), "Recycle Locator Tool", webpage.

In Scotland, 2012 regulations required all local authorities to provide a comprehensive recycling service to households, collecting dry recyclable waste and food waste (rural areas were exempted). In partnership with the Convention of Scottish Local Authorities (COSLA), Scottish government developed in 2015 the voluntary Scottish Household Recycling Charter, which seeks to deliver more consistent recycling collections across Scotland. Thirty of 32 councils have signed that Charter and, of these, over a quarter have services that are broadly aligned with its guidance. Wales established a common "Blueprint" for collection in 2010 (Box 2.4).

Box 2.4. Wales: A common Blueprint for kerbside collection of recyclables

The Welsh government issued a common Blueprint in 2011 that calls on local authorities to collect food waste and dry recyclable waste streams at kerbside, each in separate containers. The Blueprint includes suggestions for types of bins and collection times, as well as types of collection vehicles. While the Blueprint is non-binding, nearly all local authorities in Wales had adopted or were adopting its approach by early 2021. Welsh local authorities have encouraged waste separation by reducing pick-up times and bin sizes for residual waste (with provisions for households with specific needs, such as infants using nappies). Most Welsh local authorities collect residual waste every two weeks, and some do so every three or four weeks. With support from the Welsh government, the Waste and Resources

Action Programme has assisted local authorities in Wales in several ways. For example, it has modelled costs and benefits of new collection approaches and vehicle routes, trained staff and advised on selling separately collected waste to processors.

The Welsh government also introduced binding targets for local authority recycling in 2011, linked to its overall recycling targets (Section 2.3.2), It charges fines of up to GBP 200/t waste if targets are not met. In addition, Wales has invested over GBP 1 billion in recycling services and separate food waste collection, much of this supporting local authorities.

Source: Welsh Assembly Government (2011), *Municipal Sector Plan, Part 1 Collections Blueprint*.

Separate collection of recyclable waste from apartment buildings and other multiple-occupancy developments has been a common challenge across the United Kingdom. WRAP has identified a series of barriers, including lack of storage, high turnover rates, and difficulties in communication to often diverse residents. Some councils have acted: Islington in London increased information for landlords and tenants, for example, while Preston, near Liverpool and Manchester, increased its penalties (WRAP, 2019). A further issue is that many UK businesses contract with private companies for collection, often with lower recycling rates for paper, plastic and recyclables than household waste collected by local authorities.

The UK's 2021 Environment Act requires that all local authorities in England must collect from households a core set of recyclable waste streams: paper and card; plastic; metal; food waste and garden waste. It also calls for businesses to ensure these waste streams are collected separately for recycling or composting. The planned electronic waste tracking system (Section 2.3.4), also established under the Act, is expected to better follow these waste flows and identify opportunities to increase higher recycling rates.

Reducing and ensuring separate collection of food waste

WRAP estimates that UK households discarded about 8.1 million t of food and drink waste in 2007, about 60% of which was avoidable waste; by 2018, households had reduced their food waste by 18% (WRAP, 2020b). WRAP has organised a long-running public awareness campaign, *Love Food Hate Waste*. The campaign highlights links between food waste and greenhouse gas (GHG) emissions and provides tips for reducing waste (in Scotland, ZWS now manages the campaign). According to WRAP, this campaign, as well as the separate collection of food waste, has made households more attentive when buying and consuming food.

About half of local authorities in England collected food waste separately in 2013. However, the share was the same towards the end of decade, indicating that progress in extending collection has been slow. In contrast, Northern Ireland in 2015 called on all local councils to put in place separate collection of household food waste (which can be collected together with garden waste). In Scotland, all local authorities except those in rural areas are required to collect household food waste. In Wales, the 2010 Blueprint called on all local authorities to do so (Box 2.4) and 99% of households have a weekly separate food waste collection service. The Wales Blueprint also calls for food waste collection from businesses, which is also required in Northern Ireland (Priestley, 2016). In Scotland, all businesses outside rural areas producing more than 50 kg of food waste per week were required to ensure separate collection from 2012; in 2016, the threshold was lowered to 5 kg per week. Moreover, Scotland's 2016 circular economy strategy, *Making Things Las*t, set a target to reduce food waste from all sources to two-thirds of 2013 levels by 2025. ZWS is supporting businesses and schools to reduce their food waste.

WRAP has also worked with the food processing industry and with retailers in the Courtauld Commitments to reduce upstream food waste (Section 2.5.1); participating businesses, supported by changes in government guidance, updated food labelling to encourage consumers not to throw out useable food.

Despite these awareness-raising initiatives, many households across the United Kingdom continue to discard a high share of food waste with their residual waste or include food packaging in food waste bins. Recent government actions seek to address this issue and further promote the reduction and separate collection of food waste. In Scotland, the 2019 Food Waste Reduction Action Plan calls for new infrastructure, awareness raising and training. In 2021, Wales set a target to reduce avoidable food waste by 50% in 2025 and by 60% in 2030 (compared to 2006-07 levels). England's 2018 Resources and Waste Strategy calls for separate food collection in all English municipalities, which became law through the 2021 Environment Act.

Economic instruments: Waste charges and taxes

Local authorities in the United Kingdom do not directly charge households for waste collection and treatment, as their council taxes lack a line item for these costs. They finance all their services, including waste management, through a combination of council taxes and central government grants.

No local authorities use "pay as you throw" (PAYT) systems that link household charges to amounts of waste generated. (Many local authorities charge for specific waste streams, such as bulky waste collected at kerbside, while businesses pay for public or private collection based on their waste volumes.) PAYT charges have been proposed occasionally, including by the UK government's Advisory Committee on Packaging in 2021 (Vaughan, 2021). This could strengthen efforts to increase separate collection and recycling, especially in parts of the United Kingdom with lower levels. Relevant examples might be considered from other OECD countries. For example, in Flanders (Belgium), some local authorities charge a high price for the mandatory bags used for residual waste (OECD, 2021). In the United Kingdom, where households receive bins, local authorities could reduce bin size as in Wales. They could then charge a higher rate to households that wish to have a larger bin (with allowances for particular needs).

All four UK nations set a charge of 5 pence on single-use carrier bags in the first half of the review period: Wales was the first to launch in 2011, followed by Northern Ireland and Scotland in 2014, then England in 2015. The charge led to sharp falls in the use of these bags: Northern Ireland estimated a 72% drop in the first year, and Wales a 71% fall in the first three years. For a period in 2020, all four governments suspended the charge. In 2021, England extended the charge from food shops to all retailers and increased the charge from 5 to 10 pence (Southerland, 2020). Scotland also increased its charge to 10 pence in 2021, and Northern Ireland will increase its charge to 25 pence (for all bags worth less than 5 GBP) in 2022. In addition, the United Kingdom will introduce a tax on plastic packaging below a required level of recycled material (Section 2.4.2).

The United Kingdom established a landfill tax in 1996 of GBP 2/t for inert waste and GBP 7/t for "active" waste (and thus municipal waste). Scotland and Wales now set the landfill tax in their territories, although in practice the tax rates have remained identical to those in England and Northern Ireland. There have been regular increases each year since 1999 (called the "escalator") for active waste of GBP 1/t until 2004, then GBP 3/t until 2007, and then GBP 8/t to 2014, by which time the rate had reached GBP 80/t. After 2014, however, the increase was limited to the rate of inflation. The current rate, GBP 96.7/t, is higher than levels in nearby OECD Europe countries such as Belgium, France and the Netherlands (Table 2.2). The lower rate for inert or inactive waste, GBP 3.1/t in 2021, is far lower as it increased at a much slower pace. The landfill tax acted as one of the main drivers in the United Kingdom's reduction in landfilling of municipal waste and the shift in particular to incineration (Figure 2.6), including exports of waste for incineration with energy recovery (Elliot, 2016; HMRC, 2021a).

Table 2.2. The United Kingdom has put in place high landfill taxes

Country	Rate
UK (2021)	
Standard rate	96.7 GBP/t
Lower rate	3.1 GBP/t
Belgium (Wallonia, 2016)	78 EUR/t
France (2015)	32-40 EUR/t
Netherlands	17 EUR/t

Note: Depending on the region or country, these tax rates can also cover other non-hazardous waste.
Source: OECD (2021), *Environmental Performance Reviews: Belgium 2021*.

The United Kingdom does not have taxes on incineration, as do several other OECD Europe countries such as Belgium and Netherlands (OECD, 2021). For example, in 2020 the Flanders region of Belgium had a tax of EUR 8.18/t on incineration (with energy recovery) for general waste and EUR 2.34/t on recycling residues. For its part, the Walloon region had a tax of EUR 11.75/t on incineration with energy recovery of general waste and a rate more than five times higher for incineration without energy recovery (which is no longer used in Flanders). In 2018, a UK-wide government review indicated that it could be considered in future (HM Treasury, 2018). Wales has proposed an incineration tax in its territory; this would require authority from the UK government. Incineration taxes with common rates across the United Kingdom (and for waste exported for incineration) could provide further incentives and complement other measures to promote recycling.

The four governments have used allowance schemes that cap the amount of biodegradable municipal waste (food, yard waste and paper) that local governments can send to landfills. Municipalities in England, Scotland and Northern Ireland could trade allowances but not those in Wales. England and Scotland ended their schemes by 2013, while Northern Ireland and Wales maintained theirs through 2020. These schemes have helped all four nations meet EU targets for reducing biodegradable municipal waste to landfill (Table 2.1). When Scotland ended its allowance scheme, it announced a ban on landfilling of biodegradable municipal waste to be in place by January 2021. However, in 2019, the government postponed the ban to 2025. It cited insufficient alternative treatment facilities, as well as concerns the ban could have led Scotland to send waste to landfills in England (Pegg, 2019). This shows how waste policy in the four nations is intertwined. The Scottish government's programme for 2021-22 calls for a review of fiscal incentives, and of the role of incineration, to meet its waste and climate emissions policies.

The United Kingdom has successfully followed the recommendation in OECD's 2002 Review to revise measures such as landfill taxes to help reduce landfilling. The United Kingdom has not, however, introduced household charges that could encourage less waste, such as PAYT systems. This approach should be considered.

Public financing for waste investments

A range of government programmes has financed waste treatment facilities and other investments. In 2006, Defra established the Waste Infrastructure Delivery Programme in England. It provided local authorities with financial support for public-private partnerships, specifically for waste treatment projects financed via a Private Finance Initiative. The programme has provided about GBP 3 billion in grant funding to 27 projects. Since its inception, the programme has also supported local authorities with procurement and operations on these contracts.

The devolved governments have also supported investments for waste collection and treatment. Northern Ireland's 2019 Waste Management Plan reports, for example, that GBP 40 million was provided to local authorities for investments in recycling services and infrastructure. A further GBP 23 million would be allocated from 2019 to 2022. The Welsh Waste Infrastructure Procurement Programme has secured

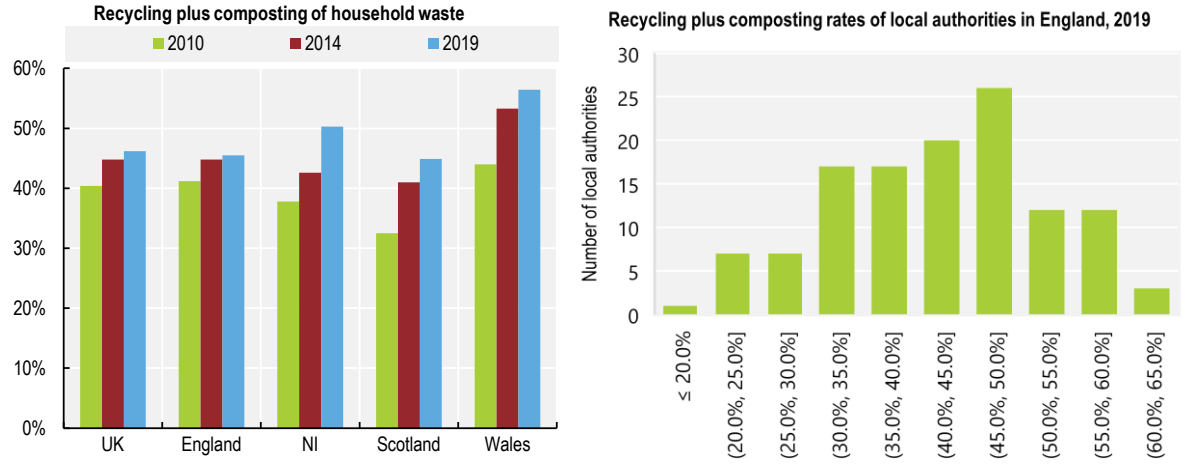
over GBP 740 million in new infrastructure, including via public-private partnerships. In particular, it has expanded recycling and anaerobic digestion capacity to help meet Welsh recycling and composting targets. The Scottish government's Strategic Waste Fund has supported development of local authority waste and recycling infrastructure. In 2021, it launched a five-year, GBP 70 million Recycling Improvement Fund administered by ZWS to help achieve recycling targets.

Progress in recycling

For the United Kingdom as a whole, landfilling has fallen steadily (Figure 2.6). This decline has been driven by several policy instruments including, notably, the growing landfill tax and public financing for alternative waste management facilities. The decline has also coincided with a shift, particularly in England, to incineration. By mid-2021, for example, England had nearly 100 incineration facilities, plus 17 facilities producing refuse-derived fuel for energy recovery. Nonetheless, about 500 landfills remained operational in England and Wales in 2021 (Environment Agency, 2021a).

Policies and public financing to support separate collection have increased recycling and composting rates. Northern Ireland, Scotland and Wales each saw the combined rate increase by more than 10 percentage points between 2010 and 2019. The combined rate grew more slowly in England, and recycling rates vary greatly among its local authorities (Figure 2.12). Recycling rates also vary greatly among Scotland's local authorities. As a result, Northern Ireland and Wales achieved the 50% EU recycling target for 2020 one year early. With 65% of all municipal waste recycled in 2019, Wales also appears to be on target to meet its ambitious 2025 targets (70% recycling and composting and zero waste to landfill in 2025). In 2020, rates are expected to be lower due to the COVID-19 pandemic.[3]

Figure 2.12. In England, combined household composting and recycling rates increased more slowly than in other nations, and rates vary greatly among its local authorities



Note: There were changes in the data collection method in 2014-15, but the data were adjusted for consistency. Data collection and definitions vary slightly across the UK.
Source: Defra (2021), UK Statistics on Waste.

StatLink https://stat.link/to0l5h

Recent UK waste policies set the stage for further increases in recycling, as well as composting. In England, for example, the upcoming reforms in the collection of dry recyclables will need to be co-ordinated closely with reforms proposed for EPR schemes (Section 2.4.2).

2.4.2. *Extended producer responsibility*

Over the past decade, EPR[4] was in place for four waste streams: packaging waste, end-of-life vehicles (ELVs), waste batteries and accumulators, and WEEE. EPR schemes are organised on a UK-wide basis. For the packaging waste, consumer battery and WEEE schemes, companies can join a producer responsibility organisation (PRO) – known as a producer compliance scheme (PCS) in the United Kingdom – that will treat their waste.

Packaging waste

Under the producer responsibility scheme for packaging, 47 PCSs in the United Kingdom had 6 294 members in 2021; another 384 companies were direct registrants fulfilling obligations themselves (Environment Agency, 2021b). The EPR uses a market-based system. The PCSs and companies that are direct registrants buy packaging recycling notes (PRNs) from waste processors and buy packaging export recycling notes (PERNs) from waste exporters equivalent to their recycling obligations. These notes serve as a proof of compliance (Environment Agency, 2020). Their availability is based on the quantities of packaging waste treated and/or exported for recycling and their price varies, sometimes substantially.

Waste processors sell PRNs based on the weight of packaging after it has been sorted and decontaminated. By contrast, PERNs are based on the entire bulk that is exported, potentially without extensive sorting. According to the British Plastics Federation, this difference creates a preference for exports rather than domestic recycling and has led to underinvestment in domestic recycling facilities (BPF, 2021). There is also an issue for prices when export markets change. For instance, China placed restrictions on plastic scrap imports starting from 2018. Consequently, the number of PERNs available from UK exporters fell, which in turn led to much higher prices. In another example, PRN prices for aluminium packaging increased in 2018 from GBP 9/t to GBP 100/t (Eminton, 2019; WRAP, 2021a). In recent years, the decrease in export opportunities has combined with limitations in domestic recycling capacity, leading to higher prices. Barriers to the expansion of UK recycling facilities have included the volatility of recycling note values, historically lower prices for exports and uncertain returns for investments in domestic recycling (Iacovidou et al., 2020).

Despite these issues, in 2018, the United Kingdom exceeded the EU targets in place since 2008 for all packaging waste streams (while the UK's aluminium rate was below the EU's combined target for metals, this was compensated for by the higher steel recycling rate). It also met or was close to many of the targets for 2025 (Table 2.3). The United Kingdom also sets higher "business targets" for the PCSs to compensate for packaging produced by businesses that is below the minimum thresholds and not subject to the regulations. The business targets are usually set annually and increased year to year, supporting long-term improvements.

Table 2.3. The United Kingdom has met recycling targets for most packaging waste streams

	Recycling rate 2018	EU target 2008 on	EU target 2025
Glass	69	60	70
Aluminium	39	50	50
Steel	75	50	70
Paper/board	74	60	75
Plastic	44	22.5	50
Wood	35	15	25
Overall	62	55	65

Note: The 2008 EU target for aluminium and steel is a combined target for metals.
Source: Eurostat (2021), Packaging waste by waste management operations; Defra (2019) "What we want to achieve: Packaging waste recycling targets".

The UK's National Audit Office has raised concerns about the data reported, as well as other aspects of this EPR. It reported that the Environment Agency "does not have a good understanding of the extent of fraud and error" (NAO, 2018). Moreover, the methodology for determining the amount of packaging consumed is complex and has not been reviewed. The National Audit Office warned of insufficient controls to prevent exports of contaminated and poor-quality plastic scrap. Unlike in other OECD Europe countries such as Belgium and the Netherlands, UK producers contribute only a minor share of the costs of municipal collection of post-consumer packaging from households. England's Waste and Resources Strategy (2018) noted that producers have limited responsibility to cover the costs of managing packaging waste. As a result, the system does not provide sufficient incentives for them to design products for greater reuse and recyclability. The strategy also outlined reforms to address shortcomings; reform proposals are described below.

Waste electrical and electronic equipment

The United Kingdom reportedly generates one of the highest levels of WEEE per capita in the world; an estimated 40% of UK WEEE is exported for treatment (HoCs, 2020). Producer responsibilities are based on the EU's 2012 WEEE Directive, which introduced separate collection of WEEE streams and imposed obligations to operators such as producers and importers (which can join one of the 28 WEEE PCSs). Collection, recovery and recycling targets are set separately for different product types. Collection targets are calculated and set annually, based on electrical and electronic equipment put on the market in the three preceding years. The recovery and recycling targets vary from 75% to 85% for recovery and from 55% to 80% for recycling, depending on the type of equipment. The following tables present an overview of recent collection, recovery and recycling rates (Table 2.4, Table 2.5).

Table 2.4. Collection of household WEEE, 2016-20

	2016	2017	2018	2019	2020
Collection target (t)	544 341	622 033	537 066	550 577	497 338
Amounts collected (t)	580 257	525 080	493 323	496 514	460 134

Source: HoCs (2020), Environmental Audit Committee, Electronic Waste and the Circular Economy, Written evidence (EWa0025); Environment Agency (2021), "Waste Electrical and Electronic Equipment (WEEE) in the UK", webpage.

Table 2.5. Recovery and recycling rates for WEEE collected in the United Kingdom

	2014	2015	2016	2017	2018
Recovery (%)	87.5	85	87.2	89.5	91.2
Recycling and preparing for use (%)	80.6	80.9	81.6	82.1	86.2

Source: Eurostat (2020), WEEE by waste management operations. Rates are calculated based on the amounts collected.

Retailers and distributors also have responsibilities. Retailers with physical stores that sell more than GBP 100 000 a year worth of electrical and electronic equipment are obliged to set up a collection point. Those with a smaller business and without a physical store can join a Distributor Takeback Scheme.

The collection rates for WEEE have been fluctuating. Targets for household WEEE were not met from 2017 to 2020 (Table 2.4). The collection rate for household WEEE was 30% in 2020, while the overall collection rate, for both household and non-household waste, was slightly lower at 26% (Environment Agency, 2021c). Whereas collection rates reach 75% for large household appliances, they are around 25% for small household appliances (BPF, 2021).

Compliance fees were introduced in 2014 to address issues when not enough WEEE is available: among these, some PCSs had reportedly been buying more evidence notes than they needed and then re-selling

for higher prices to others that fell below their targets. The compliance fees put a ceiling on the trading prices; however, they create a disincentive for the collection of WEEE whose treatment costs are higher than the fee, as noted by the House of Commons Environmental Audit Committee in 2020. The committee highlighted other challenges with the system, such as its failure to meet collection targets and the presence of free riders, including online retailers. Moreover, annual targets are set based on company self-reporting, and do not provide strong direction (HoCs, 2020). England's 2018 Waste and Resources Strategy has called for legislation to provide greater incentives to producers to design and sell more sustainable products.

Waste batteries and accumulators

Companies that produce portable batteries are obliged to join a Battery Compliance Scheme that takes care of collection and treatment. Vehicle battery producers are obliged to take back waste batteries from final holders such as garages, local authorities' collection points and ELV treatment sites and send them to approved treatment centres or exporters. Industrial battery producers also have takeback obligations from end-users (Environment Agency, 2018). Waste batteries and accumulators are banned from landfills and incineration.

Only portable batteries have a collection target: this was consistently met between 2010-20 (Table 2.6). Nonetheless, most portable batteries are not collected: England's 2018 Waste and Resources Strategy estimates that for the UK as a whole more than 320 million portable batteries per year are not recycled. The Strategy suggests possible solutions, including expanded kerbside collection and targets for different types of batteries. The strategy also underlines the upcoming challenge of collecting and treating batteries from the growing number of electric vehicles (EVs). In the light of these issues, the regulation was under review in 2021, with a stakeholder consultation expected in 2022.

Table 2.6. Target rates, amounts placed on the market and collection of portable batteries 2010-20

	Collected-total (t)	Collection rate (%)	Target (%)
2010	4 430	9.5	10
2011	7 980	18	18
2012	10 908	28	25
2013	12 187	32	30
2014	13 167	36	35
2015	14 879	40	40
2016	16 872	45	45
2017	17 427	45	45
2018	17 811	45	45
2019	17 675	45	45
2020	17 728	45	45

Note: Collection rates calculated based on batteries placed on the market.
Source: Environment Agency (2021), National Packaging Waste Database – Public Batteries Reports.

End-of-life vehicles

The UK's ELV Regulation sets free takeback obligations, and recovery and recycling targets, for vehicle producers and importers. The targets are set to 95% for recovery and 85% for recycling by average weight of each ELV. They also must report information on the recovery and recycling operations to public authorities annually. In 2018, the recovery rate (92.8%) was below the target. The reuse and recycling rate (85.2%) met the required target. As in the case for batteries, ELV Regulation is under review, with consultation expected in 2022.

Reforming the UK's EPR schemes

The United Kingdom is planning major changes to its EPR schemes along with proposals for new ones. In 2019, a joint consultation was launched on proposed amendments to increase incentives for design for reuse and recyclability of packaging and to increase the responsibility of producers in supporting municipal packaging waste collection from households. Defra and the devolved administrations are working together on the packaging waste reforms via a sectoral policy board and a management group. During initial consultations in 2019 and in a second phase in 2021, both industry and local authorities raised concerns about the proposals. Industry submissions claimed the proposals are overly complex. For their part, local authorities expressed concern the proposal would not guarantee that industry would cover the full costs of packaging in household waste collection and treatment (Smulian, 2021a and 2021b).

Alongside the packaging waste reforms, the United Kingdom and devolved governments also plan to introduce DRSs for most beverage containers (Box 2.5). These schemes tend to exhibit high collection/return rates and lower incidence of target products in litter surveys. However, the introduction of a DRS can impact incumbent waste managers when it isolates a valuable waste stream. DRSs tend to shift revenues from sale of recovered material from the incumbent waste managers (OECD, forthcoming). These concerns have been raised in the UK context, where local authorities worry that kerbside collection of these containers is likely to decrease, reducing revenues from the sale of waste materials such as metal cans. Industry representatives have stated that DRSs for plastics beverage containers could be more expensive to operate than kerbside collection.

Box 2.5. The United Kingdom plans to introduce deposit-refund schemes

In 2020, the Scottish government approved a deposit-refund scheme that will become operational in 2023. All single-use plastic, metal or glass bottles or cans will have a 20 pence deposit. The consumers will pay the deposit upon purchase and get refunded upon return. For England, Wales and Northern Ireland, a scheme has been planned since 2018. There were two rounds of consultation, the first in 2019 and the second in the first half of 2021. The government had wanted to reassess the scheme and its reception by stakeholders and the public in a post COVID-19 context. The results of the consultation were being analysed in 2021, with a scheme expected in 2024.

Source: Laville (2021), "No bottle deposit return scheme for most of UK until 2024 at earliest", The Guardian, 24 March; ZWS (2021), "Deposit Return Scheme", webpage.

OECD highlights that DRSs can increase recycling or reuse. Scotland's DRS is intended to increase recycling (and reduce litter) of single-use packaging (National Archives, 2021). The United Kingdom should explore how existing and planned schemes can be used to promote reuse. In addition, DRSs can be used to isolate a hazardous waste for treatment. The United Kingdom should consider developing DRSs for waste streams with hazardous substances, such as portable batteries.

In addition to DRSs, the UK government has prepared a UK-wide tax on plastic packaging that contains less than 30% recycled content. This tax, which aims to provide an incentive to use recycled material, will be introduced in 2022. The government estimated the tax would increase use of recycled plastic in packaging by 40% and lead to saving about 200 000 t of carbon in its first year (HMRC, 2021b).

The United Kingdom is also considering new EPR schemes. England's 2018 Resources and Waste Strategy and Wales' 2021 circular economy strategy, *Beyond Recycling,* call for schemes for textiles, bulky waste (in particular furniture), certain waste streams from the construction and demolition sector, vehicle tyres and fishing gear. In Scotland, an EPR for mattresses has been under consideration and an EPR for fishing gear is planned (ZWS, 2021a).

2.4.3. *Managing contaminated sites*

The modern industrial revolution started in the United Kingdom over two centuries ago, leaving a legacy of potentially contaminated sites, particularly in former industrial areas. In England, the Environment Agency estimated that about 325 000 sites were contaminated to some degree in 2005 (Paya Perez and Rodriguez, 2018). In 2009, the Scottish EPA estimated that about 67 000 sites could be affected by contamination (SEPA, 2009).

Land affected by contamination in the United Kingdom is mainly dealt with through the planning system, under which developers investigate and clean up the land to make it suitable for new uses. Since 2017, local authorities in England must develop registers that list previously used parcels of land that are appropriate for housing, including land that may be contaminated (CPRE, 2020); some of these "brownfield" sites may include contaminated land.

The Contaminated Land Regime in the United Kingdom was introduced in 2000 under Part 2A of the Environmental Protection Act 1995 to identify and remediate contaminated land not being dealt with through the planning system. In 2009, it was estimated that around 10% of land affected by contamination is dealt with through Part 2A. Anecdotal evidence suggests this proportion has since decreased.

According to 2012 guidance, local authorities in England should inspect sites using a risk-based approach to identify contamination. The guidance also provides local authorities with the power to designate contaminated sites. In particular, land is designated as contaminated if there is a "significant possibility of significant harm to human health" or to the environment, as local authorities consider ecosystem effects and water contamination. Local authorities oversee remediation except for "special sites", where the Environment Agency is responsible. These public bodies can recover costs from private parties if necessary (Defra, 2012).

From 2000 to the end of 2013, 38 830 sites in England, Wales and Scotland had undergone some form of inspection: these represented approximately 65% of the estimated total number of sites requiring inspection. At least 635 sites were determined as containing contaminated land, and remediation had been completed on 529 of these sites (national submission). More recent data are not available. Moreover, progress reportedly has slowed since 2013 and many sites still need inspection and remediation.

The United Kingdom has followed through on the recommendation in OECD's 2002 Review to implement legislation on the remediation of contaminated sites. Nonetheless, local governments have largely retained responsibility for designating sites and overseeing their clean-up. Given that many of these governments face funding difficulties, the pace of remediation has slowed since 2013.

2.4.4. *Addressing illegal waste dumping and illegal exports*

Illegal waste dumping (or "fly-tipping") has been an important concern in the United Kingdom. In 2020/21, local authorities in England dealt with 1.13 million fly-tipping incidents. Of the reported incidents, 34% (377 000) were equivalent to a small van load. Only 4% (39 000) of total incidents were equivalent or greater in volume to a tipper lorry load. For these large fly-tipping incidents, the cost of clearance to local authorities was GBP 11.6 million. Illegal dumping reportedly increased in 2020 during the COVID-19 pandemic. While local authorities and the Environment Agency clean up incidents on public land, private owners are responsible for cleaning up fly-tipping on their land. Local authorities vary in their support, some removing the waste for a charge.

There are several reasons for illegal dumping. Businesses want to avoid waste collection and treatment costs. Meanwhile, criminal groups offer to pick up household and commercial waste at low prices and then dump it on private or public land. Several members of parliament have contended that cuts in local government funding over the past decade have exacerbated the problem. Such cuts led to the closure of waste collection sites and a lack of information activities. An independent study (Purdy and Crocker, 2021)

concludes the system to register waste carriers, brokers and dealers in England "does not function effectively and is being misused". It noted the "upper tier" of the system, for professional waste registrations, contains over 140 000 entries. However, it pointed out that about 61% of individuals and organisations identified in a sample as advertising waste services were not registered. The study calls for reform of the registration system and for steps to ensure that only registered businesses can advertise.

UK governments have sought to address this ongoing problem. The 2018 Resources and Waste Strategy set out actions against waste crime in England. In 2014, the Scottish government published *Towards a litter-free Scotland,* and in May 2016, local authorities were given the power to issue fixed penalty notices for small-scale fly-tipping. In December 2021, the Scottish government launched a consultation on a new National Litter and Fly-tipping Strategy. In January 2020, the Environment Agency, NRW, SEPA, the UK's tax, payments and customs authority (HMRC), the National Crime Agency and the police formed a Joint Unit for Waste Crime, including illegal waste dumping. The 2021 Environment Act strengthens authorities' powers to tackle waste crime. To address shortcomings in the system for registration of waste carriers, brokers and dealers, in January 2022 Defra opened a public consultation on a proposal to require permits and to introduce, among other provisions, a technical competence qualification and a requirement to provide permit numbers for advertising and in vehicles.

To address illegal waste exports, the Environment Agency has increased enforcement: 1 889 containers were inspected at English ports in the year ending March 2020: of these, 463 were stopped for attempting to illegally export waste. In 2020 and 2021, the Environment Agency addressed illegal plastic waste exports to Turkey, an issue highlighted in NGO and press reports: in 2020, the Agency prevented 63 containers with illegal plastic waste shipments, and 104 as of November in 2021. In this area as well, the United Kingdom has strengthened measures, but further efforts are needed. The UK government plans to consult on further measures to monitor and enforce export requirements, and has also pledged to ban exports of plastic waste to non-OECD countries.

The United Kingdom has strengthened measures to prevent and discourage illegal waste disposal, including inspection and enforcement measures, as recommended in the OECD's 2002 Review. However, further efforts are needed. The UK's planned mandatory electronic waste tracking system (Section 2.3.4) is expected to tackle both illegal dumping and illegal waste exports. Illegal dumping appears largely related to small waste loads by unauthorised carriers: the proposed tracking system will need to include small loads efficiently. Moreover, the United Kingdom should follow through on proposals to reform the registration system, combined with UK-wide awareness campaigns and further enforcement actions, to tackle this issue. The tracking system will also need to trace waste exports to authorised treatment facilities abroad.

2.5. Promoting the circular economy

2.5.1. *Private sector initiatives*

A range of voluntary private sector initiatives have promoted waste reduction, resource efficiency and circular economy actions.

WRAP has co-ordinated key sectoral initiatives. In the Courtauld Commitments, WRAP brought together leading UK food manufacturers, retailers and enterprises in the hospitality and food service sector. WRAP estimates the first Commitment (2005-09), mainly with manufacturers and retailers, reduced household food waste by 270 000 t; in the second phase (2010-12) signatories reduced household food waste by 670 000 t. Also in the second phase, signatories reduced combined product and packaging waste in their supply chains by 7.4% by 2012 compared to a 5% reduction target (WRAP, 2013). Signatories reduced supply chain product and packaging waste by a further 3% in the third phase from 2013-15. Those in a

separate agreement from 2012-15 reduced their combined food and packaging waste by 11%, nearly doubling the 5% target, and also redistributed 760 t of surplus food (WRAP, 2021b and 2021c).

The Courtauld Commitment 2025, launched in 2015, saw further reductions in supply chain waste and included targets for reducing GHG emissions; this phase also promoted greater redistribution of surplus food (WRAP, 2020c). In 2021, the 2025 commitments were updated to 2030. Additional targets included halving per capita food waste compared to 2007 levels; halving GHG emissions compared to 2015; and ensuring half of food comes from areas with sustainable water management (WRAP, 2021d). Actions to reduce household food waste have been a key part of the 2025 and 2030 agreements, as this is estimated to be the largest area of food waste. Courtauld signatories, for example, supported WRAP's *Love Food, Hate Waste* campaign (Section 2.4.1).

The Sustainable Clothing Action Plan (SCAP) ran from 2012 to 2020. SCAP brought together manufacturers, brands and retailers responsible for 48% of UK clothing sales by volume to work towards targets to reduce waste, as well as water and carbon footprints. Other signatories included waste management companies, while trade associations, NGOs, academic organisations and regulatory bodies joined as supporters. While the targets to reduce water and carbon footprints by 15% were exceeded, the signatories' waste footprint only fell by 2.1% between 2012 and 2020, missing the 3.5% goal. In the supply chain, SCAP signatories reduced their use of fibres that generate higher levels of waste in production, including flax, linen and nylon. However, the plan's final report states that data gaps on waste in the textiles supply chain limited action. Clothing in household waste was reduced by only 4% in this period, significantly below the 15% goal. Household clothing consumption increased over the years of SCAP, which partly explains the small reduction in waste (WRAP, 2021e). WRAP and its partners are working on a new phase of the voluntary agreement for 2021-30, called Textiles 2030. This initative is underpinned by ambitious targets: signatories have committed to halve their GHG footprint and reduce their water footprint by 30% by 2030 compared to a 2021 baseline. The new agreement also calls for greater design for circularity (including more durable and recyclable clothes) and more circular approaches, such as greater use of recycled fibres in new products (WRAP, 2021f).

The 2018 Plastics Pact, based on the Ellen MacArthur Foundation's "New Plastics Economy" initiative, commits signatories to various targets. They must ensure that all their packaging is reusable, recyclable or compostable by 2025; that 70% is recycled or composted effectively; and that 30% of plastic packaging is composed of recycled content. From 2018 to 2019, WRAP reported that signatories had increased the recycled content of plastic packaging from 9% to 13%; increased plastic packaging recycling from 44% to 50%; maintained the level of recyclable plastic packaging at 64%; and reduced problematic or unnecessary items by 40% (WRAP, 2020d).

Several success factors have been identified for these initiatives. They include WRAP's work to bring together key actors; establish a business case for environmental improvements; identify achievable goals; agree on measurable targets; develop common methods to estimate impacts and progress towards targets; and regularly review and report on progress. WRAP has worked with leading members in the pacts to test innovative approaches that can be adopted on a wider basis. Successful agreements have brought together a high share of the markets, as for textiles companies that joined SCAP and Textiles 2030. While government sources, including Defra, funded WRAP's initial work on these agreements, signatories contribute once the agreements are launched. A review of England's Waste Prevention Programme found that voluntary agreements were successful when government and the private sector worked together; businesses took on commitments and targets; and different sources provided ongoing funding (WRAP, 2020e). WRAP initiatives such as the Courtauld Commitments notably seek to reduce both industry and household waste.

The Electrical and Electronic Equipment Sustainability Action Plan, launched in 2014 with the participation of 80 major companies, was less successful. Its aims included reducing product footprints based on a lifecycle approach and increasing durability, reuse and repair. The plan produced a product durability

guidance, among other outputs; however, government funding ceased in 2018 and private members did not support a new funding framework. The high diversity of products and a major presence of foreign manufacturers in the sector hindered agreement. However, WRAP continues to collaborate with interested companies on a project by project basis (WRAP, 2020e).

In addition to WRAP's work, other organisations and business associations have supported work on the circular economy. The Waste to Wealth Commitment, developed by Business in the Community, provides guidance to increase resource productivity and improve waste management. For its part, the Circular Economy Taskforce, organised by the Green Alliance, promotes networking, innovation and entrepreneurship.

These agreements have interacted with government policy. For example, the 30% recycled content target in the Plastics Pact was reflected in the minimum content for the 2022 Plastic Tax. The work of the Ellen MacArthur Foundation and WRAP contributed to circular economy policies as have other initiatives. The Prince's Responsible Business Network, for example, organised the 2018 "Waste to Wealth" Conference. This event supported the ambitious 2050 resource productivity objectives of that year's England Resources and Waste Strategy.

WRAP has worked with other countries. In an EU LIFE project, the European Clothing Action Plan, WRAP and partners in Denmark and Netherlands used SCAP as a model for initiatives in these two countries and awareness raising across Europe. In 2021, WRAP, the Ellen MacArthur Foundation and partners in Denmark and elsewhere launched the Textiles Action Network to promote global actions for the circular economy in the clothing industry. WRAP helped launch Plastics Pacts in the European Union and in South Africa in 2020 (WRAP, 2020e).

With the upcoming introduction of stronger EPR for packaging and other waste streams (Section 2.4.2), waste reduction goals may become less relevant for voluntary agreements. Agreements such as Textiles 2030 are taking on new objectives for the transition to a circular economy.

2.5.2. *Government actions and policies*

England's 2013 Waste Prevention Programme has supported private initiatives for resource efficiency. Recent circular economy policies call for a range of further work in co-operation with business, research bodies and civil society. This includes encouraging new product design and supporting the social economy to achieve greater material productivity. In 2021, Defra held a consultation on a new Waste Prevention Programme for England. Among its proposals are actions to promote product design that supports reuse, repair and recycling and to encourage industrial symbiosis. The final Programme should be published in 2022.

Scotland's 2016 circular economy strategy, *Making Things Last* highlights product reuse and remanufacturing among its themes. It establishes Revolve, a quality standard and label that second-hand shops can use to boost consumer confidence in their goods. The strategy encourages social enterprises working on reuse and repair through funding and technical support, including training to improve skills. The government also supports the Scottish Institute for Remanufacture, where business and research organisations collaborate to promote the growth of remanufacturing. The circular use of biological resources is among the priorities for the 2016 strategy. The government, for example, has sponsored an initiative to recover protein from whisky production waste water and use it as salmon feed, replacing traditional inputs (Horizon Proteins, n.d.).

In its 2021-22 programme, the Scottish government reiterated a proposal to introduce a circular economy bill. To support Scotland's resource productivity and climate objectives, ZWS has launched studies to improve metrics related to the circular economy. It has identified material flow accounts and carbon footprint as key indicators to be developed.

The Welsh government created a Circular Economy Fund, financed with GBP 6.5 million and managed by WRAP Cymru. *Beyond Recycling*, the 2021 circular economy strategy for Wales, highlights the role of social enterprises in product repair and reuse. It calls for a Green Growth Pledge for business and the development of repair and reuse hubs within communities. The Welsh government has issued a set of indicators for its *Beyond Recycling* strategy, including indicators for carbon savings from recycling, the activity of repair cafés and the amount of plastic sent for recycling outside Wales.

UK policies also address the role of products in the transition to a circular economy. Both the Scotland and Wales strategies call for improving product design for longer lifetimes and greater reparability and reusability. The 2021 Environment Act provides the United Kingdom and devolved governments with powers to set resource efficiency requirements in several areas. These include those related to product durability, recyclability and reparability, as well as recycle content (Smith and Priestley, 2021). The 2021 Energy-related products policy framework calls for products that can be more easily repaired, remanufactured and recycled. Meanwhile, the UK government is working on a broader products policy that will include circular economy goals. The UK's innovative plastics tax can provide a start for further, ground-breaking work on product policy. Given the importance of its trade with the EU, the United Kingdom should consider developments in the European Union, including the upcoming sustainable products policy initiative and possible product standards, as well as work in other OECD countries. It should also co-ordinate its policy closely with the European Union and other OECD economies.

Both the United Kingdom and devolved governments have also acted to reduce waste and promote the circular economy via their procurement (Box 2.6).

Box 2.6. Reducing waste and promoting the circular economy in government operations

At the UK level, the Greening Government Commitments for 2016 to 2020 included pledges to halve paper use compared to 2009/10, reduce waste generation and increase recycling. By 2019, UK government paper use had fallen 59%, waste generation by 40% and recycling had increased to 65%.

The Scottish government has promoted sustainable procurement tools for lifecycle impact mapping, considering the impacts of raw materials extraction and the reuse, recycling and remanufacture of materials among their criteria. In Wales, the 2019 *Sustainable Procurement Code of Practice* for the National Health System calls for reducing waste and incorporating circular criteria for both products and services, and the 2021 *Wales Procurement Policy Statement* cites the policy objectives for the circular economy and local supply chains in its principles. Quantitative results of these initiatives were not available, however.

Source: Defra (2020), *Greening Government Commitments Annual Report: April 2018 to March 2019*; NHS Wales (2019), *NWSSP Procurement Services Sustainable Procurement Code of Practice*; Scottish government (2021), "Sustainable Procurement Tools", webpage; Welsh government (2021), *Wales Procurement Policy Statement*.

Local initiatives include London's 2017 *Circular Economy Route Map* (LWARB, 2019), which identifies construction, food, textiles, electronics and plastics among its priority sectors. As one example, "Advance London" supports circularity in small and medium-sized enterprises (SMEs) via advisory services. Topics include project finance, product design and communication. One in three participating SMEs had accessed some form of financing within 18 months. They produced a variety of goods and services, including thermal packaging material from surplus feathers, returnable packaging for hot or cold drinks, and a food sharing app (Ellen MacArthur Foundation, 2019a).

Circular Glasgow, was launched in 2017 by the city's Chamber of Commerce in collaboration with ZWS, the City Council and Circle Economy. Initially funded by the European Regional Development Fund, it

focused first on local food and beverage businesses before adding construction, finance, tourism and creative sectors (Ellen MacArthur Foundation, 2019b). A Circle Lab Challenge in 2018 resulted in a reuse and return scheme for cutlery, containers and bottles used at large-scale events; a project to create energy from food waste; and an initiative to integrate circularity principles into business branding and communication (ZWS, 2021b).

Other cities, such as Peterborough in England, have launched circular economy initiatives. ZWS is working with organisations in several parties of Scotland, including the Edinburgh Chamber of Commerce and Highlands and Islands Enterprise (a Scottish economic development agency) for a large rural and maritime area of northern Scotland (ZWS, 2021c). Other local initiatives include the Northern Ireland Resources Network, a pilot that brings together local governments, community associations, charities and social enterprises to promote reuse and repair in Northern Ireland for bicycles, clothing, electronics, food and plastic and support local and national government action (NIRN, 2020).

Governments at different levels are taking greater and often ambitious circular economy initiatives. The United Kingdom has followed the OECD's 2004 Recommendation on Material Flows and Resource Productivity (C(2004)79) and 2008 Recommendation on Resource Productivity) (C(2008)40) by gathering information and developing indicators on material flows, including on a life-cycle basis, and developing policies and measures at different government levels to improve resource productivity.

As of mid-2021, however, little information was found on policy results in terms of environmental outcomes, such as waste reductions and improved resource productivity. As local and national initiatives develop further, results should be monitored more closely, along with regular evaluations to understand success factors and challenges. Private sector initiatives such as those co-ordinated by WRAP can provide a model. Governments will need to further develop and put in place economy-wide data and indicator frameworks, such as the work by ZWS and the Welsh government, to monitor progress towards resource productivity targets. To meet the UK's ambitious circular economy and resource productivity goals, governments as well as the private sector, independent organisations and research bodies should increase information exchange on success factors and challenges, as well as strengthen networks.

2.5.3. *Addressing material flows and waste in the construction sector*

The UK's construction sector is a major consumer of materials and producer of waste. Government policies and private initiatives have sought to improve resource efficiency, reduce waste and increase recycling in this sector.

One longstanding instrument is the aggregates levy, introduced across the United Kingdom in 2002: this tax on commercially extracted sand, gravel and rock, including imports,[5] aimed to reduce quarrying impacts on the environment and increase recycling in construction (UK Government, 2021). The original rate of GBP 1.6/t rose to GBP 2/t in 2009 but has not increased since. One study found that consumption of aggregates per unit of construction output fell about 40% over 2002-10, influenced by both the aggregates levy and the landfill tax on construction and demolition waste (CDW) (Ettlinger, 2017). From 2010 to 2018, however, consumption of aggregates rose 19%, close to the 21% increase in construction sector output (ONS, 2021). In 2021, the National Audit Office concluded the aggregates levy had only a limited effect, while noting "a wider set of regular indicators is needed to assess the levy's environmental impact" (NAO, 2021). In November 2021, following a review and consultation, the UK government proposed to modify some exemptions to the levy but not increase its rate.

Over the past decade, government policies have set ambitious actions and objectives to increase material productivity in the construction sector, reduce CDW and increase recycling. Northern Ireland's 2013 Waste Management Plan, for example, calls for increasing use of recycled materials in government construction projects. Scotland's 2016 circular economy strategy, *Making Things Last*, and Wales' 2010 waste strategy, *Towards Zero Waste,* highlight construction among the sectors that can deliver the greatest resource and

waste improvements. SEPA has prepared sectoral plans for housing and the strategic infrastructure transport and utilities sector. Both highlight waste reduction and increasing resource efficiency as goals but without quantitative targets.

Government policies emphasise collaboration with the private sector. England's 2018 Resources and Waste Strategy calls for collaboration on a roadmap to zero avoidable waste in the sector with the Green Construction Board, which brings together stakeholders. The strategy also cites the 2018 Construction Sector Deal between government and industry that pledges GBP 170 million of government funding for the sector's development, including increasing efficiency of construction techniques. The ZWS Circular Economy Investment Fund has supported industrial research projects such as Kenoteq, a start-up company that produces bricks made of 90% construction waste (Kenoteq, 2021).

From 2008 to 2015, WRAP co-ordinated a voluntary agreement, "Halving Waste to Landfill". Over 800 companies signed on, exchanging good practices and monitoring their material flows. WRAP developed tools to help businesses in the sector monitor their process and identify ways to reduce their waste throughout the supply chain. WRAP reported that member companies collectively achieved the headline target of halving their waste to landfill (WRAP, 2021g).

Private sector initiatives include the UK Green Building Council (GBC), which brings together over 600 private enterprises to share guidance and good practice, and promote innovation. In 2021, the government-sponsored Green Construction Board's Taskforce on Zero Avoidable Waste which produced a *Routemap for Zero Avoidable Waste in Construction*, as part of the transition to a circular economy (Adams et al., 2021). The routemap defines zero avoidable waste as preventing waste at every stage in a project's lifecycle and promoting reuse and recycling. It calls for reaching this goal by 2050 and sets out actions to be taken by the construction sector and by government, including better monitoring to track progress.

It is not clear, how well these initiatives have improved trends in materials use and waste management in the sector, as UK-wide indicators show mixed results. The UK consumption of non-metallic minerals, much of which is related to construction, rose 11% from 2010 to 2018 compared to the 21% increase in the sector's economic output. This suggests a relative decoupling. However, as noted above, growth in the consumption of aggregates (an important component of non-metallic minerals for the construction sector) closely matched the sector's output. In this period, the volume of construction waste rose 16%, implying a small relative decoupling. The signatories of the WRAP initiative did halve their waste to landfill. However, the UK's total volume of CDW to landfill increased from 2.1 Mt to 2.5 Mt between 2010 and 2016 (while falling to 1.5 Mt in 2018) (Eurostat, 2021b).

Both government and the private sector have ambitious long-term goals for resource productivity and waste reduction in the construction sector. To achieve these goals, UK governments and private sector bodies will need to step up the pace. Reinforcing economic instruments, for example by raising the rate of the aggregates tax, could support resource productivity goals. Stronger monitoring, highlighted in the *GBC Routemap*, will be needed to track progress, including both private sector action and further government initiatives. In this regard, the planned waste tracking system and the National Materials Datahub (Section 2.5.2) could play an important role.

Recommendations on waste management and circular economy

Policy ambition, coherence and co-ordination

- Continue and strengthen the integration of circular economy policies with industrial and carbon reduction policies.
- Consider how promoting greater domestic recycling and reprocessing capacity and increasing industrial symbiosis can support circular economy goals while ensuring greater economic resilience. Strengthen policy goals and initiatives for the repair, reuse and remanufacturing of products while creating local jobs.
- Continue development of a UK product design strategy that supports circular economy goals. This could draw on current work in the European Union and other OECD economies for product standards on durability, reuse, repair and recyclability, together with co-ordination with other advanced economies, including via OECD working parties.
- Expand resource efficiency goals to incorporate the reduction of the UK's worldwide material footprint.
- Strengthen formal and informal mechanisms for co-ordination, peer learning and policy development among environmental authorities of the four UK nations in setting, implementing and evaluating waste management and circular economy policies.
- Provide additional funding to support local authorities, catalyse private sector action, and promote innovative waste and circular economy initiatives, including via independent organisations such as WRAP and Zero Waste Scotland.

Policy instruments

- Ensure effective implementation of England's waste management reforms, including the kerbside collection of household food waste and national guidance for separate collection of a core set of recyclable waste streams to reduce co-mingling.
- Ensure that local authorities have adequate capacity and resources to put reforms in place and reach minimum recycling rates. Strengthen financing of waste management at local level where needed. Consider the use of pay-as-you-throw mechanisms that can provide incentives for waste reduction, as well as moving to full financing of waste collection and treatment costs via user fees, in line with the polluter pays principle.
- Carry out public information campaigns to support successful implementation of the new requirements.
- Develop mechanisms to increase resources and capacity for local authorities for the identification and clean-up of contaminated sites to accelerate progress.
- Continue and strengthen actions to tackle illegal waste dumping and illegal waste exports, including the introduction of an electronic waste tracking system, and fulfil policy goals to end exports of plastic scrap to non-OECD countries.
- Put in place planned reforms to extended producer responsibility schemes to improve the performance of existing systems, extend EPR to new waste streams, and establish co-operation between EPR schemes and local authorities. Consider options to use the new deposit-refund schemes to promote beverage container reuse and consider opportunities for new deposit-return systems for waste streams with hazardous components such as portable batteries.
- Consider further use of economic instruments to promote waste management and circular economy goals, in particular introduction of incineration taxes to provide further incentives for

recycling and avoid a "lock-in" of incineration capacity, plus an increase in aggregates tax to encourage further resource efficiency and recycling in construction. After monitoring the results of the plastics tax, to be introduced in 2022, consider the feasibility of increasing the minimum recycled content and of introducing taxes to promote recycled content in other products.

- Continue and enhance initiatives for private sector action on circular economy, including support for voluntary agreements, innovative research and co-operation with local authorities and civil society.
- Use the UK's innovative work on measures of the carbon footprint of waste streams and waste treatment to identify opportunities to further reduce the direct and indirect carbon emissions of each economic sector. Develop and implement methods to track the results of circular economy initiatives on domestic materials consumption, material footprint and carbon emissions, including in the construction sector.

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Notes

[1] Material footprint refers to raw materials extracted globally to meet the final demand of the economy, including materials processed abroad for intermediate and final products.

[2] Based on current prices, non-seasonally adjusted, Great Britain, 2009 to 2019.

[3] Provisional figures show England's combined rate fell to 45% in April to June 2020 from 48% for the same period in the previous year.

[4] The UK government refers to current schemes as "producer responsibility" and to its planned reforms as "extended producer responsibility". This distinction is not made in the Review, which refers to both current and planned schemes as extended producer responsibility.

[5] There are exemptions for exports and for aggregates used in agricultural and industrial processes and reductions for activities in Northern Ireland to reduce cross-border trade distortions with the Republic of Ireland.

OECD Environmental Performance Reviews

UNITED KINGDOM

Over the past decade, the United Kingdom has reduced several environmental pressures while growing its economy. Ahead of its presidency of the 2021 UN Climate Change Conference of the Parties, it has led the way by raising its national ambition. However, air pollution, deteriorating natural assets and missed biodiversity targets are all concerns. Further efforts are needed to achieve net zero greenhouse gas emissions by 2050, prepare for climate change, reverse biodiversity loss and ensure a more resource-efficient circular economy. Strengthening co-ordination between the United Kingdom and devolved governments, as well as enhancing coherence between sectoral and environmental policies will be key.

This is the third Environmental Performance Review of the United Kingdom. It evaluates progress towards green growth, with a special chapter focusing on waste, materials management and the circular economy.

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