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September 2022

TECHNICAL ASSISTANCE REPORT – PUBLIC INVESTMENT MANAGEMENT ASSESSMENT: CLIMATE CHANGE MODULE

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United Kingdom

Public Investment Management Assessment: Climate Change Module

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Technical Report

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ABBREVIATIONS

ALB	Arms-Length body
C-PIMA	Climate PIMA
CCA	Climate Change Act
CCC	Climate Change Committee
CCUS	Carbon Capture, Use and Storage
CCRA	Climate Change Risk Assessment
CfD	Contracts for Difference
CGS	Clean Growth Strategy
DBEIS	Department for Business, Energy and Industrial Strategy
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DLUHC	Department for Levelling Up, Housing and Communities
EIB	European Infrastructure Bank
Eurostat	Statistical Agency of the European Union
GHG	Greenhouse Gas
GMPP	Government Major Projects Portfolio
HMT	Her Majesty's Treasury
IPA	Infrastructure and Projects Authority
NAP	National Adaptation Programme
NAO	National Audit Office
NI	Northern Ireland
NIC	National Infrastructure Commission
NPPF	National Planning Policy Framework
NZ	Net Zero
NZS	Net Zero Strategy
OBR	Office of Budget Responsibility
ONS	Office of National Statistics
OSCAR	Online System for Central Accounting and Reporting
PC	Public Corporations
PFI	Private Finance Initiative
PF2	Successor Framework to the Private Finance Initiative
PIMA	Public Investment Management Assessment
PPP	Public-Private Partnership
RAB	Regulated Asset Base
SOE	State Owned Enterprise
UK	United Kingdom
UKIB	UK Infrastructure Bank
UKGI	UK Government Investments
VfM	Value for Money

PREFACE

At the request of the Chancellor of the Exchequer, a team from the IMF's Fiscal Affairs Department (FAD) undertook a remote Climate Public Investment Management Assessment (C-PIMA) during September 20 to October 5, 2021. The assessment also incorporates information from relevant strategic documents that were later published, the Net Zero Strategy (October 19, 2021) and the Autumn Budget and Spending Review 2021 (October 27, 2021). The assessment was conducted remotely given health and travel related restrictions in place due to the COVID-19 pandemic. The mission team was led by Ms. Carolina Renteria and included Mr. Bryn Battersby, Ms. Michelle Stone, Mr. Tjeerd Tim (all FAD), Mr. Carlos Mulas Granados (European Department) and Mr. Murray Petrie (FAD short term expert). Mr. Tommy Chrimes from the UK IMF ED Office joined some meetings.

The mission team met from the HM Treasury with the Director for Climate, Energy and the Environment Mr. Steve Field, Deputy Director, Climate Policy, Mr. Joe Taylor, Deputy Director, Energy, Environment and Agriculture, Mr. Jon Fuller, Mr. Ant Parham and Mr. Tom Gour. From the Green Book team, the mission met with Mr. JP Spencer (Head of Green Book and Major Projects Unit), Mr. Joseph Lowe, Ms. Liz Cronin and Ms. Ibitoye Ibukunoluwa. The mission also met Mr. John Arnold and Mr. Harry Fallowfield of the Infrastructure Strategy Branch, Ms. Dominique Lam (Head of Innovative Finance Branch) and Mr. Harry Pellegrini (Head of Green Finance Legislation) and staff from their teams.

From Departments and Agencies, the team met the Department for Business, Energy and Industrial Strategy (BEIS) Mr. Henry Green, Ms. Gemma Mabin; from the Department for Environment, Food and Rural Affairs (DEFRA) Mr. Tom Handysides, Mr. Nigel Miller; Ms. Caroline Povey and team members; from the Department for Levelling Up, Housing and Communities (DLUHC) Mr. Aaron Gould; from the Department for Transport (DFT) Mr. Bob Moran; from National Highways Mr. Ivan LeFevre, and Mr. Elliot Shaw; and from Network Rail, Mr. Steven Hart and Ms. Helen McAllister.

In addition, the team met with the Climate Change Committee (CCC), Mr. Michael Thompson; from the Infrastructure and Projects Authority (IPA) with Ms. Hariom Newport, Mr. Mark Hunter, Mr. Simon Lawrence, Mr. Daniel Byrne, Mr. William Varah and Mr. Matthew Vickerstaff; from the National Audit Office (NAO) Ms. Katy Losse, Ms. Shoko Okamura and Ms. Emma Taylor; from the National Infrastructure Commission (NIC) Mr. Ed Beard, Ms. Joanna Campbell, Mr. Jonathan Chappel; from the Office for National Statistics (ONS), Mr. Ian Townsend, Ms. Nicole Shearman and team members; from UK Government Investments (UKGI) Ms. Lucie Lambert, Mr. Patrick Daniel, Ms. Siobhan Duffy; from the UK Infrastructure Bank, Ms. Alison Doyle, Mr. Mark Howat, Ms. Helen Williams; from the UK Office of Budget Responsibility (OBR), Mr. Richard Hughes, Mr. Andy King, Mr. Thomas Wickstead and team members.

The mission team would like to thank the UK government for their cooperation and their participation in constructive discussions during the mission. The mission would especially like to thank Mr. Mark Anderson, Ms. Heather Britton and Mr. Ant Parham for their support in organizing the mission.

EXECUTIVE SUMMARY

The UK has one of the most ambitious climate mitigation targets in the world, achieving net-zero emissions by 2050. Long-term emissions reduction targets are legally-binding, there is a well-developed climate change framework including governance frameworks for mitigation and adaptation. Interim national targets or “five-year carbon budgets” are submitted to parliament for approval and there are National Adaptation Programs. The UK has reduced its greenhouse gas (GHG) emissions by 44 percent between 1990 and 2019, but it will likely be exposed to severe climate change risks such as increased flooding.

To meet these targets, the UK needs to speed up implementation of reforms and investments. The UK’s pathway to a net zero economy will be capital intensive. The Climate Change Committee (CCC) estimates about £50 billion per year in additional investment is required to get to net zero by 2050. Managing the planned scaling up of infrastructure, while achieving climate goals, will require good planning and implementation. The institutional setting, policies and actions to address mitigation are more developed than those for adaptation, where action is lagging. Although a framework to respond to climate change challenges exists and capacity is high, the scale, depth and complexity of the challenge go beyond the existing possibilities and requires systemic institutional change and a convergence process. There are shortages in the supply of technical expertise in climate change and its interaction with policies and programmes. Training programs are being deployed but they fall short. A significant and speedy scale up of capacity building is required.

The Climate-PIMA shows that the UK has a relatively well-designed system to manage climate relevant public investment, but there is room to strengthen its institutional design and there are important gaps in its effectiveness. Table 1 and Figure 1 present the scoring based on institutional design—out of 15 dimensions, the UK scores high in 9 and medium in 6—and discusses the effectiveness of practices. The report presents recommendations and an Action Plan (Annex 1) to strengthen the design and to reduce gaps in effectiveness. The call for action from the CCC, and more widely, from COP26, requires effective institutions that deliver results. The detailed scores are at Annex 2, and the questionnaire used in the final report is at Annex 3.

The institutional setting for planning climate relevant public investments is well advanced. National and sectoral public investment plans are aligned with the UK’s climate objectives; spatial planning and building regulations are designed to ensure resilience to climate-related natural disasters and extensive written guidance is provided to assist with the incorporation of climate objectives in the planning of programmes and projects. However, modifications in standards are still to be developed and more extensive training and support is required across government to integrate climate-relevant targets in programmes and projects.

Coordination between entities from a climate change perspective is strong across central government, but is reduced when it relates to local governments and public corporations. There is a well-defined framework for coordination of climate policy at the **central government**,

covering major climate related investments, there are lead responsibilities at the executive level and departmental roles and responsibilities are clearly defined. **Local government** have a key role to play, and they are increasingly making a commitment to meeting climate change targets. **Public corporations** (PCs) are subject to market regulations, climate change related reporting standards and have to develop their strategic plans in coordination with their sponsoring departments. However, local governments are not required to report climate change-related investment strategies or projects to the UK Government and there are no formal policy fora or processes to discuss, develop and coordinate climate related public investment strategies; the current PC ownership framework lacks a UK government-wide ownership policy and accompanying performance instruments that require PC capital spending plans to be fully consistent with mitigation and adaptation targets and policies.

Project appraisal practices are strong, but there is room to strengthen project selection criteria and transparency. Infrastructure projects are required to incorporate climate analysis in their **business cases**; and the Green Book and related supplementary guidance outlines how project development, appraisal and decision making should take into account climate change. Ad hoc reviews of the management of existing private finance initiative (PFI) contracts are facilitating improvements in mitigation and adaptation outcomes. Budget decisions and **selection of projects** are expected to take into consideration climate impacts. However, business cases are not published; the framework for managing climate impacts of legacy PFI contracts is still being established, subnational PPP frameworks and the Green Book PPP annex do not refer explicitly to climate change; and formal selection criteria are not in place.

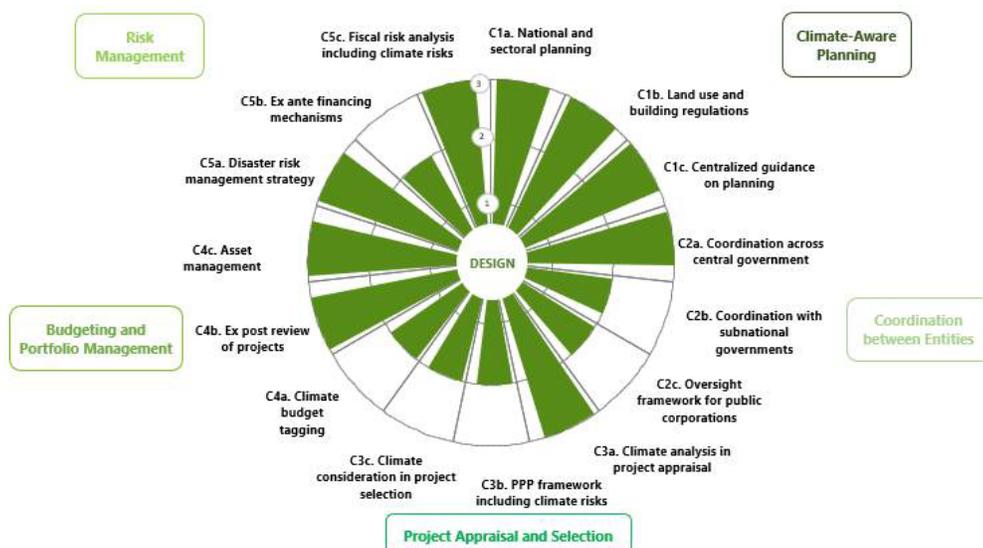
There are good practices for portfolio oversight and monitoring. Annual budget documents **report** on capital spending inputs for each major policy area and the Infrastructure and Projects Authority (IPA) has been strengthening assurance tests on net zero and climate resilience. There is a well-developed regulatory framework and guidance on the conduct of **ex post project reviews and of Value for Money audits** by the National Audit Office. There is a **central property register** that records climate-related data and supports reporting against targets. However, details in budgets and related published documents on outputs or expected outcomes of climate-related public investments are limited; there is limited information on multiyear project spending and outputs and negative climate change impacts are not identified.

The UK has a strong risk management framework. Disaster risks related to climate change are detailed in the CCC's **Climate Change Risk Assessment** (CCRA) Report and the UK Risk Register in the National Cabinet Office. The National Adaptation Programme provides the Government's response to the identified risks and outlines the strategy for managing those risks. HMT may authorize issues out of the **Contingencies Fund** subject to 2 percent of the total authorized supply expenditure, with fiscal space as the primary tool for managing residual climate-related risks to infrastructure. **Fiscal risk analysis** is presented in the CCRA, including quantification of exposure to climate-related risks for infrastructure, and the Office for Budget Responsibility (OBR) provides illustrative guidance of the fiscal impact of climate-related shocks drawing on the assessment in the CCRA.

Table 1. United Kingdom: Climate PIMA Summary Scoring

Institution		Assessed Strength	Reform Priority
C1	Climate aware planning	HIGH National and sectoral public investment plans are aligned with the UK's climate objectives; spatial planning and building regulations are designed to ensure resilience to climate-related natural disasters and extensive written guidance is provided to assist with the incorporation of climate objectives in the planning of programmes and projects.	Low
C2	Coordination between entities	MEDIUM . Various investment coordination practices exist that promote consistency of climate change-related public investments across different parts of the public sector. However, there is space to develop more explicit expectations and formal requirements to ensure that all public investments of local governments and public corporations are fully consistent with national climate commitments.	Medium
C3	Project appraisal and selection	MEDIUM Good guidance for climate-aware appraisals in place, but appraisals are generally not public. New private finance initiative and similar projects are few, but existing contracts not always managed from a climate perspective. Spending decisions reflect climate considerations (especially mitigation) but formal criteria are not in place.	Medium
C4	Budgeting and portfolio management	HIGH Budget documentation includes information on capital spending inputs for each major policy area; SR20 and SR21 included climate-related investments; IPA has assurance tests on Net Zero and climate resilience. Well-developed regulatory framework and guidance on the conduct of ex post project reviews and of Value for Money audits by the NAO. The Better Business Case process incorporates an assessment of whether a project has plans for maintenance and resilience; central property register records climate-related data.	Low
C5	Risk management	HIGH . There is a strong risk management framework, with comprehensive fiscal risk analysis presented in the Climate Change Risk Assessment and the OBR's Fiscal Risk Statement. While the Contingencies Fund provides some flexibility to manage climate-related risks, fiscal stress tests of high-impact low-probability climate-related events could be used to assess the value of alternative ex-ante financing mechanisms to cover extreme events.	Medium

Figure 1. Climate PIMA Results



Source: IMF staff

Table 2. United Kingdom: Summary of Climate-PIMA Recommendations

	Recommendation	Agency
C1. Climate aware planning	<p>1.1: Build strategy and planning capacity across government agencies for investment strategies to better support achievement of climate targets</p> <p>1.2: Increase guidance and training on incorporating mitigation and adaptation objectives into public investment.</p>	BEIS and DEFRA in consultation with HMT
C2. Coordination Between Entities	<p>2.1. Develop a regional and local government delivery, and accompanying reporting, framework with climate change-related investment responsibilities, actions and requirements.</p> <p>2.2. Develop and implement guidance on integrating climate into shareholder ownership and oversight functions.</p>	BEIS, DEFRA, DLUHC HMT, BEIS, DEFRA
C3. Project Appraisal and Selection	<p>3.1: Improve the transparency of business cases - publication.</p> <p>3.2: Improve training and support on the incorporation of climate impacts in business cases and DEFRA's capacity to support business case assessments.</p> <p>3.3: Establish a framework for legacy PFI contract management and the return of assets to the public sector that embeds climate considerations.</p> <p>3.4: Devolved authorities implementing PPPs should update their guidelines for climate risks.</p> <p>3.5: Include information on adaptation impacts to the highest-level decision makers during spending reviews.</p>	HMT HMT with DBEIS and DEFRA IPA Devolved Admin. with IPA HMT
C4. Budgeting and Portfolio Management	<p>4.1: Define and publish an operational definition of what constitutes a climate change-related investment</p> <p>4.2: Expand disclosure of anticipated impacts of new public investment spending in existing budget documents or as part of a wider Climate or Green Budget Statement</p> <p>4.3: Implement current policy on publication of ex post project evaluations and increase the accessibility of evaluation reports</p> <p>4.4: Develop detailed monitoring and evaluation frameworks for climate change adaptation</p>	HMT HMT, BEIS and DEFRA All government agencies DEFRA with HMT
C5. Risk Management	<p>5.1: Close the gaps in progress toward planning for climate-related infrastructure risks identified by the CCC</p> <p>5.2: Undertake fiscal stress tests of high-impact low-probability climate-related events and assess the need for alternative ex-ante financing mechanisms to cover extreme events</p> <p>5.3: Assess the need for alternative ex ante financing mechanisms (e.g., disaster fund or risk-transfer mechanisms) for extreme events.</p>	DEFRA HMT HMT
Information systems	<ul style="list-style-type: none"> • Include key project level climate information in GMPP database • Design Green Register to meet a wide range of user needs for information in addition to green gilt reporting 	IPA HMT with BEIS, DEFRA, ONS
Capacity Development	<ul style="list-style-type: none"> • Extend the ambition for government capacity summarized in the Net Zero Strategy to all levels of government and to public corporations, and develop measures to build this capacity • Build capabilities in relevant areas of DEFRA to ensure strategies and plans are implemented, and to deliver guidance and training 	All levels of government DEFRA

I. CLIMATE CHANGE AND THE UK

A. Climate Change Framework in the UK

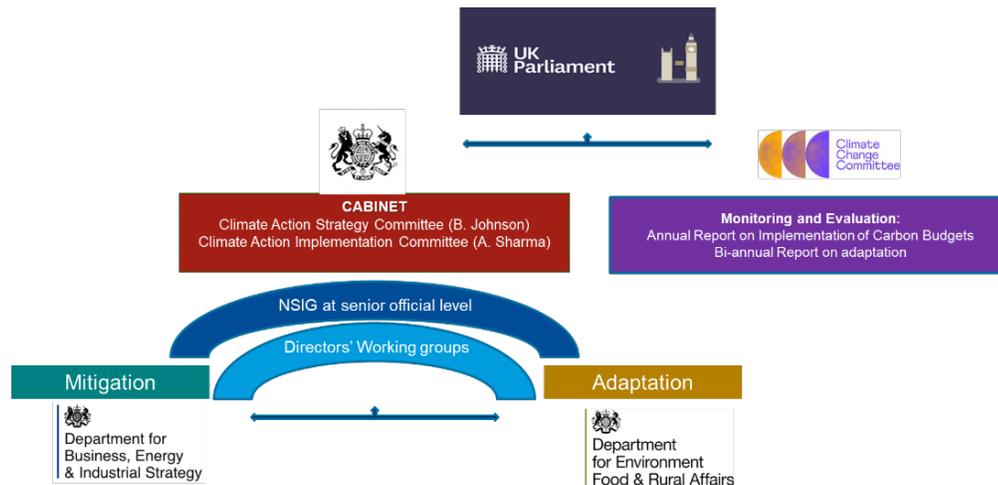
1. The UK has a strong climate change framework emanating from the Climate Change Act (CCA). The CCA 2008 was the first law of its kind. It introduced legally binding quantitative short-, medium- and long-term targets, clear processes for policy planning to realize short and interim emissions-targets, and an independent advisory body, which advises the UK governments on meeting its targets and monitors progress. Notably, the scope of the legislation is not limited to climate change mitigation, but also introduced governance and processes related to climate change adaptation. The CCA has since been cited as a model by other jurisdictions that have introduced similar legislation.

2. Through the CCA, the government has developed a well-defined climate governance framework. The CCA defines the climate-change-related duties and powers of UK government departments. Through Cabinet committees, of which one is chaired by the prime minister, the government pursues collective climate mitigation and adaptation decision-making. The Department for Business, Energy and Industrial Strategy (BEIS) is responsible for producing cross-economy decarbonization strategies for meeting legally binding carbon budgets, the most recent of which was the Net Zero Strategy. BEIS also holds policy portfolios for reducing emissions from the power sector and industry sector and works jointly with the Department for Levelling-up, Housing and Communities (DLUHC) to reduce emissions from buildings. The Department for Transport (DfT) is responsible for reducing emissions from transport and the Department for Environment, Food, and Rural Affairs (Defra) is responsible for reducing emissions from land use, agriculture, waste, water and Fluorinated greenhouse gases. These departments are supported by officials in the Cabinet Office, Prime Minister's Office and HMT. For example, Her Majesty's Treasury (HMT) is closely engaged in climate policy through, amongst other activities, creating a budgetary framework that provides an enabling environment for climate policy. There are working groups at director general and director levels to secure interdepartmental coordination and implement decisions taken by Cabinet committees (Figure 2).

3. Although the devolved administrations have their climate policies, they must also contribute to achieving the UK-wide climate change targets. Scotland, Wales, and Northern Ireland are responsible for roughly 20 percent of the total UK GHG emissions. Around 11 percent of emissions are in areas where some or all key powers are reserved to the devolved administrations, who are also involved in climate proofing the public infrastructure.¹

¹ CCC Analysis from the Sixth Carbon Budget Report: <https://www.theccc.org.uk/publication/sixth-carbon-budget/>

Figure 2. Climate Change Governance Framework in the UK



Source: IMF staff

Note: The CCC is comprised of a Chairman and eight independent members and is supported by a secretariat of roughly 30 staff. The CCC members are experts in the fields of climate change, science, economics, behavioral science, and business. Funding for the CCC is provided by the UK government as well as the devolved administrations of Scotland, Wales, and Northern Ireland. For more information see: <https://www.theccc.org.uk/>

4. Independent institutions like the Climate Change Committee (CCC) play a crucial role in the climate governance framework. To provide independent oversight, the CCA established the CCC, a publicly funded independent statutory body, that advises the UK government and the devolved administrations on reducing their GHG emissions and preparing for- and address the impacts of climate change today and in the future. The primary duties of the CCC are to: perform independent analyses, to engage with stakeholders and the public to promote informed discussions on climate change, to provide independent advice on setting and meeting carbon budgets, preparing for climate change, and to monitor progress. Another institution that plays an important role is the Office for Budget Responsibility (OBR). The OBR estimates the potential economic and budgetary impacts and the fiscal risks of climate change adaptation and mitigation actions.

B. Climate Change Objectives and Strategies

Climate Change Mitigation

5. The UK aims at achieving net-zero emissions by 2050. The 2008 CCA enshrined a long-term emissions reduction target of 80 percent below 1990 levels by 2050. In 2019, the UK passed its most ambitious legislation in this area and increased its 2050 target to net-zero emissions, meaning that any GHG-emissions in 2050 would be balanced out by actions to remove an equivalent amount of emissions from the atmosphere.

6. The CCA uses a budget-based approach called carbon budgets, assigning quantitative caps on GHG-emission-levels. To meet its long-term emissions reduction targets, the CCA dictates that the government must set five-year carbon budgets at the national level from 2008 to 2050, which must be set 12 years in advance. Carbon budgets are to be proposed by the CCC to the UK government. The UK government is required to consider, though does not have to follow, the CCC advice when setting the carbon budgets and submitting them for approval to Parliament. The government must explain the reasons if it chooses to deviate from the CCC's recommendation. So far, six budgets have been approved and the government has always taken on board the CCC's proposed carbon budgets (Table 3).

Table 3. United Kingdom: Carbon Budgets and the Pathway to Net-Zero

Budget	Budget Period	Carbon Budget Level	Approx. Emissions Reduction Target (below 1990 levels) ²	Progress
1	2008 to 2012	3,018 MtCO ₂ e	25%	Target met
2	2013 to 2017	2,782 MtCO ₂ e	31%	Target met
3	2018 to 2022	2,544 MtCO ₂ e	37% by 2020	Ongoing
4	2023 to 2027	1,950 MtCO ₂ e	51% by 2025	Still to start
5	2028 to 2032	1,725 MtCO ₂ e	57% by 2030	Still to start
6	2033 to 2037	965 MtCO ₂ e	78% by 2035	Still to start

Source: IMF staff

7. Against the global trend, the UK significantly decreased its GHG-emissions between 1990 to 2019. UK's annual GHG-emissions fell by around 49 percent between 1990 and 2020 from 809 MtCO₂e to 458 MtCO₂e.³ (excl. LULUCF) The UK's reduction of GHG-emission starkly contrasts the global GHG-emissions position. Between 1990 and 2018, the UK reduced emissions by 40 percent, while global emissions increased by 54 percent over the same period. The UK's share of worldwide GHG emissions went from 2.5 percent in 1990 to 1 percent in 2019, excluding LULUCF.⁴

8. The UK's GHG-emissions are decoupled from population increase and economic growth. GHG-emissions per capita have dropped by 49 percent, which indicates that the UK has successfully decoupled its emissions from population growth. Additionally, emissions per USD\$ unit of GDP have decreased sharply by 77 percent, as compared to a global decrease of 69 percent (Table 4). Figure 3 provides an overview of GHG-emissions of 20 major GHG-emitting economies in 1990 and 2018.

² Percentage reductions implied by Carbon Budget levels have been based on emissions estimates from the UK 1990-2019 GHG Inventory (under IPCC AR4 GWPs). Emissions estimates are revised annually to incorporate methodological improvements, updated data and changes to international guidelines, therefore percentage reductions implied by CB levels are subject to change.

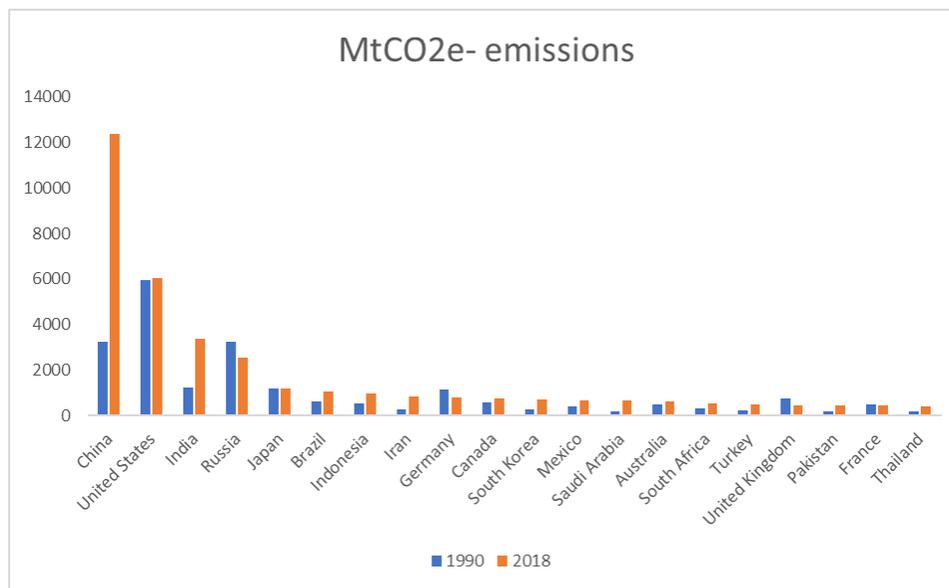
³ <https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics>

Table 4. GHG-Emission Per Capita and GDP (excl. LULUCF)

	Region	1990	2018	Change from 1990 %
ton CO2e per capita	World	7.3	6.6	-8%
	UK	13.2	6.8	-49%
ton CO2e per thousand USD\$ GDP	World	3.8	1.2	-69%
	UK	0.7	0.2	-77%

Source: Climate Watch 2021, available at climatewatchdata.org/ghg-emissions.

Figure 3. GHG-Emission of 20 Major GHG-Emitting Economies

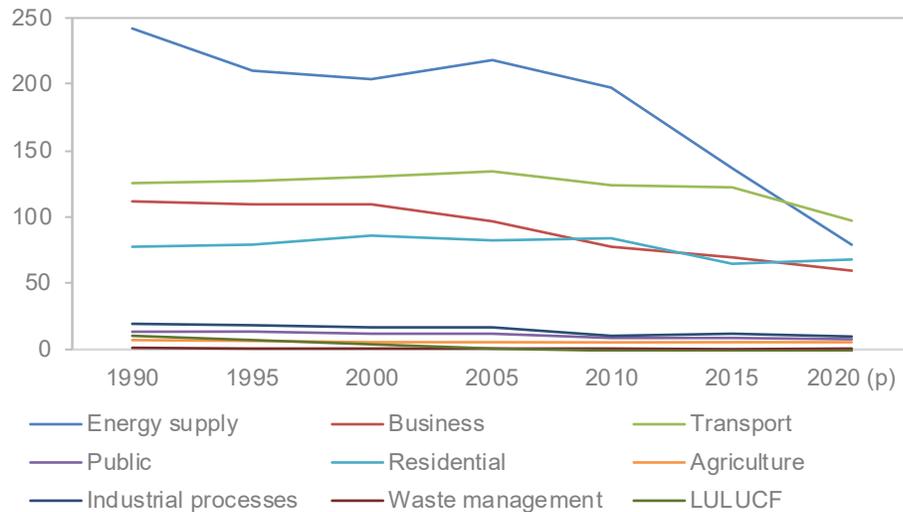


Source: Climate Watch 2021, available at climatewatchdata.org/ghg-emissions.

9. The UK has reduced CO₂-emissions in all economic sectors, with the strongest reduction in the energy sector. Around 54 percent of the decrease in CO₂-emissions between 1990 and 2020 can be explained by emission reduction in the electricity sector, around 19 percent by emission reductions in the business sector, and 10 percent by emission reductions in the transport sector (Figure 4).

10. The strong reduction of CO₂ emissions in the electricity sector is related to the decarbonization strategy of the electricity sector. This strategy includes carbon pricing, feed-in tariffs to ensure a fixed income level for low-carbon generators, and an Emissions Performance Standard limiting the amount of CO₂ that new power stations can emit per kWh of electricity generated.

Figure 4. CO₂-Emissions in Mt, by Sector, 1990–2020



Source <https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics>

Climate Change Adaptation

11. The CCA also legislates governance and processes related to climate change adaptation. The CCA requires the establishment of an Adaptation Sub-Committee of the CCC. Whereas the CCC advises on how to reduce GHG-emissions, the Adaptation Sub-Committee provides advice on how to adapt to the risks posed by climate change. The UK government is required to publish a Climate Change Risk Assessment (CCRA) every five years. This risk assessment should set out risks and opportunities facing the UK from climate change and the UK government and the devolved administrations must respond to the findings in the CCRA in their National Adaptation Programmes (NAP). The CCA also granted the government Adaptation Reporting Power, which is a discretionary power under the CCA, that enables the government to invite or direct infrastructure providers and public bodies to report on their climate change preparedness.

12. Even under ambitious global scenarios for reducing GHG-emissions, the UK will most likely be exposed to severe climate change risks. In its CCRA3, the UK expects climate change will increase its exposure to weather-related hazards. Key accentuations include changing rainfall patterns, flooding, water scarcity, coastal erosion, wildfires, and increased variability of weather variables such as wind strength and direction, sunshine, and UV-levels. Additionally, the Bank of England (2021) estimated that sea level rise could exacerbate the risk of coastal flooding in the UK.

13. The policy actions included in the National Adaptation Programme focus on 6 priority areas. The latest NAP covering the period 2018–23, sets out the government’s response to the second Climate Change Risk Assessment, which identified and ranked 6 priority areas of climate change risks for the UK (Table 5).

Table 5. United Kingdom: NAP 2018–23 Climate Change Risk Priority Areas

1	Flooding and coastal change risks to communities, businesses and infrastructure	High priority
2	High temperatures risk to health, well-being and productivity	
3	Shortages in the public water supply for agriculture, energy generation and industry	Medium-low priority
4	Risks to natural capital including terrestrial, coastal, marine and freshwater ecosystems, soils and biodiversity	
5	Risks to domestic and international food production and trade	
6	New and emerging pests and diseases and invasive non-native species affecting people, plants and animals.	

Source: National Adaptation Programme for 2018–23 of the UK government

C. Climate Change and Public Infrastructure in the UK

14. Infrastructure assets that are critical to government service delivery are in both public and private hands in the UK. Government’s role is to ensure that infrastructure enables the provision of services that citizens need for wellbeing and to support economic growth. In the UK, some essential infrastructure is built, owned, and operated by the public sector, other infrastructure is operated by the private sector on behalf of government, and some is owned and operated by the private sector under license and strict regulatory oversight. This latter category includes infrastructure that is held by public companies in many countries e.g., utility assets and toll roads. The UK privatized many public infrastructure assets in the 1970s and 1980s and as a result, public infrastructure is low as a share of GDP relative to peers (44.6 percent in 2019 compared to the advanced country average of 55.7 percent).

15. Reflecting the diverse ownership and operation arrangements, many aspects of public investment planning and coordination in the UK covers all forms of ownership of infrastructure. For example, the National Infrastructure Commission’s remit covers private and public infrastructure; critical national infrastructure overseen by the National Centre for Infrastructure Protection includes public and private sector assets; and sector plans cover private investment.⁴ This C-PIMA report generally focuses on infrastructure assets that involve direct expenditure, or contingent assets and liabilities for the government. Annex 4 contains more information on delivery modalities for infrastructure assets in the UK.

16. Managing the planned scaling up of infrastructure while achieving climate goals will require concerted policy effort. The UK Government announced in March 2021 that it plans to invest more than GBP 600 billion in gross public sector investment over the next five

⁴ <https://www.cpni.gov.uk/critical-national-infrastructure-0>

years.⁵ This investment offers scope to make the investments needed for the achievement of climate goals, but if poorly handled, it risks undermining the achievement of the Government's climate targets.

17. The UK's pathway to a low-carbon energy system will be capital intensive. In 2020, the CCC stated that the capital investment required to achieve a low-carbon energy system will go up from around GBP 10 billion in 2020 to around GBP 50 billion in 2030, and it remains at approximately this level until 2050. The CCC assumes that the additional capital expenditure will mainly be driven by required investments in electricity supply, fuel supply, energy networks, surface transport, buildings, and land use, land-use change, and forestry.

18. If planned and executed well, aggregate operating cost savings could match the annual investment necessary to achieve a low-carbon energy system. A low-carbon energy system is typically more energy efficient and represents overall cost savings. Many of the new technologies deployed in a carbon-neutral energy system will have considerably lower operation costs than the alternatives they replace. The CCC indicated that cost savings will mostly arise in the transport sector, and to a lesser extent in the electricity supply sector and low-carbon buildings.

19. Climate change risks to infrastructure affect sectors that are fundamental to day-to-day life in the UK. Weather and climate both impact on infrastructure performance and manifest themselves in a variety of ways, often likely leading to disruption or, in more severe cases, loss of service entirely. This has significant implications, not just for economic activity, but societal equity, health, and well-being more generally (for more detail see Institution C5 – Risk management).

II. CLIMATE CHANGE AND PUBLIC INVESTMENT MANAGEMENT ASSESSMENT

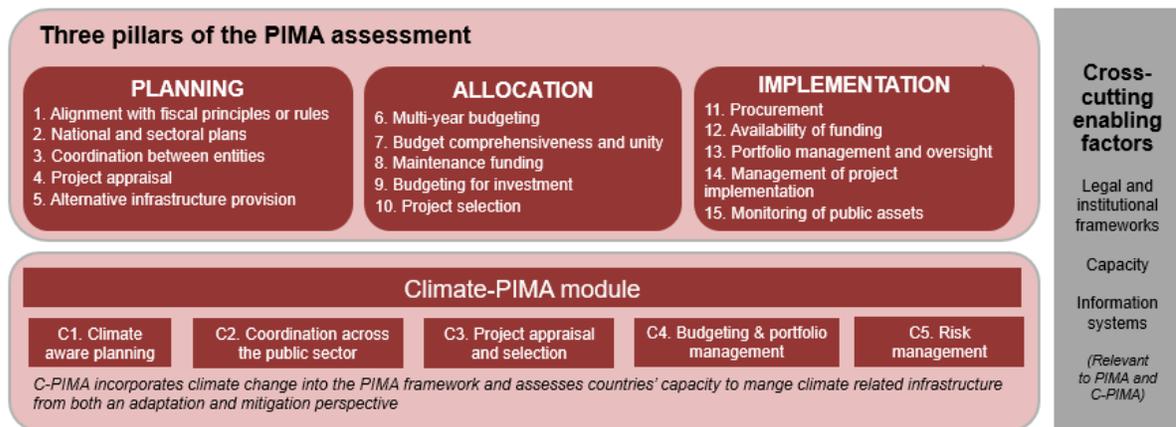
A. Climate PIMA Framework

20. The Climate PIMA assesses five key public investment management practices from the climate change perspective and is an extension of the existing PIMA framework.

Figure 5 describes the main elements and Annex 3 includes the questionnaire.

⁵ Chancellor of the Exchequer, *Build Back Better: our plan for growth*, March 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/968403/PfG_Final_Web_Accessible_Version.pdf

Figure 5. Climate Public Investment Management Assessment Framework



Source: IMF staff

21. The Climate PIMA covers the following specific issues:

- *C1. Climate-aware planning:* Is public investment planned from a climate change perspective? This is necessary to ensure that long- and medium-term plans contribute to meeting climate objectives and facilitate effective prioritization and decision-making.
- *C2. Coordination between entities:* Is there effective coordination of decision making on climate change-related public investment across the public sector? In addition to the central government, devolved authorities, local governments, PCs and private sector entities play key roles in realizing climate-related public investment. Climate adaptation investments will often take place at the local level, and both PCs and private sector entities may play key roles for instance in energy production.
- *C3. Project appraisal and selection:* Do project appraisal and selection include climate-related analysis and criteria? This is necessary to ensure that the most effective and efficient investments are prioritized. This serves to maximize the climate impacts of public investments within available resources.
- *C4 Portfolio management and oversight:* Is climate-related investment spending subject to active management and oversight? Public investment projects are subject to numerous implementation challenges—climate investments are no exception. Because the climate benefits may be less tangible and more difficult to quantify than other project benefits, systematic and consistent benefits management over the project lifecycle is critical.
- *C5. Risk management:* Are fiscal risks relating to climate change and infrastructure incorporated in budgets and fiscal risk analysis and managed according to a plan? The likelihood of climate related disasters is expected to increase over time. The impacts of these risks on public infrastructure must be systematically assessed and monitored, to facilitate adequate and effective risk mitigation.

B. Detailed Assessment and Recommendations

C1. Climate-aware Planning (Strength: High)

C.1.a National and Sectorial Planning (Strength: High)

22. National and sectoral public investment plans are aligned with the UK's climate objectives. Under the Planning Act (2008), the government is required to explain how national policy statements relate to the mitigation of, and adaptation to, climate change. National mitigation targets are anchored in the Climate Change Act (2008) and set out in the legislated Carbon Budgets.⁶ The government's principal strategy document for meeting carbon budget targets was the 2017 Clean Growth Strategy (CGS) until 2021,⁷ and the Net Zero Strategy (NZS) in 2021. The Net Zero Strategy summarizes the key sectoral policies and programmes for meeting the Sixth Carbon Budget, part of the pathway the UK government has set for reaching net zero by 2050. The 2020 Spending Review set out multi-year capital programme settlements for climate change policies, including those announced in the Net Zero Strategy. The NAP⁸ sets out adaptation targets to address the challenges identified in the CCC's CCRA and to build resilience across the most affected sectors of the country, but primarily for England. Figure 6 is a stylized representation of the arrangement of key strategy documents for achieving climate-related targets in the United Kingdom.

23. The Net Zero Strategy provides indicative pathways for key sectors and estimates the combined private and public investment requirement to meet the Carbon Budgets. Substantial expected reductions in emissions are outlined across six key sectors, contributing to an indicative delivery pathway to achieving the carbon budget targets and the nationally determined contribution. For each key sector, policies and total public and private investment requirements are described, and the revised NZS pathway is estimated and presented (Figure 7). The NZS highlights investment decisions equivalent to around GBP26 billion that have been taken as part of the Ten-Point Plan for a Green Industrial Revolution and some future key investments that are likely to be required. The Strategy does not provide a detailed roadmap of public investment requirements to achieve Net Zero but promotes a "systems approach" to policymaking and the consideration of future public investment, and provides a framework for considering the different roles of public and private investment in achieving the Net Zero targets. Still, while the 2021 Spending Review provides a description of key investments, a multi-year

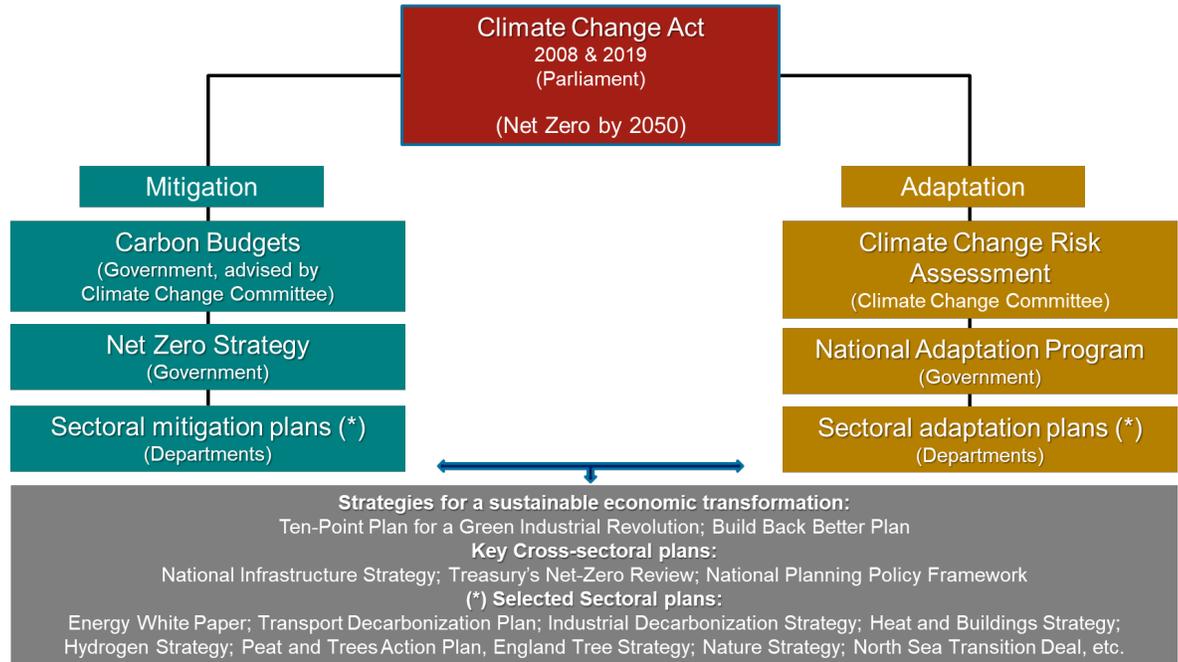
⁶ In the carbon budgets are supplemented by the UK's submitted National Determined Contribution: <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United%20Kingdom%20of%20Great%20Britain%20and%20Northern%20Ireland%20First/UK%20Nationally%20Determined%20Contribution.pdf>

⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf

⁸ <https://www.gov.uk/government/publications/climate-change-second-national-adaptation-programme-2018-to-2023>

capital programme for investments under the range of newly announced sectoral plans is yet to be presented.

Figure 6. The Legal Anchor, Strategies, and Sectoral Plans Guiding Climate-Related Public Investment



Source: IMF staff

24. Climate adaptation policy is a devolved matter in the United Kingdom. The second Scottish Climate Change Adaptation Programme⁹ addresses the risks set out in the second Climate Change Risk Assessment. The Programme is a requirement under the Climate Change (Scotland) Act 2009. Wales’ first five-year plan for climate change adaptation was produced in 2019, covers the period from 2020 to 2025 and is guided by the Wellbeing of Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016. Northern Ireland’s second Climate Change Adaptation Programme was published in 2019 and covers the period from 2019 to 2024.

⁹ <https://www.gov.scot/publications/climate-ready-scotland-second-scottish-climate-change-adaptation-programme-2019-2024/>

Figure 7. Excerpt from the NZS: Total Annual Investment Requirements to Achieve Net Zero Pathway (GBP bn)

Sector	Carbon Budget 3 (average 2020-2022)	Carbon Budget 4 (average 2023-2027)	Carbon Budget 5 (average 2028-2032)	Carbon Budget 6 (average 2033-2037)
Power*	1	7-8	11-22	12-23
Fuel Supply	0.3	2.0	1.3-2.3	0.6-1.9
Industry	0.0	0.9	1.1	0.9
Heat and Buildings**	2	12	12	14
Transport	2	8	17	18
Natural Resources, Waste, and F-Gases³⁷	0.6	1.2	1.7	2.6
Greenhouse Gas Removals	0.0	0.7	1.6	1.7
CCUS (T&S Infrastructure)	0.0	0.6	1.2-1.4	0.8-1.0
Total	5-6	32-33	48-59	52-61

*Figures exclude additional Transmission and Distribution Network investment requirements.

**Costs represent a scenario where heat is predominantly decarbonised via electrification through heat pumps.

Source: IMF staff

25. Public investment plans consistent with the Net Zero targets and the NAP are outlined in several government publications.

- The Ten-Point Plan for a Green Industrial Revolution and the accompanying National Infrastructure Strategy¹⁰ set a series of headline commitments across the economy that could contribute to Net Zero.
- The National Infrastructure strategy commits to making infrastructure resilient to future climate change and requires that expected effects of climate change are fully considered at the design stage for major projects.
- The Energy White Paper supported the Ten-Point Plan and included commitments to support at least one power CCS project by 2030 and the goal of a final investment decision on one nuclear power plant during the current Parliament.

¹⁰ The National Infrastructure Strategy responds to the independent National Infrastructure Assessment produced by the National Infrastructure Commission. The forthcoming 2023 National Infrastructure Assessment has identified Net Zero and Climate Resilience as two of three emerging conclusions.

- The Transport Decarbonization Plan sets out the path to net zero transport in the UK, and the commitments and investments to decarbonize transport.
- The National Planning Policy Framework aligns all actions by central and local governments in the areas of housing and community development with the concept of sustainable development.
- The Heat and Buildings Strategy sets out the government's plan to cut carbon emissions from homes across the United Kingdom.
- The Hydrogen Strategy, which provides a roadmap on how the Government will support the development of a hydrogen economy.
- Other high profile sectoral planning documents have included the Industrial Decarbonization Strategy, the North Sea Transition Deal, and the Peat and Trees Action Plan.

26. While plans are aligned with climate objectives and targets, the capacity to ensure strategies and plans are well-designed and implemented outside core agencies is lagging, diminishing the effectiveness of strategies and sectoral policies. The Net Zero Strategy notes that action is required at unprecedented scale to reduce emissions, and that this requires specialist skills and expertise. However, there remains a capacity gap. The Net Zero Strategy outlines a summary of the actions the government is taking to build capacity in the public sector, with an expanded training offer for civil servants specific to climate change and the inclusion of climate considerations in the professional development framework of the Civil Service.

C.1.b Spatial Planning, Land Use and Building Regulations (Strength: High)

27. Spatial planning regulations are designed to ensure resilience to climate-related natural disasters. The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England¹¹ and how these should be applied. The NPPF contains a chapter that provides guidance and direction to mitigate and adapt to climate change in plans, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. The Planning and Compulsory Purchase Act (2004) requires that applications for planning permission be determined in accordance with the development plan. The National Planning Policy Framework must be taken into account in preparing the development plan, and is a material consideration in planning decisions.

28. Existing building regulations contain some requirements to improve efficiency, though forthcoming regulations will address climate change mitigation and resilience more directly. Part L of the Building Regulations 2010 (England and Wales) set requirements relating to the conservation of fuel and power, aiming to raise energy performance of buildings. The government began a consultation on a Future Homes Standard in 2019 and a Future

¹¹ While devolved authorities are responsible for spatial planning regulations, they use the NPPF as their basis.

Buildings Standard in 2021, setting out the ambition for low carbon heating and high energy efficiency in new homes, and new energy and ventilation standards for existing homes and buildings to assist with the achievement of the Net Zero targets. However, these future standards are unlikely to be in place before 2025.

29. The new planning bill and revised NPPF is expected to address climate change mitigation and resilience more clearly and increase its effectiveness. The government is in the process of reviewing responses to a 2020 White Paper¹² on planning, Proposal 15 of the White Paper outlines the government's intention to ensure that the planning system can effectively play a role in mitigation and adapting to climate change. Proposal 18 outlines plans to facilitate ambitious improvements in energy efficiency standards for buildings to help achieve the Net Zero target. Still, the CCC has been critical of the current version of the Planning Bill, noting that it "misses the powerful opportunity to ensure that developments and infrastructure are compliant with Net Zero and appropriately resilient to climate change."

C.1.c Centralized Guidance on Planning (Strength: High)

30. Extensive written guidance is provided to assist with the incorporation of climate objectives in the planning of programmes and projects. BEIS has provided supplementary analysis to the Green Book on how analysts should quantify and value both the direct and indirect impact of energy use and greenhouse gases in project planning. Similarly, DEFRA has provided supplementary guidance to support analysts and policymakers to ensure that policies, programmes, and projects are resilient to the effects of climate change, and that these effects are considered during the appraisal of options. The Project/Programme Outcome Profile provides guidance to officials on specific contribution of their intervention to the delivery of relevant priority outcomes, including Net Zero or adaptation priorities. This continuity of alignment and support is referred to as a 'golden thread' running from the strategic priorities of the government through a programme's objectives to the delivery objectives of individual projects.

31. Some training is provided to assist with the implementation of guidance and the preparation of plans, but capacity is lagging the ambitious reform agenda of the government, slowing its implementation and effectiveness. While HMT provides training on the application of the Green Book, capacity for the long-term climate-relevant strategy development in departments and other agencies is, in some cases, lagging demand. Officials have noted the need for specialized climate-relevant knowledge in strategy-making to assist with the development of plans to manage the transformational change that is necessary for meeting the governments targets. At the same time, there is limited capacity for key agencies, such as DEFRA, to deliver training or capacity development on climate-related planning, notwithstanding the considerable effort to ramp up capacity across the government.

¹² <https://www.gov.uk/government/consultations/planning-for-the-future>

Recommendations

- **Recommendation 1.1:** Build strategy and planning capacity across government agencies to ensure national and sectoral investment strategies are adequately designed to achieve climate targets and are effectively implemented (BEIS and DEFRA in consultation with HMT).
- **Recommendation 1.2:** Build government capabilities to deliver regular advice, guidance, and training on the incorporation of mitigation and particularly adaptation objectives in the design of public investment-related programmes and projects (BEIS and DEFRA in consultation with HMT).

C2. Coordination Between Entities (Strength: Medium)

C.2.a Central Government (Strength: High)

32. Coordinated at executive level of the central government, the UK government has a well-defined framework to integrate climate change into government decision making. The Prime Minister's and cabinet office are at the center of the climate change governance framework. Since 2020, two cabinet committees have been established to integrate climate change into government (capital) decision making. The Climate Action Strategy Committee (CAS), chaired by the Prime Minister, focusses on the delivery of the UK's domestic and international climate strategy. The Climate Action Implementation Committee (CAI) is chaired by the President for COP26 and focusses on net zero and building UK's climate resilience to climate change. Decisions taken by the Cabinet committees are binding on the entire Cabinet. The executive leadership of all relevant government departments participate in the two committees.

33. Climate change departmental roles and responsibilities are clearly defined, and government officials collaborate through interdepartmental working groups, integrating climate change considerations into public investments. The primary UK government department responsible for implementing climate change mitigation policy and related investments is BEIS. DEFRA leads on domestic climate change adaptation. The CAS and CAI are supported by a governance framework at the level of government officials. Interdepartmental working groups have been established, including a cross-government group that was established to ensure a whole-of-government approach to integrating climate objectives into government policy and investments, with oversight at senior levels. Their work is complemented by institutes such as the Infrastructure and Projects Authority (IPA), which is the government center of expertise for major government investment projects. The IPA reports to the Cabinet Office and HM Treasury (HMT) and is tasked to ensure that major projects are clearly linked to climate change priorities from the outset and to support their delivery.

34. HMT is also undertaking various actions to integrate climate change into government capital decision-making, which supports the effectiveness of the public investment framework from a climate perspective. In addition to laudable initiatives such as the net-zero review and the green financing framework, HMT is including CC impact assessment

in the Spending Review process, beyond what is required by the CCA. By further integrating climate change into HMT-processes such as the Spending Review, HMT further enables the government to include climate change in executive level capital spending decision-making processes.

C.2.b Devolved Authorities and Local Governments

Devolved Authorities¹³

35. Through the CCA, the devolved administrations create climate policy and investments for their areas and must help implement UK-wide climate policies. Scotland, Wales, and Northern Ireland represent roughly 20 percent of the total UK's CO₂-emissions. To the extent that policies such as planning, local transport, and agriculture are devolved responsibilities, each devolved administration contributes to the UK's overall Net Zero target and each has its own adaptation programme. As such, each devolved administration has taken a different approach establishing different targets and policies.

36. The devolved authorities are represented in UK-wide climate change targets. Before laying a draft statutory instrument containing an order setting a carbon budget, the UK government must take into account the CCC's advice and any representations made by the devolved administrations.

37. The CCC reported that the role of devolved authorities is becoming increasingly important in tackling climate change. After the UK government has taken many necessary climate change mitigation measures in, e.g., the power sector, the CCC indicated that the national climate mitigation progress extends into sectors where key powers are devolved. The devolved nature of climate change mitigation and adaptation presents both challenges in aligning policy signals and outcomes and opportunities to learn from each other's best practices. Developing the flow of such information in the devolved framework for public investment coordination could increase the effectiveness of the UK-wide public investment framework.

Local Governments (Strength: Medium)

38. Despite their relatively small GHG-footprint, local governments in the UK can be a barrier or an enabler of an efficient and effective public investment framework. Although local authorities are directly responsible for only 2–5 percent of total GHG-emissions, they have significant policy levers that can drive GHG-emission reduction and prepare the public infrastructure to cope with potential climate change risks. Local governments capital spending and assets, legal powers, local knowledge and their stakeholder networks make them important

¹³ The C-PIMA assesses coordination of subnational governments with the central government. This brief section on devolved authorities is particular for the UK, it describes the framework, but does not qualify it.

actors for the UK to fully integrate climate change considerations in all public investments and achieve climate targets within their defined areas.

39. Many local governments are increasingly making a climate change commitment, over one third have developed strategies and actions to deliver targets by 2040 and 2050.

According to the CCC, over 300 local government councils have declared climate emergencies. NAO research (NAO, 2021) has indicated that throughout England, local governments are publishing GHG- abatement targets (Table 6).

Table 6. United Kingdom: Local Government Climate Action

Carbon neutrality and net zero commitment	Percentage of local governments¹⁴
Before or by 2030	38 percent
Between 2031 and 2050	33 percent
No target date	3 percent
Total	73 percent

Source: IMF staff

40. The UK government is driving climate-related local investments through its sectoral policies and project specific capital transfers. Through instruments such as sectoral policies for the local level,¹⁵ climate-change relevant building and spatial standards that are designed and set at the national level, and conditionalities of climate change-related¹⁶ and specific capital transfers to local governments, the UK government is influencing the allocation of climate change-related capital spending of local governments.

41. The UK government’s analysis and presentation of its capital spending strategies do not include all locally financed capital spending strategies of local UK governments. Local governments are solely responsible for their locally financed capital spending, which can be strongly influenced by national fiscal strategies and tax rates, yet existing local governmental financial reporting mechanisms do not require local governments to report all their climate-change-related investment strategies or projects to the UK government. Local government capital spending financed by grants from central government are considered in the UK

¹⁴ The NAO identified and reviewed climate mitigation commitments to achieving net zero or carbon neutrality made from 1 April 2021 by 232 local authorities. The assessment included 152 single- and upper-tier authorities, 10 combined authorities, the Greater London Authority, and a sample of 69 out of the 181 district councils in England.

¹⁵ The Net Zero Strategy identifies local energy, heat and buildings, local transport and local green infrastructure and the environment as its sectoral priorities at the local level.

¹⁶ For example, the UK government is allocating more than GBP 12 billion for local investment in decarbonizing local transport systems.

government's analysis and presentation of its capital spending strategies and appropriate reporting is in place.

42. Local funding for climate action is fragmented, which undermines efficient and effective multiannual allocation of investment resources. Through the Local Government Finance Settlement, various government grants and support schemes, borrowing, and private finance, local funding takes place. The NAO identified 22 net-zero related grant schemes from the UK government for local governments.¹⁷ As recognized in the NZS, consolidation of fragmented funding and longer-term funding certainty could enhance innovation and investments, reduce bureaucracy and encourage integrated budget decision-making and the Government committed to exploring consolidation where this provides the best approach to net zero funding.

43. The current climate change related public investment framework does not deliver the clearest overview of the guidance given to and the delivery roles of local governments. Challenges related to the complexity of climate change investments, limited information exchange about climate change related plans and projects and the informality of policy networks in which the capital spending strategies of the central and local governments can be discussed, could pose challenges for local governments hoping to develop cost effective climate change related public investment strategies. Annex 7 provides an example from Netherlands of a formal coordination mechanism designed to ensure that local government develop local grown energy transitions strategies that—at an aggregate level—sufficiently contribute towards achieving renewable energy targets.

44. Intergovernmental coordination of national-local capital spending seems informal and fragmented. Despite the numerous commendable climate change mitigation and adaptation related initiatives organized by departments and cooperation arrangements with representative bodies such as the Local Government Association (LGA), authorities did not indicate the existence of a well-coordinated framework through which the UK-government and local governments develop their climate-change-related public investments.

45. The recently published Net Zero Strategy announced increased support to all local governments in developing and delivering zero delivery plans and adaptation. It announced the intention to set clearer expectations for local authorities, provide resources for local places and support capacity and capability building at the local level. The UK government aims to build on existing engagement with representative bodies such as LGA and ADEPT. BEIS will have overall responsibility for improving coordination with local government and other local actors. The Government's NZS sets out its commitment to improving engagement with local authorities through the creation of a new Local Net Zero Forum. This forum aims to embed climate considerations into local decision-making processes. For example, it seeks to ensure that local

¹⁷ [Local-government-and-net-zero-in-England.pdf \(nao.org.uk\), page 35.](#)

public investments do not lock in assets that are not aligned with UK-wide climate change targets.

C.2.c Public Corporations¹⁸ (Strength: Medium)

46. Within the UK government, sponsoring departments execute PC-ownership functions. Sponsoring departments execute their PC-ownership functions, such as approving investment strategies of PCs or performance monitoring, per the PC-specific framework documents. Sponsoring departments can make use of expert corporate finance or corporate governance advice by UKGI or turn BEIS and Defra for climate change relevant expertise.

47. PCs in the UK are subject to climate-change relevant market regulations and reporting standards. UK public corporations need to comply with climate-change mitigation and adaptation-relevant standards, such as the minimum standards for energy efficiency and the UK ETS, which all—in their own way—promote consistency with climate change targets. By 2025, the UK will require climate risk disclosures in line with the Task Force of Climate-related Financial Disclosures (TCFD)¹⁹ by all public corporations. Additionally, and as per the Green Government Commitments (GCG) policy paper from October 2021, the UK government has committed to reduce the GHG-emissions of the government and develop organization specific Climate Adaptation Strategies. However, at this stage, it remains unclear whether all PCs are subject to this requirement.

48. The current framework for PC ownership and oversight lacks a single and UK government-wide ownership policy that requires compliance of PC capital spending plans with CC targets. The government does not set formal requirements to all PCs and sponsoring departments to assess all new PC-investment projects or programs for impacts on climate mitigation and their exposure to climate change risks. Neither does the government formally require that all PCs and sponsoring departments incorporate climate objectives, targets, and indicators in PC ownership instruments such as performance agreements, and monitor performance against these targets. Authorities did indicate that consistency with climate change objectives is promoted and that throughout time, climate change is becoming more integrated into all ownership instruments, as framework documents are reviewed periodically, and long-term capital strategies will continuously be updated.

49. However, based on information presented in annual reports, many PCs are developing their corporate strategies in the context of national climate change targets and policies. Different PCs are publishing information about climate commitments and climate adaptation as relevant to their operations. Some example annual reports even included

¹⁸ In the UK, PC is a narrowly defined term which refers to a very small number of corporations owned by the Government. The following points apply to these corporations but also to some other ALBs, particularly those which are constituted as companies, such as those within the portfolio of UK Government Investments.”

¹⁹ See <https://www.fsb-tcf.org/>.

reflections on the contribution of a PC to the Sustainability Development Goals, which goes beyond what is minimally required in the context of the PC ownership framework.

Recommendations

Recommendation 2.1. Develop a regional and local government delivery and accompanying reporting framework with clear climate change-related investment responsibilities, actions and requirements, to ensure that subnational capital spending plans are informed by UK-wide climate change policies and capital spending plans. (BEIS, DEFRA, DLUHC)

Recommendation 2.2. Develop guidance and communicate to shareholder ministries how to integrate climate mitigation and adaptation into their shareholder ownership and oversight functions and activities (HMT, BEIS, DEFRA).

C3. Project Appraisal and Selection (Strength: Medium)

C.3.a Project Appraisal (Strength: High)

50. Infrastructure projects are required to incorporate climate analysis in progressively more developed business cases as they pass through gateway reviews (Figure 8).²⁰

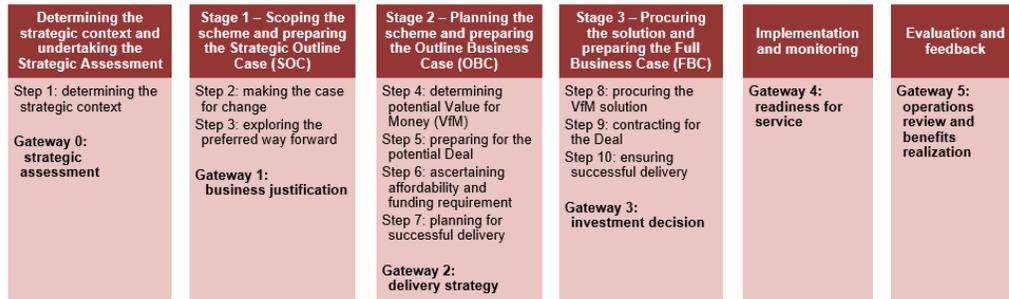
- These business cases follow standard methodology documented in the Green Book, Better Business Case Guidelines and related supplementary guidance that includes extensive advice about the incorporation of climate mitigation and adaptation (Annex 6). Whole of government methodologies, templates, tools and examples are generally publicly available. Support is available from HMT to departments and agencies in applying this framework. Some departments provide advice on the application of appraisal methodology to their sectors, with DfT having the most comprehensive guidance in the form of the Transport Analysis Guidance.²¹
- IPA performs business case assurance for government major project portfolio (GMPP) projects, and in recent years has increased the effort placed on assurance of projects that are relevant to achieving net zero. Business cases are also reviewed by HMT and relevant departments (for arm's length bodies) to ensure quality. HMT delivers monthly training to assessors of business cases.

²⁰ Business cases prepared for an investment project develop the outputs and outcomes from a project and evaluate its design and return. In the UK, the "five case model" is applied, requiring definition of i) the strategic case, ii) the economic case (often through cost benefit analysis); iii) the commercial case; iv) the financial case and v) the management case. These cases are developed through the Strategic Outline Case, Outline Business Case and Full Business Case as set out in Figure 8.

²¹ <https://www.gov.uk/guidance/transport-analysis-guidance-tag>

- The Green Book and its related guidance are used by devolved administrations either directly, or in amended form that is usually updated in line with updates to the Green Book.²²

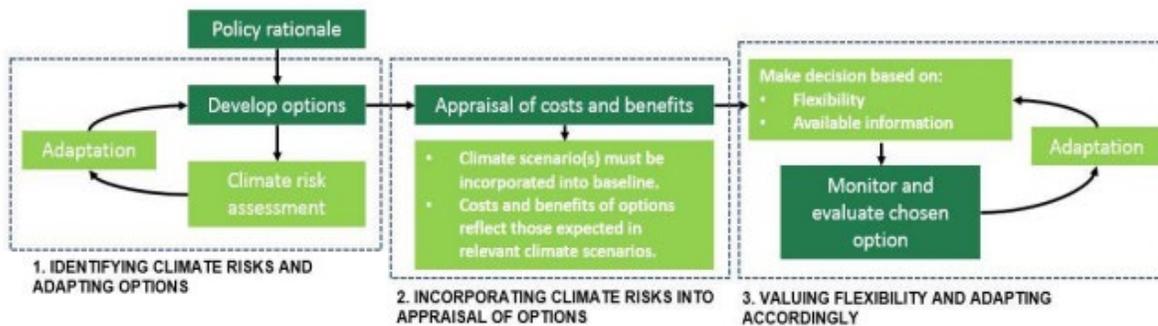
Figure 8. Business Case Development Framework



Source: HM Treasury and Welsh Government, Guide to Developing the Project Business Case: Better Business Cases for Better Outcomes, 2018.

51. Accounting for The Effects of Climate Change: Supplementary Green Book Guidance outlines how climate change is taken into account in project development and decision making. This document, originally produced in 2009 and updated in late 2020, sets out how project development, appraisal and decision making should take into account climate change. Figure 9 is taken from the document and shows the key points at which climate change is to be incorporated into the project development process.

Figure 9. Incorporating Climate into Project Development and Decision Making in the UK



Source: DEFRA, *Accounting for the Effects of Climate Change: Supplementary Green Book Guidance*, November 2020.

52. The Green Book Review proposed actions that would strengthen climate analysis and project appraisals.

- In the Green Book Review, the Government committed to commence the publication of summary business cases from April 2021 within four months of projects having reached final

²² Northern Ireland: <https://www.finance-ni.gov.uk/articles/better-business-cases-ni>; Wales uses the UK Better Business Case Guidelines; Scottish Capital Investment Manual.

approval.²³ The first publications under this policy are expected soon and will be a useful increase in transparency. The assessment team found it difficult to find public examples of business cases that incorporated climate impacts and were not provided with examples by government agencies.

- Discussions during the mission indicated mixed levels of capability across government to prepare robust appraisals that take into account a wide range of relevant climate impacts. This accorded with the Green Book Review that also pointed to the difficulty ministries have in articulating policy goals (including contribution to the net zero objective) and factoring them into project appraisals, which can lead to a narrow focus on BCRs that are not aligned with decision-makers' objectives.
- Some of the measures to improve the conduct of appraisals announced in the Green Book Review have been implemented, including the revisions to the Green Book itself in December 2020 and the introduction of the project outcome profile.²⁴ A review of the discount rate for environmental valuation (committed to in the Green Book Review) was completed in September 2021 and concluded that no change was necessary.²⁵ Further technical advice is also still to be developed, including on the valuation of biodiversity in project appraisal. With so much guidance available, considerable effort will be needed to keep the documents harmonized and up to date.

53. Effectiveness would be increased to match the strength of institutional design through implementation of greater transparency of appraisals and continuing to support capacity building. Publication of business cases would improve effectiveness (i) by improving the information for developers of related projects or services and those conducting project evaluations, and (ii) through external scrutiny that incentivizes ministries to prepare higher quality appraisals. Continuing to invest in growing capacity of the sector to undertake appraisals that include climate mitigation and adaptation impacts will also boost effectiveness. Strengthening the network of business case professionals across government would also help support continuous development and information sharing.

²³ HM Treasury, *Green Book Review 2020: Findings and response*, November 2020.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/937700/Green_Book_Review_final_report_241120v2.pdf

²⁴ Infrastructure and Projects Authority and HM Treasury, *Guide to Completing the Project/Programme Outcome Profile*, July 2021.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002633/1175-APS-IPA_CCS0521533378-001_Project_Outcome_Profile.pdf

²⁵ HM Treasury, *Environmental Discount Rate Review: Conclusion*, September 2021.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1014758/20210817_-_Environmental_discount_rate_review_conclusion.pdf

C.3.b Public Private Partnerships and the Private Finance Initiative (Strength: Medium)

54. Solutions for managing the climate impacts of legacy PFI contracts are being explored in the context of the existing contractual provisions in place. The UK Government halted the use of PFI contracts in 2018. At that time more than 700 projects had been executed with a capital value of GBP 57 billion (2.7 percent of GDP), which were to run to the end of the contract period. Management of legacy contracts at the national level is supported by IPA's PFI Centre of Excellence. The IPA has been examining how contract management can contribute to climate mitigation and adaptation goals.

- IPA is working with sectors including health (hospitals), education (schools), waste and street lighting on improving the climate focus of contract management. The main opportunities for improvements include: (i) allowing project reserves to be invested in reducing GHG-emissions or improving adaptation readiness without requiring contract amendments, and (ii) through appealing to partners to make amendments due to their own desire to demonstrate the achievement of environmental outcomes.
- IPA is also working on an overarching framework for PFI contract expiry which will include options for managing the carbon impact of PFI assets to be transferred back to government. In 2020, the NAO estimated that assets to be transferred back to the central government in the period to 2026 are valued at GBP 3.9 billion.²⁶

55. Historical, now retired, PPP guidance did not include managing climate risks in future contracts beyond the general Green Book and related provisions. PPPs are some of the longest-term contracts the government enter. They also involve considerable climate related impacts and risks, the allocation of which should be proactively managed.

- The now archived and withdrawn PFI guidance,²⁷ and the Green Book, do not cover whether PPP contracts explicitly recognize that long-term arrangements expose government to heightened risks from climate change; do not give advice on the allocation of risks between the private operator and government that are influenced by projected and possible climate change; and do not give advice on how to handle the exposure of these PPP assets to future climate change.
- PPPs continue to be used by devolved governments, who have established their own modalities for such contracts. Like the now archived national level guidance on PPPs,

²⁶ National Audit Office, *Managing PFI assets and services as contracts end*, June 2020.

<https://www.nao.org.uk/wp-content/uploads/2020/06/Managing-PFI-assets-and-services-as-contracts-end.pdf>

²⁷ HMT, *Standardisation of PFI Contracts Version 4*, 2007 and other archived HM Treasury material outlining standardized PFI/PF2 contracts available at

https://webarchive.nationalarchives.gov.uk/ukgwa/20121204162202/http://www.hm-treasury.gov.uk/ppp_standardised_contracts.htm

devolved government guidance on PPPs also does not appear to include explicit advice on coverage of climate risks (Table 7).

56. Parts of procurement legislation that have been carried over from European Union frameworks do, however, include some relevant considerations. *Concession Contracts Regulations 2016* provides scope to consider environmental and social objectives.²⁸ *Utilities Contracts Regulations 2016*, which govern the management of regulated assets in the water, energy, transport and postal services sectors, notes that whole of life cycle cost “may include the cost of emissions of greenhouse gases and of other pollutant emissions and other climate change mitigation costs.”²⁹

Table 7. United Kingdom: Incorporation of Climate Aspects into PPP Guidance

Jurisdiction	Approach to PPPs	Guidance on Climate Risk Allocation
England	PFI scheme no longer in effect. Current policy is for non-traditional PPP contracts. (Also see Annex 4)	PPP Annex in Green Book provides general guidance. No specific rules for allocation of climate risks in PPPs is provided.
Northern Ireland	PPPs subject to rules and Northern Ireland Department of Finance approval. Support is available from Centre for Procurement Excellence.	Proposals follow <i>Better Business Cases NI</i> which notes incorporation of GHG emissions in assessment and also must follow the Green Book. No specific rules for climate are included in the PPP rules outside of Green Book requirements. https://www.finance-ni.gov.uk/articles/public-private-partnerships-ppp-projects-and-procurement-issues
Wales	The Welsh Mutual Investment Model is similar to PFI/PF2. A defining feature of the model is the requirement that the project delivers community benefits, such as training and local content.	Proposals must follow the joint HMT-Welsh Government Better Business Case Guidance. https://gov.wales/mutual-investment-model-infrastructure-investment
Scotland	Scotland implements managed investment model contracts and Non-Profit Distributing PPP models, with these arrangements overseen by the Scottish Futures Trust.	Specific guidance relating to climate impacts has not been identified. However, the Trust’s mission includes aiming to deliver and manage net zero infrastructure. https://gov.wales/mutual-investment-model-infrastructure-investment , and https://www.scottishfuturestrust.org.uk/page/non-profit-distributing

Source: IMF staff

²⁸ Crown Commercial Service, *Handbook for the Concessions Contract Regulations 2016*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/528062/2016_0607_Handbook_for_the_Concession_Contracts_Regulations_2016_final.pdf

²⁹ UK Parliament, *Utilities Contract Regulations 2016*.
https://www.legislation.gov.uk/uksi/2016/274/pdfs/uksi_20160274_en.pdf

57. Looking ahead, plans to improve broader operational and expiry management of PPP contracts (by the UK and Scottish administrations) by including climate adaptation and mitigation outcomes and would boost both institutional design and effectiveness.

IPA's plans to systematize this work are worthwhile and should be completed. For Devolved Authorities, if new PPP contracts are being taken forward in material numbers, guidance could also be updated to reflect the climate specific considerations of long-term PPP contracts. Both changes would strengthen the completeness and the effectiveness of the PPP framework. Considering how climate impacts and risks are managed in service concessions and projects being developed under RAB models (e.g., the forthcoming Hinkley Point C decision) are also worthwhile as renewals are considered or new arrangements are established.

C.3.c Project Selection (Strength: Medium)

58. The contextual framework for decision making on investment spending enables budget decisions to be taken in consideration of climate mitigation impacts.

Comprehensive Spending Reviews set medium-term expenditure ceilings in October and align spending with government priorities. Spending Reviews are the primary means of determining budget allocations for major public investment projects (Box 1), with approvals being a blend of project specific decisions and capital allocations. Emphasis has been placed on the inclusion of climate data in the Spending Review 2021 process, particularly on mitigation.

- Spending Review 2021 commenced in September 2021 and was released on October 27, 2021. The Review's focus on mitigation, and the achievement of the net zero target, was reinforced in a letter from the Chancellor of the Exchequer to all Secretaries of State at the commencement of the 2021 Spending Review³⁰ and the final documents demonstrate the links as set out in C4.
- HMT advised that climate impacts, particularly on mitigation is a key criterion for political-level decision making on budget allocations. Consistent with this, the mission was advised that templates for information to be used by Ministers in making Spending Review decisions include information on climate change mitigation.

³⁰ Letter from the Chancellor to Secretaries of State dated 7 September 2021, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015748/CX_LETTER_TO_ALL_SECRETARIES_OF_STATE_070921.pdf

Box 1. Spending Reviews and Timing of Capital Spending Decisions

The majority of capital spending decisions are taken in the context of Spending Reviews that are typically taken on a three-yearly basis and provide departments with a funding envelope for capital and recurrent spending over a three-year period.^{1/} Spending Reviews make allocations for (i) continuing projects, (ii) new projects that are selected in the Spending Review process, and (iii) for projects still to be allocated in each of the spending departments. Spending Review decisions are made by the Chancellor of the Exchequer, in consultation with the relevant Minister and, at times, with the Prime Minister.

Projects can be considered for funding in the Spending Review process regardless of the stage the project and the maturity of the business case (i.e., the stage in Figure 8). The guidelines also outline what to do when a project announcement precedes development of a full business case; namely a reduced options analysis. There are examples of budget funded investment projects not proceeding if subsequent business case development suggests the project is not of sufficient value for money.

¹ Government changes and COVID-19 meant that spending reviews were done in three successive years, 2019, 2020 and 2021. The 2019 and 2020 reviews covered only one year given their exceptional nature.

59. HMT is working to improve compliance with requirements that support the inclusion of climate impacts in budget decision making on capital projects, which will improve effectiveness. Having reviewed the lessons from efforts to support the inclusion of climate impacts in budget decision making on capital projects at Spending Review 2020, HMT has worked with departments to improve the carbon impacts information provided at Spending Review 2021, in line with Green Book guidance. HMT advises that the coverage of returns increased significantly. These returns meant that Spending Review 2021 investment decisions were informed by data and evidence on the expected contribution of proposals to meeting net zero carbon emissions by 2050 and assessed within the context of the broader suite of policies set out in the Net Zero Strategy. HMT will be carefully considering next steps in this area.

60. The final investment decision is part of the 5 Case model that guides the progress of projects through to delivery and actively embeds climate adaptation and mitigation in decisions to proceed with a project. The assurance process overseen by the IPA applies tests to projects as they seek to obtain approvals to move through the gateway process in Figure 8. The Gate Review Workbooks include high-level tests for net zero and climate adaptation.³¹ These intend to achieve early consideration of climate mitigation and adaptation, biodiversity and wider environmental targets and the incorporation of these in project definition and option assessment; embed the use of relevant Green Book and Supplementary Guidance; ensure strategic alignment with departmental or sectoral strategies and plans as they become available; ensure consistent estimation, measurement and reporting of GHG emissions, where applicable; and proportionality in the application of relevant tests. Projects that receive a positive final

³¹ Infrastructure and Projects Authority, *Gate 2: Delivery Strategy*, and *Gate 3: Investment Decision*, both July 2021 available at <https://www.gov.uk/government/collections/infrastructure-and-projects-authority-assurance-review-toolkit>

investment decision at Gate 3 are generally funded from within budget allocations that have been made within spending reviews.

Recommendations

Recommendation 3.1: Improve the transparency of business cases:

- Publish key information from business cases in line with commitment in the Green Book Review (HMT in consultation with government agencies).
- Publish business cases retrospectively for already approved major projects. (HMT in consultation with government agencies).

Recommendation 3.2: Improve training and support on the incorporation of climate impacts in business cases:

- Include climate elements in training courses on business case preparation and assessment. (HMT in consultation with DBEIS and DEFRA)
- Increase DEFRA's capacity to support business case assessment of adaptation impacts (DEFRA).

Recommendation 3.3: Establish a framework for the management of legacy PFI contracts and the eventual return of assets to the public sector that embeds consideration of climate mitigation and adaptation: (IPA)

Recommendation 3.4: Devolved authorities implementing PPPs should update their guidelines to provide advice on the allocation of climate risks. (Devolved Administrations in consultation with IPA)

Recommendation 3.5: Include information on adaptation impacts to the highest-level decision makers during spending reviews so that they impact final decisions. (HMT)

C4. Budgeting and Portfolio Management (Strength: High)

C.4.a Budgeting (Strength: Medium)

61. The annual budget documents include information on capital spending inputs for each major policy area but limited details on outputs or expected outcomes of climate-related public investment expenditures and projects. The Main Estimates presented in April each year contain information by department on the capital spending in the budget year under each of the government's main policy areas.³² For instance, in the 2021-22 Budget there is a line

³² Central Government Supply Estimates 2021-22 Main Supply Estimates May 2021
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/986125/CCS01_CCS0321282944-001_HMT_Main_Estimates_2021-22_Bookmarked.pdf

in BEIS's Estimates for 'Taking action on climate change and decarbonization' and the same line for the Department's Arm's Length Bodies (ALBs), and a similar broad line for Defra for capital spending on flood protection by its ALBs. The budget for DfT presents capital spending for 'sustainable travel' and lines for two High Speed Rail projects. The Budget and Estimates lack information on climate-related spending at the output level and contain only limited information at the major project level. The Main Estimates for each Department present details of the contingent liabilities to which each Department is exposed including some that are climate related e.g., related to the nuclear power industry.³³

62. The Spending Review in October 2021 (SR21) includes targeted investments to deliver a green industrial revolution and to tackle climate change in the period to 2024–25. The Autumn Budget and SR21 confirmed that since March 2021 the government will have committed a total of £30 billion of public investment for the green industrial revolution in the UK to support the delivery of the priorities in the Ten Point Plan. SR21 contained Departmental Settlements that present broad information on inputs (e.g., total new multi-year spending in a number of areas) with some references to specific projects but without project-level allocations (Box 2).

63. Departments now publish annual Outcome Delivery Plans. Outcome Delivery Plans contain details of the priority outcomes set for each Department by SR20, and discussion of its strategies for delivering the outcomes. They also contain an outline of projects, programmes, and workstreams that will contribute to the priority outcomes, and an outcome evaluation plan. To support the clearer linking of projects and programmes to the government's priority outcomes, the government has launched a new tool, the Project Outcome Profile.³⁴ The SR21 calls for departments to report publicly on the delivery of their Outcome Delivery Plans in their Annual Reports and Accounts.

³³ In the Main Estimates for 2021-22, Part III: Note K – Contingent Liabilities contains details of CLs notified to Parliament during 2021-21, and CLs, grouped by category such as environmental clean-up e.g., relating to risks from the nuclear power industry.

³⁴ IPA TIP 2030 Project Outcome Profile.

Box 2. Spending Review 2021 and Climate Change

Building on SR20, SR21 included targeted investments to tackle climate change, including:

- £620 million of new investment over the next three years to support the transition to electric vehicles and a significant increase in new funding to encourage more people to walk and cycle.
- £416 million R&D funding for programmes to help commercialize low and zero emission transport technologies, including trials of three zero emission HGV technologies, a multi-year Clean Maritime Demonstration Competition, and £180 million to kick-start the development of commercial-scale UK sustainable aviation fuel (SAF) plants and a SAF clearing house to test and certify new fuels.
- £3.9 billion to decarbonize buildings, including £1.8 billion to support tens of thousands of low-income households to make the transition to net zero while reducing their energy bills and £1.4 billion to help decarbonize the public sector estate in England.
- £1.5 billion to fund net zero innovation and laying the foundations for the wider transition to a more resilient energy supply by investing in nuclear technologies and offshore wind, including £1.7 billion to enable a final investment decision for a large-scale nuclear project in this Parliament, £120 million for a new Future Nuclear Enabling Fund to address barriers to entry for nuclear projects, and £380 million for the offshore wind sector.
- Confirming £1 billion for Carbon Capture, Usage and Storage (CCUS).
- Up to £140 million to support hydrogen producers and heavy industry adopting CCUS through the Industrial Decarbonization and Hydrogen Revenue Support scheme.
- Expansion of the Nature for Climate Fund to ensure total spending of more than £750 million by 2024-25 to help meet the commitment to plant at least 7,500 hectares of trees every year in England by 2025 and restore 35,000 hectares of peatland.

64. SR21 contains limited detail on outputs (e.g., specific new infrastructure assets to be completed) and little information on outcomes at the project level (e.g., anticipated GHG impacts). SR21 continued the emphasis in SR20 on tying spending more directly to the climate change mitigation and adaptation outcomes the government is aiming to deliver by updating ³⁵ provisional priority outcomes and performance indicators for each area of spending. This included outcome and performance indicators for BEIS, DfT, and Defra relating to climate change mitigation and adaptation.

65. Departments now publish annual Outcome Delivery Plans. Outcome Delivery Plans contain details of the priority outcomes set for each Department by SR20, and discussion of its strategies for delivering the outcomes. They also contain an outline of projects, programmes, and workstreams that will contribute to the priority outcomes, and an outcome evaluation plan. To

³⁵ Spending Review 2021: Priority outcomes and metrics.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1029277/Supplementary_Document_on_Outcomes_Metrics.pdf

support the clearer linking of projects and programmes to the government's priority outcomes, the government has launched a new tool, the Project Outcome Profile.³⁶

66. The IPA monitors and reports on a number of climate-related public investment projects. The Government Major Projects Portfolio (GMPP) in 2020-21 comprised 184 projects with a total Whole Life Cost of £542bn, a number of which are climate-related projects implemented by BEIS, Defra, and DfT and their ALBs.³⁷ The IPA's Annual Report contains an Annex with a detailed rating of progress for each major project in the form of a 5-level Delivery Confidence Assessment of a project's likelihood of achieving its aims and objectives and doing so on time and budget. The IPA has been strengthening assurance tests on net zero and climate resilience and supports the consistent measurement and management of GHG emissions in the Construction Playbook and in the IPA Benchmarking Guidance 2021. Twenty-four GMPP projects reported using a carbon calculator in the 2020–21 Annual Report and a further 7 plan on using one in the future. The IPA has noted that achieving net zero requires greater focus on carbon measurement and management as well as an increased focus on understanding and monitoring environmental outcomes of investments. Departmental and ALB annual reports provide a description of the policy actions being taken to meet climate objectives and report associated results. For instance, Highways England's 2020 Annual Report stated that since 2014 it has contributed to a 48 percent reduction in its corporate carbon footprint and a 48 percent reduction in the risk of flooding in 260 locations. However, it is generally difficult to link reported outcome information in Annual Reports to projects and outputs.

67. The UK issued its first sovereign green bond in September 2021 and is setting up systems to select, track, and report on expenditures financed from the bond proceeds.³⁸ Eligible green expenditures include climate change mitigation and adaptation together with other environmental expenditures. The Government's Green Financing Framework has been developed in accordance with the 2021 International Capital Market Green Bond Principles which specify alignment with four core components relating to the use of proceeds, transparent project evaluation and selection criteria, tracking and attestation of net proceeds, and regular reporting on spending and impacts.³⁹ HMT will set up a dedicated tracking process within its internal information systems known as the Green Register to track allocations against Eligible Green Expenditure categories (Box 3). A second Green Gilt,⁴⁰ with a longer (32 year) maturity, was issued in October. Both issues enjoyed strong investor support and represent implementation of the government's plans to build out a green yield curve.

³⁶ IPA TIP 2030 Project Outcome Profile.

³⁷ Major projects are defined as those which require spending over and above departmental expenditure limits, require primary legislation, or are innovative or contentious.

³⁸ <https://www.dmo.gov.uk/media/17705/pr210921.pdf>

³⁹ UK Government Green Financing Framework June 2021. HM Treasury and UK DMO.

⁴⁰ <https://www.dmo.gov.uk/media/17762/pr211021.pdf>

Box 3. Eligible Expenditures and Reporting for UK Green Gilts

Eligible Green Expenditures can include government expenditures in the form of direct or indirect investment expenditures, subsidies, or tax foregone (or a combination of all or some of these) and selected operational expenditures. The eligible expenditures are limited to government expenditures that occurred no earlier than 12 months prior to issuance, the budget year of issuance, and the two budget years following issuance. HMT will allocate at least 50 percent of net proceeds to current and future expenditures.

HMT intends to publish an allocation report on its Eligible Green Expenditures annually and an impact report setting out the environmental impacts and social co-benefits at least every two years. Reporting will be informed by the guidelines and recommendations on how to appraise and evaluate policies, projects, and programmes, as set out in the Green and Magenta Books. In addition, HMT intends to align this Framework with the UK's developing classification of environmentally sustainable economic activities.

Ministries and departments will collect allocation and impact information related to their Eligible Green Expenditures. Examples of intended environmental impact metrics include those for clean transportation (annual GHG emissions reduced/avoided in tons of CO₂ equivalent; project lifetime GHG impacts in MtCO₂; and reduction of specific air pollutants). Examples of impact metrics for climate change adaptation include number of flood defenses and the number of properties better protected.

68. A growing number of countries are initiating exercises referred to broadly as Green Budgeting to disclose the linkages between fiscal policies and climate change and other environmental domains. Some of these are confined to disclosing expenditures promoting mitigation and adaptation to climate change while a few cover wider environmental domains and, in at least one case, report both positive and environmentally harmful expenditures. Annex 7 sets out some of the main elements and features of green budgeting as identified by the European Commission, the IMF and the OECD as published in the joint report "Green Budgeting: towards common principles"⁴¹, and cites examples of country practices. The UK could consider an approach to disclosure that might be confined, at least initially, to climate-related public investment spending in budgets and SRs, or it may wish to consider a more comprehensive approach that incorporates a wider range of fiscal policies (e.g., all spending, tax expenditures, tax and carbon pricing policies) and wider environmental domains.

69. The effectiveness of budgeting for climate-related investment spending would be strengthened by initiatives that provide a 'line of sight' between Carbon Budgets and the government's budget. It is difficult to trace the consistency of new public investment decisions with NZS and appropriate adaptation. There have been calls for more transparency of climate-related spending and impacts, for example from the CCC and the NAO, as well as an assessed general lack of transparency with respect to major public investment projects (Resolution Foundation 2020).

⁴¹ Green budgeting: Towards Common Principles" https://ec.europa.eu/info/sites/default/files/economy-finance/cop26_en.pdf

70. The lack of an operational definition of climate related spending restricts the line of sight between carbon budgets and the government budget, limiting the transparency and effectiveness of climate change policies. While the Green Gilts initiative will see systems established to tag and report spending financed by green bonds, and climate-related programs are identified in the budgets of BEIS, Defra and DfT, it will still not be possible to identify all climate-related investment spending in the rest of the government's budget. There is also little information on the anticipated outcomes of climate-related investment spending (although again this will be published for expenditures financed by Green Gilts). The NAO has observed that "Government does not yet monitor total spend on delivering its environmental goals" and recommends they do so "alongside the benefits they achieve, as part of developing performance indicators reporting against the Plan."⁴² In addition, the IPA has noted that achieving net zero requires more investment in carbon measurement and management as well as an increased focus on understanding and monitoring environmental outcomes of investments.

C.4.b Ex Post Reviews (Strength: High)

71. There is a well-developed regulatory framework and guidance on the conduct of ex -post project reviews and of Value for Money (VFM) audits by the NAO. Guidance on the conduct of project evaluation is contained in Chapter 8 of the Green Book and in the Magenta Book on evaluation in government. The Magenta Book is aligned with the revised HMT Green Book which sets out the economic principles that should be applied to both appraisal and evaluation. In addition, as noted in Figure 9 the planning of monitoring and evaluation for spending proposals is required to follow the HMT Business Case guidance for programmes and projects. Finally, the NAO has a mandate to conduct Value for Money (VFM) audits and portfolio reviews of public investment projects (Box 4).⁴³

72. There is a formal requirement for evaluation of the outcomes of major projects including mitigation and adaptation outcomes. The BBC Gate 5 Review: *Operations Review and Benefits Realisation* is an external assurance review that follows the Post Implementation Review completed by the project delivery entity. The Gate 5 Review assesses whether the agreed strategic outcomes are being met, with a first review typically occurring when the project is about to hand over to Business-as-Usual operation, is repeated 6–12 months after handover to the new owner, and a final review shortly before the end of a service contract. All major infrastructure and construction projects must publish a long-term evaluation of their social and economic benefits between five and ten years into operation. Reviews include strategic alignment, for example inclusion of Net Zero in the strategic aims of the project, the procurement strategy and implementation, and a clear quantifiable demonstration of the project's contribution to the

⁴² National Audit Office, *Achieving government's long-term environmental goals*, November 2020. <https://www.nao.org.uk/wp-content/uploads/2020/11/Achieving-governments-long%E2%80%91term-environmental-goals.pdf>

⁴³ See for instance *Lessons Learned from Major Programmes Cross-government*, National Audit Office, November 2020.

Government's Net Zero target. The Review also includes whether the project embedded the National Infrastructure Commission's four recommended design principles including adaptation to climate change.⁴⁴

Box 4. Examples of NAO Climate-Change Related Value for Money Audits

[Managing flood risk](#) (2020): the report covered whether the current risk management arrangements provide effective oversight and direction, what government has achieved in the period 2015–2021 to reduce flood and coastal erosion risks and measure progress, and government's preparedness to manage and reduce flood risk when a new expanded investment programme begins in 2021. Findings include that EA is on track to achieve 300,000 homes better protected by March 2021 within its budget of £2.6 billion; 'Homes better protected' is an easy-to-understand performance measure but on its own does not provide a good view of progress in tackling overall flood risk; and the need to adhere to strict funding cycles impacts the value for money of the programme.

[Green Homes Grant Voucher Scheme](#) (2021): In July 2020 government announced a BEIS Green Homes Grant Voucher Scheme as part of the green pandemic recovery to assist homeowners to install energy efficiency improvements and low carbon heat measures. The report concluded the Department worked at an ambitious pace to deliver a scheme which would contribute to decarbonisation while delivering a short-term economic boost, but the tension between these aims and the short delivery time was never properly reconciled leading to an overly complex scheme that could not be delivered to a satisfactory level of performance in the time available.

[Reducing carbon emissions from cars](#) (2021): Over the past 10 years government has spent over £1 billion to incentivise the take-up of ultra-low emission cars. While there has been an increase in the number of ultra-low emission cars and the required charging infrastructure, carbon emissions from cars have not reduced in line with government's initial expectations. The lack of an integrated plan with specific milestones for carbon reductions from cars has resulted in a lack of clarity over what value the public money should be delivering. As a result, the departments have not been able to demonstrate value for money from the amounts expended.

73. The IPA also conducts ex post reviews and monitors and reports performance on major projects. Its Annual Report contains an Annex with a detailed rating of progress for each major project in the form of a 5-level Delivery Confidence Assessment of a project's likelihood of achieving its aims and objectives and doing so on time and on budget.

74. The CCC published an assessment of the evidence base for the indicative costs and benefits of adaptation as part of CCRA3. The report contained a synthesis of results from available evidence, including with respect to infrastructure, and fed into the magnitude scoring for the CCRA3 Technical Report. One conclusion was that, with the exception of a few areas

⁴⁴ National Infrastructure Commission, *Anticipate, React, Recover: Resilient infrastructure systems*. May 2020. <https://www.england.nhs.uk/mids-east/wp-content/uploads/sites/7/2014/10/bus-cas-five-cas-mod-guide.pdf>

(flooding and water) there is almost no evidence on current and planned adaptation effectiveness.⁴⁵

75. Government policy is that evaluation reports should be published, although in practice, they have limited visibility, reducing policy effectiveness. In line with government transparency standards and the Government Social Research Publication Protocol, evaluation reports and the research that informs them should be placed in the public domain promptly subject to appropriate exemptions.⁴⁶ In practice, there is limited visibility of evaluations of climate change-related investment projects, aside from VFM audits conducted by the NAO. The government acknowledged in SR20 the need to strengthen evaluation across government, and the CCC has recommended that DEFRA develop a detailed monitoring and evaluation framework for adaptation responses for each risk in CCRA3 (Figure 12).

C.4.c Asset Management (Strength: High)

76. The Better Business Case process incorporates an assessment of whether a project has plans for maintenance and resilience in place at project completion. The Gateway 5 Review includes tests of how the assets will be satisfactorily maintained over the lifecycle of the asset, and whether sustainability targets are met or exceeded and are appropriately aligned to Net Zero. The review also tests whether management has a resilience framework in place (resilience standards in line with the 'Anticipate, React, Recover, Resilient Infrastructure Systems Report by the NIC), including a plan to undertake regular stress tests and implement plans to address any vulnerabilities identified. The Gateway 5 review also tests whether ongoing management plans take account of who will maintain the asset and who will run operational services e.g., for a rail project, this could include Network Rail and the relevant Train Operating Companies.

77. There is evidence that asset maintenance addresses climate change adaptation risks. The two main operators of infrastructure assets in the transport sector, Network Rail and Highways England, have integrated climate change adaptation into their strategies and activities. Technical standards for estimating maintenance needs have been updated to reflect the increased incidence of disasters, and these impact on funding and pricing reviews. For instance, Network Rail's Delivery Plan includes reducing service-affecting failures by improving the reliability of infrastructure, including in relation to climate change. Its Key Performance Indicators (KPIs) include an Asset Management Composite Reliability Index and a Composite Sustainability Index (Annex 8). The Office of Rail and Road monitors and assesses the operators' performance. Its 2019-20 assessment of Network Rail noted progress in delivering on asset sustainability requirements but recommended continued development of more robust resilience plans to

⁴⁵ Monetary Valuation of Risks and Opportunities in CCRA3, Paul Watkiss Associates, May 2021, Summary, p.2.

⁴⁶ HM Green Book, 8.17; *Magenta Book*, Central Government Guidance on Evaluation, March 2020, Chapter 6.5.

mitigate against climate change and severe weather, and improved reporting of maintenance delivery.

78. Maintenance planning in the transport sector also incorporates climate change mitigation objectives. Highways England is one of the UK's largest buyers of construction materials and has initiated reductions to the carbon impacts of its maintenance. In 2020–21 it delivered an innovative road resurfacing scheme that was the first carbon neutral minor works scheme in the UK. Actions have included using recycled materials from the existing road surface and using low carbon technologies in maintenance activities. Highways England has also set a net zero target for maintenance and construction emissions by 2040 (Annex 8).

79. The government publishes a full balance sheet annually that reflects the current condition of infrastructure assets. The 2018–19 Whole of Government Accounts (WGA) is made up of over 9,000 entities including central government departments, local authorities, devolved administrations, and public corporations. Property, plant and equipment comprises 60 percent of assets in the WGA, the largest component of which is infrastructure assets, largely road and rail networks. The WGA contains discussion of the valuation methodologies used for the road and rail networks and the associated uncertainties. The WGA also report liabilities and commitments that are disclosed, but not recognized (including capital commitments and PFI finance lease commitments); incorporates the financial impact of any substantial damage to assets due to climate-related disasters, presents detailed disclosures of provisions (liabilities of uncertain timing and amount), the largest of which is for nuclear decommissioning; and disclose contingent liabilities.

80. There is a central property register that records climate-related data and supports reporting against targets. The Climate Change Act 2008 (S. 86) imposes a duty on the government to report to Parliament annually on progress towards efficiency and contribution to sustainability of buildings that are part of the civil estate. Government organizations are required to record their property information on the Government's central database, the Electronic Property Information Mapping Service, which is also used to support performance reporting (Box 5). In September 2021 the government issued a Government Functional Standard for Property with guidance on how those engaged in the planning, delivery and management of government property shall ensure that property is managed sustainably across the property life cycle.⁴⁷ The government is also establishing a National Underground Asset Register as part of efforts to build back better and greener.⁴⁸ The Register is intended to contribute to the efficient maintenance of critical services such as gas, water, electricity and telecommunications.

⁴⁷ GovS 004: Property Version: 2.0 Date issued: 01 September 2021.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1019167/6.76_09_CO_Govt_Functional_Std_GovS004_WEB.pdf

⁴⁸ <https://www.gov.uk/government/news/next-phase-of-government-project-to-map-the-uks-underground-pipes-and-cables-launched>

Box 5. The Government Property Register: Measuring the Climate Impact of Government Property

The Electronic Property Information Mapping Service (e-PIMSTM) covers property owned or occupied by central government departments, executive agencies and non-departmental public bodies, and government companies. Coverage of the register and reporting is expanding to over a wider range of public sector entities. The 2019–20 Report also covered Courts, Prisons, Health, Job Centers, Schools, and Offices.

The Government Property Unit collects performance data for inclusion in an annual State of the Estate Report published by the Cabinet Office. Individual organizations also report on the energy rating of newly procured buildings and this information is summarized in the State of the Estate Report.

The Key Performance Indicators (KPIs) reported are:

- the overall size of the Central Estate;
- the total cost of the Central Estate;
- the utilization of office space per person;
- compliance with the commitments to procure buildings in the top quartile of energy performance;
- sustainable performance for GHG emissions, waste, and water consumption.

The State of the Estate Report also reports progress against the government’s Greening Government Commitments to reduce the direct environmental impact of the public sector. Government has reduced its emissions by 50% in 2019-20 compared to compared to the 2009-10 baseline, exceeding the 43percent target for 2020. It is estimated that 31 percent of the reduction in emissions was due to the improved management of the estate and a further 19percent was due to the decarbonization of the national grid. Government departments sent only 6percent of waste to landfill in 2019–20, exceeding the target to send less than 10percent.

Source: State of the Estate in 2019-20. Cabinet Office.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/979276/State-of-the-Estate-in-2019-20.pdf

Recommendations

Recommendation 4.1: Define and publish an operational definition of what constitutes a climate change-related investment (HMT).

Recommendation 4.2: Connect carbon budgets with the government’s budget by disclosing details of the anticipated impacts of new public investment spending on net zero and adaptation objectives in annual Budgets and in Spending Reviews, either in existing budget documents or as part of a wider Climate or Green Budget Statement (HMT, supported by BEIS and DEFRA).

Recommendation 4.3: Implement current policy on publication of ex post project evaluations, increase the accessibility of evaluation reports (All government agencies).

Recommendation 4.4: Develop detailed monitoring and evaluation frameworks for climate change adaptation (DEFRA supported by HMT).

C5. Risk Management (Strength: High)

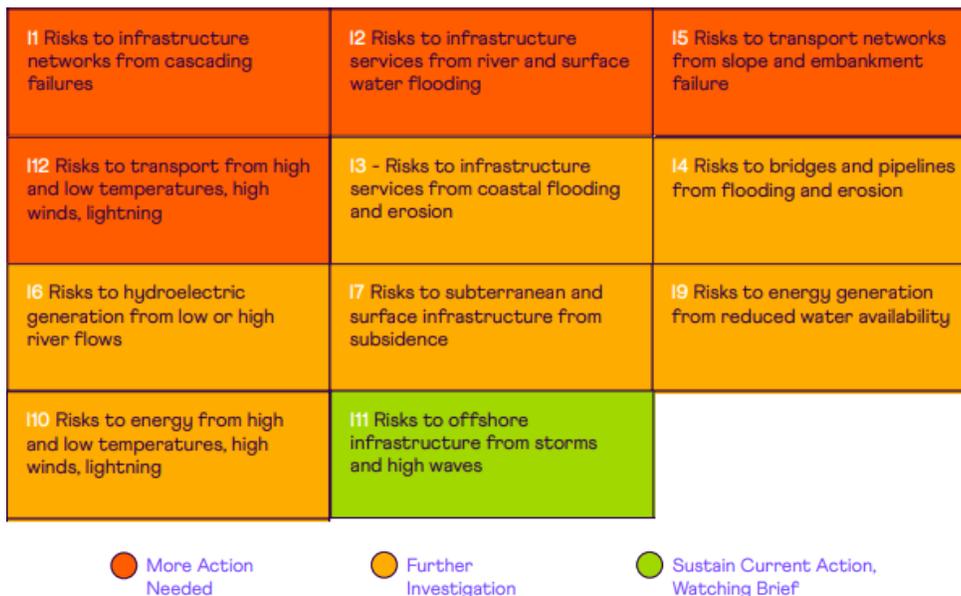
C.5.a Disaster Risk Management (Strength: High)

81. The government undertakes detailed analyses of the climate-related disaster risks to public infrastructure and has a range of plans for managing natural disasters. Disaster risks related to climate change are detailed in the Climate Change Committee’s Climate Change Risk Assessment (CCRA) Report. The UK Risk Register also sets out risks related to climate change and the government’s planning for emergency response to these events. More detailed planning for the management of climate-related risk realizations is undertaken by the Civil Contingencies Secretariat in the National Cabinet Office, where a new National Resilience Strategy is being developed that would include plans for responding to climate-related natural disasters. The government also works closely with academia to assess climate-related risks, such as through the UK Climate Resilience Programme, which is jointly led by UK Research and Innovation and the Met Office.

82. The Technical Report of the CCRA assesses the extent and exposure of climate-related risks, including those to infrastructure assets. The CCRA identifies 61 high-level climate-related risks and opportunities across the economy, of which 11 are directly related to infrastructure (Figure 10). The report also awards an ‘urgency score’, which takes into account the current and future level of risk; the management of the risk; and the additional benefits of further action over the coming five years. Risks to infrastructure related to flooding, temperature changes, and embankment failures along with risk related to cascading effects from one type of failure to another are the most urgent. The CCRA3 specifically highlights the risk of cascading failures beginning in the power sector as one of the eight priority areas for urgent action.

83. The National Adaptation Programme provides the Government’s response to the identified risks and outlines the strategy for managing those risks. This required response to the independent analysis of the CCC mirrors the role of the Net Zero Strategy as a response to Carbon Budget targets. The current 2018–23 National Adaptation Plan responds to the earlier CCRA2, which also identified significant risks to infrastructure from flooding, rising sea levels and increase in the frequency and severity of extreme weather. The plan provides a general overview of the government’s plan for mitigating climate-related risks to infrastructure on a sector-by-sector basis.

Figure 10. CCC Estimates on Infrastructure-Related Risks and Opportunities by Urgency Score



Source: CCRA3

84. The management of flooding risks is addressed in detail in the National Flood and Coastal Erosion Plan (NFCEP). The CCRA reports have identified flooding risks as the most serious climate-related risks in the UK. The NFCEP includes an outline of the management and recovery from flooding-related disasters. This includes a series of measures targeting improved awareness and management of flooding events, and strategic objectives to develop support for people and businesses to recover more quickly from flooding.

85. However, the CCC has noted that government action has not yet been effective enough to drive the progress needed to adequately address climate-related risks, including risks to infrastructure. In the June 2021 Adaptation Progress Report, the CCC found the gap between future levels of risk and planned adaptation has widened in the past three years. The management of climate-related risks to infrastructure was weakest around infrastructure interdependencies and cascading failures, and around the design and location of new infrastructure. The CCRA3 Technical Report indicates that sufficient adaptation is underway for only four out of 61 risks and opportunities, and that there are no plans in place at all for a further seven.

C.5.b Ex Ante Finance Mechanisms (Strength: Medium)

86. The UK Contingencies Fund allows the financing of urgent expenditure when it would be inappropriate to postpone the expenditure until funds have been voted. Typically, the Contingencies Fund has been used as an advance ahead of pension receipts (for instance, at the National Health Service); Common Agricultural Policy scheme payments to the Rural Payments Agency; and to cover debt restructuring. However, the Contingencies Fund can also be

drawn on for advances to cover additional services during crises and recovery. Most notably, the Contingencies Fund provided substantial flexibility for the government to respond to the COVID-19 pandemic in 2020 and 2021.

87. HMT is responsible for authorizing issues out of the Contingencies Fund subject to the limit set on the capital of the Fund by the Contingencies Fund Act 1974. The limit is usually fixed at 2 percent of the total of authorized Supply expenditure (i.e., the total of all authorized departmental net cash requirements) in the preceding financial year. HMT controls access to the Contingencies Fund, consistent with the requirements set out in *Managing Public Money and Supply Estimates: A Guidance Manual*.⁴⁹ Advances that are made from the Contingencies Fund must be repaid to the Fund through a Supplementary or out-of-turn Estimates in the same year as the advance, or in the following year if enabling legislation has not been passed.

88. The limit on the Contingencies Fund can be adjusted through an Act of Parliament, which occurred during the COVID-19 pandemic. The Contingencies Fund Act 2020 was created to increase the maximum capital of the United Kingdom's contingency fund from 2 percent to 50 percent in response to the urgent expenditure needs during the first year of the COVID-19 pandemic. The subsequent Contingencies Fund Act allowed for a temporary increase in the maximum capital of the United Kingdom's contingency fund to 12 percent of all authorized expenditure in the previous year.

89. The government does not utilize other ex-ante financing mechanisms to manage the cost of post-disaster recovery. FloodRe⁵⁰ is a government-supported reinsurance program that is in place to support and encourage household insurance against flooding. This helps to reduce the implicit contingent liability associated with the rebuilding of private homes following flooding, but the program does not insure public infrastructure. In the past, the UK has had access to multi-year disaster financing mechanism that have provided some support for disaster recovery. Prior to the withdrawal of the UK from the EU, the UK had access to the EU Solidarity Fund (EUSF) which was set up in 2002 to respond to major natural disasters across EU member states.⁵¹ This fund provided aid of around €160 million to assist with managing the consequences of floods in the UK in 2007.⁵² However, the UK government has not established or announced a successor program to replace the EUSF, and does not maintain any budgetary or

⁴⁹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/220744/estimates_manual_july2011.pdf.

⁵⁰ <https://www.floodre.co.uk/>

⁵¹ Depending on the size, nature and consequences of the disaster, other EU instruments such as the EU structural and investments fund could also have been used to boost recovery.

⁵² In 2016, The European Commission offered €60 million for regional floods in the UK, though this was rejected by the government.

financing mechanisms to manage unexpected costs of natural disasters on public infrastructure other than the Contingencies Fund.

90. The government’s principal fiscal tools for managing residual climate-related risks to infrastructure is to reprioritize spending and/or access capital markets. The government has demonstrated the ability to adjust the Contingencies Fund and to readily borrow in its own currency in usually highly liquid markets. The effectiveness of this approach was demonstrated during COVID-19, with the government quickly making available funding for health service delivery and broader economic support. Still, as climate-related disaster risks to infrastructure rise, the government may find benefit in assessing the merit of other ex-ante financing mechanisms, such as a multi-year disaster fund or insurance mechanism.

C.5.c Fiscal Risk Analysis (Strength: High)

91. The UK government undertakes detailed analysis of the fiscal risks related to climate change. The Office of Budget Responsibility is responsible for preparing a Fiscal Risks Report every two years. The report identifies and analyses risks to the medium-term outlook for the public finances and to long-term fiscal sustainability. The 2019 Fiscal Risks Report introduced climate-related fiscal risks, surveying some of the climate-related risks to the economy and the types of fiscal risks associated with climate change. The 2019 report drew on the Bank of England’s framework for assessing climate-related risks to financial stability. This framework categorizes climate-related risks as either physical risks (such as damage to property from extreme weather events) or transition risks (or risks associated with the process of adjustment toward a lower-carbon economy).

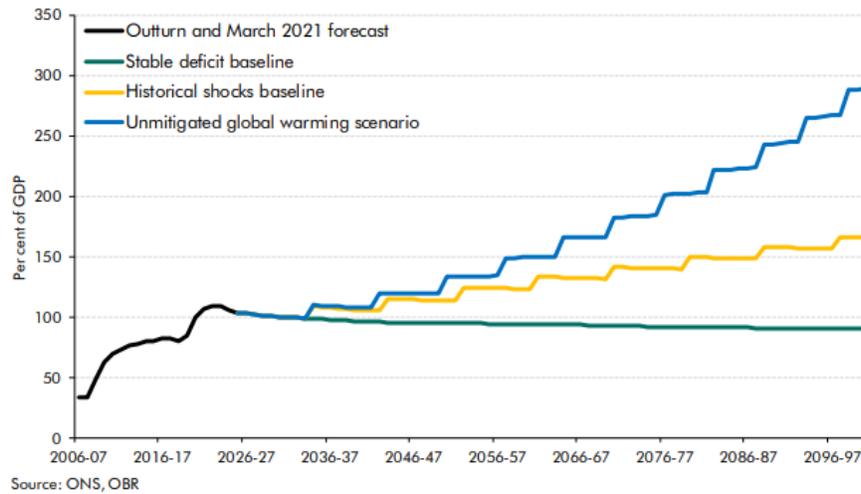
92. The OBR’s 2021 Fiscal Risks Report substantially deepens the analysis of fiscal risks related to climate change. Chapter 3 of the 2021 Report illustrates the potential physical, economic, and fiscal risks from different paths for global warming; outlines the cost of decarbonization; considers the implications of the transition to net zero; and presents a set of fiscal scenarios for achieving net zero under different assumptions.

93. The 2021 Fiscal Risks Report provide useful illustrative quantitative guidance of the fiscal impact of climate-related shocks. The OBR’s scenario analysis looks at the fiscal impact of unmitigated climate change against a baseline of balanced budgets and historically consistent net public investment along with recession shocks that have a fiscal impact of around 10 percent of GDP every nine years (Figure 11). The unmitigated climate change scenario assumes a 4-degree Celsius increase in UK temperatures by the end of the century, with a cost of adaptation for each degree of warming of around 0.3 percent of GDP each year. The scenario also assumes the scale and frequency of shocks roughly doubles by the end of the period, as climate-related events increase. Under the illustrative scenario, net debt interest payments increase from 2.5 percent to around 28 percent of revenue by the end of the century, adding considerably to pressure on long-term fiscal sustainability. While the analysis is illustrative, it provides a helpful

starting point that calibrates the scale of the risk and the benefit of greater resilience and earlier mitigation.

Figure 11. OBR’s Scenario Analysis

Chart 3.6: Public sector net debt: an illustrative unmitigated global warming scenario



94. The government also publishes detailed and comprehensive quantitative analysis of the climate-related risks to public infrastructure assets. The CCC quantifies the scale of the exposure to climate-related risks for infrastructure in the Technical Report of the CCRA. Table 8 provides an extract from the report on the exposure of infrastructure to flooding risks across the UK,⁵³ but similar analysis is also undertaken on the exposure of infrastructure to temperature changes and other extreme weather related to climate change. However, while analysis of the exposure of infrastructure assets to climate-related disasters provides a basis for establishing the likelihood of loss and an estimate of the fiscal risk to the government, this calculation is not provided in the CCRA documents (or in other fiscal risk related documents such as the Fiscal Risks Report).

⁵³ The analysis in Chapter 4 of the CCRA Technical Report is supported by the Third UK Climate Change Risk Assessment Future Flood Risk Report, available at <https://www.ukclimaterisk.org/wp-content/uploads/2020/07/Future-Flooding-Main-Report-Sayers-1.pdf>.

Table 8. Exposure of Infrastructure Assets to Coastal Flooding

Table 4.13 Number or length of infrastructure assets currently exposed to 'significant' risk of coastal flooding across the UK (Sayers <i>et al.</i> 2020)					
Infrastructure Asset at 1:75 or greater risk of coastal flooding (present day)	England	Northern Ireland	Scotland	Wales	Total (UK wide)
Water sites (no.)	3	11	0	8	22
Sewage treatment works (no.)	53	0	20	18	91
Power stations (no.)	34	0	1	0	35
Electricity substations (no)	23	0	4	7	34
Rail length (km)	114	20	65	312	511
Rail stations (no.)	5	3	5	12	25
Landfill sites	0	0	0	0	0

Source: CCRA3 Technical Report Chapter 4

95. The Monetary Valuation of Risks and Opportunities in CCRA3 provide indicative quantitative analysis of the economic scale of the eleven infrastructure-related risks associated with climate change. The valuations express the risks and opportunities in terms of the effects on social value, which includes all significant costs and benefits that affect the wellbeing of the population. This broad definition goes beyond the likely explicit fiscal risk to the government, particularly as many infrastructure assets are privately operated. Still, the analysis provides an overview of the implicit risk for the government from climate-related damage to infrastructure. Figure 12 presents an extract of the summary of infrastructure-related risks from climate change from the Monetary Valuation of Risks and Opportunities. The largest valuations are for risks related to cascading failures in infrastructure networks and for risks related to flooding, with risk valuations in the hundreds of millions to billions of pounds per year. Future work funded by DEFRA will also look at the economics of adaptation and is expected to include the costs of inaction and the economic benefits and costs of further adaptation.

96. The NAO has issued guidance on managing climate change risks in recognition of the challenges facing government in improving performance in this area. To gauge the level of climate change risk maturity in government the NAO conducted a survey of Chairs of Audit and Risk Assurance Committees (ARACs).⁵⁴ While four out of five ARAC Chairs considered climate risks to be relevant to their organization, over half noted that their organization did not have a climate or sustainability risk policy or a dedicated employee accountable for either. Additionally, seven in ten Chairs said that climate change risks had either never been discussed at an ARAC

⁵⁴ <https://www.nao.org.uk/naoblog/author/chriscoyne/>

meeting or had been discussed less than annually. The NAO guide is intended to help ARACs support and challenge senior management in their approach to managing climate change risks.⁵⁵

Figure 12. Valuation of Risks and Opportunities for Infrastructure Related to Climate Change

Excerpt from the Monetary Valuation of Risks and Opportunities

Table ES2. Economic Valuation of Risks and Opportunities for Infrastructure.

Risk / Opportunity	Present Day	2050s		2080s, 2°C		2080s, 4°C		Confidence
11. Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures	H	VH		VH		VH		Low
12. Risks to infrastructure services from river, surface water and groundwater flooding	H	H – VH		H - VH		VH		Low
13. Risks to infrastructure services from coastal flooding and erosion	M	M		M		M		Low
14. Risks to bridges and pipelines from flooding and erosion	M	M		M		M		Low
15. Risks to transport networks from slope and embankment failure	M	M – H		M - H		H		Low
16. Risks to hydroelectric generation from low or high river flows	L	M	+M	M	+M	M	+M	Low
17. Risks to subterranean and surface infrastructure from subsidence	M	M		M		M		Low
18. Risks to public water supplies from reduced water availability	M	H		H		H		Low-med
19. Risks to energy generation from reduced water availability	L	Unknown		Unknown		Unknown		Low
110. Risks to energy from high and low temperatures, high winds, lightning	M	H- VH	+H- VH	H- VH	+H- VH	H- VH	+H- VH	Low
111. Risks to offshore infrastructure from storms and high waves	L	H- VH	+H- VH	H- VH	+H- VH	H- VH	+H- VH	Low
112. Risks to transport from high and low temperatures, high winds, lightning	M - H	M – H		M - H		M - H		Low
113. Risks to digital from high and low temperatures, high winds, lightning	Unknown	M		M		H		Low

Key

Risks	Opportunities	
VH	+VH	£billions/year
H	+H	£hundreds of millions/year
M	+M	£tens of millions/year
L	+L	£<10 million/year

Source: CCC-commissioned Monetary Valuation of Risks and Opportunities

97. The quality of recent analysis and publications on the value of exposure and fiscal risks related to climate change is very high, but to be effective, risks will need to be addressed in government’s fiscal and sectoral policies. The published reports are highly effective in clearly articulating the exposure, scale, and challenge of climate-related fiscal risk management in the UK. However, their ultimate effectiveness is likely to be judged by the impact they have on climate-related risk management. The next National Adaptation Programme will provide a response to the risk assessment in the CCRA3, and sectoral strategies provide an opportunity to address the risks in more detail. However, future spending reviews and budgets should also present the government’s strategy for managing the climate-related fiscal risks outlined in the OBR’s Fiscal Risks Report. Fiscal stress tests could also be undertaken to help to

⁵⁵ Climate change risk: A good practice guide for Audit and Risk Assurance Committees, NAO, August 2021. <https://www.nao.org.uk/wp-content/uploads/2021/08/Climate-Change-Risk-A-good-practice-guide-for-Audit-and-Risk-Assurance-Committees-.pdf>

assess the extent to which fiscal space is adequate to manage high-impact, low-probability climate-related disasters.

Recommendations

Recommendation 5.1: The government should act to close the gaps in progress toward planning for climate-related infrastructure risks identified by the CCC (DEFRA).

Recommendation 5.2: The government should complement the analysis in the Fiscal Risks Report on climate-related risks with fiscal stress tests of high-impact low-probability climate-related events and assess the need for alternative ex-ante financing mechanisms to cover extreme events (HMT).

Recommendation 5.3: Assess the need for alternative ex-ante financing mechanisms (such as a disaster fund or risk-transfer mechanisms) to cover extreme events (HMT).

C. Cross-Cutting Issues

Legal Framework

98. The UK has a comprehensive framework of laws, institutions, regulations, and guidelines on the implementation of climate change mitigation and adaptation policies.

While the UK's budget system is largely convention-based, the climate change legal framework has been codified in law since 2008 and integrated with public investment management. The Climate Change Act 2008 is an innovative statute that set a binding GHG emissions target in UK law, established the independent CCC with clear roles and responsibilities, 5-yearly carbon budgets as a pathway to meet the long-term target, and mandated transparency of climate change adaptation risks, plans, recommendations, and government responses. There are also independent institutions for publishing analysis of the fiscal risks from climate change (the OBR) and for advising on public investment requirements and processes (the NIC), while the IPA provides oversight of the delivery of major climate-related projects. Independent oversight entities including the NAO and the Office of Rail and Road provide further transparency and accountability. In addition, the legally binding nature of the government's net zero commitment has resulted in judicial review of specific public investment decisions on the basis that they are inconsistent with the target.⁵⁶

99. There have been three five-year cycles of carbon budgets and adaptation plans since the CCA 2008, and the processes have become institutionalized, although the government has not always responded in the time set by law. Climate Change has been

⁵⁶ See Grantham Research Institute on Climate Change and the Environment. https://climate-laws.org/geographies/united-kingdom/litigation_cases/transport-action-network-v-secretary-of-state-for-transport-and-highway-england-company-on-roads-investment-strategy

incorporated in the key instruments regulating public investment. All proposed public investment spending must be developed and presented in accordance with the HMT Green Book supplementary 5-case model and Business Case guidance. There are some gaps in the legal framework, such as transparency of selection criteria used in deciding between alternative investment projects, and publication of details of climate-related public investment spending. There is also limited compliance with requirements to publish project appraisals and post-project evaluations.

Information Systems

100. Information systems for financial information are well developed in the UK, but systems for recording climate information on infrastructure projects is less developed.

HMT maintains an integrated financial Online System for Central Accounting and Reporting (OSCAR). This manages financial reporting and the budget estimates, but it also collects key datasets for government. OSCAR also shares financial information with IPA for the purposes of monitoring and managing the GMPP. The OSCAR and GMPP databases do not currently include climate information. The datasets in OSCAR include the PFI database, which includes UK government departments and devolved administrations PFI/PF2 data. Data collection takes place annually and includes key dates such as start of the contract, estimated original capital investment and forecast future annual payments.

101. The Green Register being developed to facilitate reporting on green gilts is a key opportunity to improve climate information and reporting in government.

To facilitate implementation of the green financing framework, HMT has committed to set up a dedicated tracking process within their internal information systems known as the Green Register.⁵⁷ Allocations against Eligible Green Expenditure categories will be tracked in the Green Register. The register will necessarily follow the taxonomy chosen for reporting green gilts, but it is an opportunity to build a database that would support a wider range of reporting needs, including contributing to the preparation of a Green/climate budget statement (as discussed in recommendation 4.2) and support decision making on adaptation and mitigation policies.

102. Monitoring and managing data on adaptation is more challenging than mitigation as the challenges and risks are multi-faceted.

Adaptation policy impacts are currently not tracked, and a baseline of adaptation indicators is not yet available. Many datasets on mitigation impacts and risks are however available to inform analysis, and many of these are helpfully organized by DEFRA in *Accounting for the Effects of Climate Change: Supplementary Green Board Guidance*.

103. The ONS is leading the development of an online portal for climate information and has introduced a survey on investment and climate impact.

Stemming from demand from departments to better share climate data and resources, the NAO is leading a process to

⁵⁷https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002578/20210630_UK_Government_Green_Financing_Framework.pdf

develop a public portal for climate information. The portal will be based around a new UK Climate Framework. It is planned to be launched in a prototype form in coming months before being progressively expanded over the next few years. The ONS has also prioritized building higher frequency data on mitigation impacts—and has developed the *Low Carbon and Renewable Energy Economy Survey*, which it launched earlier this year.⁵⁸ The Survey includes estimates of public and private investment.

Recommendations

- Include key project level climate information in GMPP database (IPA)
- Design Green Register to meet a wide range of user needs for information on climate and infrastructure in addition to green gilt reporting (HMT in consultation with BEIS, DEFRA, ONS).

Capacity Building

104. While capacity in the UK government is very high, it is being stretched to ensure strategies and plans are appropriately aligned with ambitions climate change objectives.

The ambition and scale of the net zero and adaptation targets require specialized planning and forecasting capacities in the departments, agencies, arms-length bodies, devolved authorities, and public corporations that play a key role in the achievement of the objectives. However, and notwithstanding the already high general capacity across the government service, many organizations reported a significant challenge in acquiring and developing this capacity.

105. Technical expertise on climate change and the interactions with programmes and policies is in very high demand, but supply is limited. The application of climate-related guidance in project development and appraisal requires a detailed understanding of the interaction of the project design and outcomes with climate-related targets. The pool of officials with this knowledge and expertise has grown but remains limited and unevenly distributed across the government and sub-national governments. This creates a risk that projects with merit are overlooked because they are developed in departments where this capacity is not yet well established.

106. Written guidance on how to take climate change into account in project development, appraisal, and decision-making is available, but little training is provided.

Well-crafted supplements to the Green Book provide guidance on the quantification and valuation of the impact on greenhouse gas emissions in project planning, and on ensuring projects are resilient to the effects of climate change. General and widespread training on the Green Book has been provided by HMT. However, there is very limited training or available guidance on the use of the supplements. In the context of the ambitious climate agenda in the

⁵⁸<https://www.ons.gov.uk/surveys/informationforbusinesses/businesssurveys/lowcarbonandrenewableenergyeconmysurvey>

UK, the absence of training and support on the use of the supplements creates a risk that they will be incorrectly or unevenly applied.

107. DEFRA and, to some extent, BEIS could be better staffed and resourced to provide guidance and training to incorporate adaptation in project planning and appraisal. While BEIS is reasonably well-staffed with over 100 officials working on mitigation policy and coordination, the central team in DEFRA responsible for the government adaptation agenda is significantly smaller and does not have enough capacity to provide significant guidance or training on the incorporation of resilience and adaptation principles in policies, programmes, or projects. This may create a bottleneck in developing the capacity that is needed to support the National Adaptation Programme.

108. The Net Zero Strategy notes the capacity challenge the government faces, and outlines steps the government is taking to strengthen capacity. The ambition for climate capabilities summarized in the NZS ranges from broad essential capabilities for understanding climate interactions in policy through to world-leading technical specializations (Annex 9). The steps summarized in the NZS to achieve this ambition include:

- Establishing the Government Skills and Curriculum Unit to oversee the development of better and more relevant training;
- Expanding the curriculum for civil servants to include specific training on climate change;
- Embedding climate considerations in the competency framework supporting professional development in the Civil Service; and
- Establishing a new climate focus for the training of future leaders of the Civil Service.

However, it will be equally important to build capacity in devolved administrations, local governments, and in public corporations, where much of the implementation effort will take place.

Recommendations

- Extend the ambition for government capacity summarized in the Net Zero Strategy to all levels of government and to public corporations, and develop measures to build this capacity (All levels of government).
- Build capabilities and identify if staffing is adequate in relevant areas of DEFRA to ensure strategies and plans are implemented, and to deliver guidance and training on the incorporation of mitigation and adaptation objectives in public investment programmes and projects (DEFRA).
- Update the curriculum of training courses on business case preparation and assessment to include and highlight the Green Book guidance on the quantification and valuation of the impact on greenhouse gas emissions and the Green Book Supplement Accounting for the Effects of Climate Change (HMT).

Annex 1. Action Plan

Action	Timing	Responsible Agency
Climate-aware planning		
Build strategy and planning capacity across government agencies to ensure national and sectoral investment strategies are adequately designed to achieve climate targets and are effectively implemented.	December 2022	BEIS and DEFRA, in consultation with HMT
Build government capabilities and identify if staffing is adequate in the relevant institutions to deliver regular advice, guidance and training on the incorporation of mitigation and adaptation objectives in the design of public investment-related programmes and projects.	December 2022	BEIS and DEFRA, in consultation with HMT
Coordination between entities		
Develop a regional and local government delivery and accompanying reporting framework with clear climate related investment responsibilities, actions and requirements, to ensure that subnational capital spending plans are informed by UK-wide climate change policies and capital spending plans.	December 2022	BEIS, DEFRA, DLUHC
Develop guidance and communicate to public corporations' shareholder ministries how to integrate climate mitigation and adaptation into their shareholder ownership and oversight functions and activities.	December 2022	HMT, BEIS, DEFRA
Project appraisal and selection		
Improve the transparency of business cases <ul style="list-style-type: none"> • Publish key information from business cases in line with commitment in the Green Book Review • Publish business case information retrospectively for already approved major projects. 	Immediate June 2022	HMT in consultation with government agencies
Improve training and support on the incorporation of climate impacts in business cases <ul style="list-style-type: none"> • Include climate elements in training courses on business case preparation and assessment • Increase DEFRA's capacity to support business case assessment of adaptation impacts. 	June 2022 June 2022	HMT in consultation with BEIS and DEFRA DEFRA
Establish a framework for the management of legacy PFI contracts and the eventual return of assets to the public sector that embeds consideration of climate mitigation and adaptation.	June 2022	IPA
Devolved authorities implementing PPPs should update their guidelines to provide advice on the allocation of climate risks.	December 2022	Devolved Administrations in consultation with the IPA
Include information on adaptation impacts to inform highest-level decision makers during spending reviews.	December 2023	HMT
Budget and portfolio management		
Define and publish an operational definition of what constitutes a climate change-related investment.	June 2022	HMT

Action	Timing	Responsible Agency
Connect carbon budgets with the government's budget by disclosing details of the anticipated impacts of new public investment spending on net zero and adaptation objectives in annual Budgets and in Spending Reviews, either in existing budget documents or as part of a wider Climate or Green Budget Statement.	June 2023	HMT, supported by BEIS and DEFRA
Implement current policy on publication of ex post project evaluations, increase the accessibility of evaluation reports.	Immediate	All government agencies
Develop detailed monitoring and evaluation frameworks for climate change adaptation.	December 2022	DEFRA, supported by HMT
Risk Management		
Act to close the gaps in progress toward planning for climate-related infrastructure risks identified by the CCC.	December 2023 (with next NAP)	DEFRA
Complement the analysis in the Fiscal Risks Report on climate-related risks with fiscal stress tests of high-impact low-probability climate-related events and assess the need for alternative ex-ante financing mechanisms to cover extreme events.	December 2022	HMT
Assess the need for alternative ex-ante financing mechanisms (such as a disaster fund or risk-transfer mechanisms) to cover extreme events.	December 2022	HMT
Cross-Cutting Issues		
Information Systems		
Include key project level climate information in GMPP database	June 2022	IPA
Design Green Register to meet user needs for information on climate and infrastructure	June 2022	HMT in consultation with BEIS, DEFRA, ONS
Capacity Building		
Extend the ambition for government capacity summarized in the Net Zero Strategy to all levels of government and public corporations, and develop measures to build this capacity	December 2023	All levels of government
Build capabilities and identify if staff is adequate in relevant areas of DEFRA to ensure strategies and plans are implemented, and to deliver guidance and training on the incorporation of mitigation and adaptation objectives in public investment programmes and projects	December 2022	DEFRA
Update the curriculum of training courses on business case preparation and assessment to include the Green Book guidance on the quantification and valuation of the impact on greenhouse gas emissions and the Green Book Supplement Accounting for the Effects of Climate Change.	December 2022	HMT

Annex 2. Climate-PIMA Detailed Scoring

C1. Planning		Score
C1a	National and sectoral planning	3
C1b	Spatial Planning, Land use and building regulations	3
C1c	Centralized guidance on planning	3
C2. Coordination		Score
C2a	Coordination across central government	3
C2b	Coordination with devolved administrations and local governments	2
C2c	Oversight and monitoring framework for PCs	2
C3. Project appraisal and selection		Score
C3a	Climate analysis in project appraisal	3
C3b	PPP framework including climate risks	2
C3c	Climate consideration in project selection	2
C4. Portfolio oversight and monitoring		Score
C4a	Climate budget coding	2
C4b	Ex post review of projects	3
C4c	Asset management including climate risks	3
C5. Risk management		Score
C5a	Disaster risk management strategy	3
C5b	Ex ante financing mechanisms	2
C5c	Fiscal risk analysis including climate risks	3

Not met	Partially met	Fully met
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Annex 3. Climate-PIMA Assessment Framework

Indicator		Scoring		
		1 = To no or a lesser extent	2 = To some extent	3 = To a greater extent
C1. Climate-aware planning: Is public investment planned from a climate change perspective?				
C.1.a	Are national and sectoral public investment strategies and plans consistent with the government's climate objectives, targets, and expected outcomes?	National and sectoral public investment strategies and plans are not consistent with the government's climate objectives, targets, and expected outcomes.	National public investment strategies and plans are consistent with the government's climate objectives, targets, and expected outcomes with respect to either adaptation or mitigation.	National and sectoral public investment strategies and plans are consistent with the government's climate objectives, targets, and expected outcomes with respect to both adaptation and mitigation.
C.1.b	Do central government and/or sub-national government regulations require that land use, building codes and other planning regulations address climate-related concerns affecting decisions on public investment?	Central government and/or sub-national government regulations do not require that land use, building codes and other planning regulations address climate-related concerns affecting decisions on public investment.	Central government and/or sub-national government regulations require that land-use regulations, building codes and other planning regulations address climate-related risks and impacts in jurisdictions where some general government investment takes place.	Central government and/or sub-national government regulations require that land-use regulations, building codes and other planning regulations address climate-related risks and impacts in jurisdictions where most general government investment takes place.
C.1.c	Is there centralized guidance and support for government agencies on planning public investment in the context of climate change?	There is no centralized guidance or support for government agencies on planning public investment in the context of climate change.	There is centralized guidance for government agencies on planning public investment in the context of climate change with respect to either adaptation or mitigation.	There is centralized guidance and support for government agencies on planning public investment in the context of climate change with respect to both adaptation and mitigation.
C2. Coordination between entities: Is there effective coordination of decision making on climate change-related public investment across the public sector?				
C.2.a	Is decision making on public investment coordinated across central government from a climate-change perspective?	Decision making on public investment is not coordinated across central government from a climate-change perspective.	Decision making on public investment is coordinated across budgetary central government from a climate-change perspective.	Decision making on public investment is coordinated across all central government, including externally financed projects, PPPs and extra-budgetary entities , from a climate-change perspective.

C.2.b	Is the planning and implementation of capital spending of SNGs (local Governments) coordinated with the central government from a climate-change perspective?	The planning and implementation of capital spending of SNGs is not coordinated with the central government from a climate-change perspective.	The central government issues guidance on the planning and implementation of capital spending from a climate-change perspective and information on major climate-related projects of SNGs is shared with the central government and is published alongside data on central government projects.	The central government issues guidance on the planning and implementation of capital spending from a climate-change perspective, information on major climate-related projects of SNGs is shared with the central government and is published alongside data on central government projects, and there are formal discussions between central government and SNGs on the planning and implementation of climate-related investments.
C.2.c	Does the regulatory and oversight framework for public corporations ensure that their climate-related investments are consistent with national climate policies and guidelines?	The regulatory and oversight framework for public corporations does not promote/recognize consistency between their climate-related investments and national climate policies and guidelines.	The regulatory and oversight framework for public corporations promotes consistency between their climate-related investments and national climate policies and guidelines.	The regulatory and oversight framework for public corporations requires that their climate-related investments be consistent with national climate policies and guidelines.
C3. Do project appraisal and selection include climate-related analysis and criteria?				
C.3.a	Does the appraisal of major infrastructure projects require climate-related analysis to be conducted according to a standard methodology with central support?	The appraisal of major infrastructure projects does not require climate-related analysis to be conducted according to a standard methodology.	The appraisal of major infrastructure projects requires climate-related analysis to be conducted according to a standard methodology.	The appraisal of major infrastructure projects requires climate-related analysis to be conducted according to a standard methodology with central support, and summary information on these appraisals is published.
C.3.b	Does the PPP framework include climate-related elements?	There is no PPP framework or no explicit consideration is included in the framework of the impacts of climate change on PPP investments.	The PPP framework includes explicit consideration of climate change with respect to how risks are allocated between the government and PPP partners.	The PPP framework includes explicit consideration of climate change with respect to how risks are allocated between government and PPP partners, and to how the design of PPP projects reduces their exposure to climate-related risks.
C.3.c	Are climate-related elements included among the criteria used by the government for the selection of infrastructure projects?	Either there are no explicit selection criteria or climate-related elements are not included among the criteria used by the government for the selection of projects for financing.	Climate-related elements are included among the criteria used by the government for the selection of all major budget-funded projects , and the criteria are published.	Climate-related elements are included among the criteria used by the government for the selection of all major projects, including externally financed projects, projects financed by extra-budgetary entities, and PPPs , and the criteria are published.

C.4 Budgeting and portfolio management: Is climate-related investment spending subject to active management and oversight?				
C.4.a.	Are planned climate-related public investment expenditures, sources of financing, outputs and outcomes identified in the budget and related documents, monitored, and reported?	Planned climate-related public investment expenditures are not identified in the budget and related documents.	Some planned climate-related public investment expenditures are identified in the budget and related documents, including projects funded externally, by extra-budgetary entities, and PPPs.	Most planned climate-related public investment expenditures, sources of financing, and outputs and outcomes are identified in the budget and related documents, including projects funded externally, by extra-budgetary entities, and PPPs, and expenditure on these projects is monitored and reported.
C.4.b.	Are ex-post reviews or audits conducted of the climate change adaptation and mitigation outcomes of public investments.?	No ex-post reviews or audits are conducted of the climate change adaptation and mitigation outcomes of public investments.	Ex-post reviews or audits are conducted for some major public investments of either the climate change adaptation or mitigation outcomes.	Ex-post reviews or audits are conducted and published for relevant major public investments of both the climate change adaptation and mitigation outcomes.
C.4.c.	Do the government's asset management policies and practices, including the maintenance of assets, address climate-related risks?	Neither the government's asset management policies and practices nor methodologies for estimating the maintenance needs of climate change-exposed infrastructure assets address climate-related risks.	Methodologies prepared by the government for estimating the maintenance needs of some climate change-exposed infrastructure assets address climate-related risks.	Methodologies prepared by the government for estimating the maintenance needs and associated costs of most climate change-exposed infrastructure assets address climate-related risks, and government asset registers include information on the damage to or impairment of these assets caused by climate change.
C5. Risk management: Are fiscal risks relating to climate change and infrastructure incorporated in budgets and fiscal risk analysis and managed according to a plan?				
C5.a.	Does the government publish a national disaster risk management strategy that incorporates the potential impact of climate change on public infrastructure assets and networks?	Either there is no published national disaster risk management strategy, or the strategy does not identify the key climate-related risks to public infrastructure assets and networks.	The government publishes a national disaster risk management strategy that identifies the key climate-related risks to public infrastructure assets and networks in terms of hazards, exposure, and vulnerability.	The government publishes a national disaster risk management strategy that identifies and analyses the key climate-related risks to public infrastructure assets and networks in terms of hazards, exposure and vulnerability, and includes the government's plans to mitigate and respond to these risks.

C5.b.	Has the government put in place specific ex ante financing mechanisms, such as contingency funds or insurance schemes, to manage the exposure of the stock of public infrastructure to climate-related risks?	The government has not put in place any specific ex ante financing mechanisms to manage the exposure of the stock of public infrastructure to climate-related risks.	There is an annual contingency appropriation in the budget that is available to meet the costs of disaster-related damages to public infrastructure.	There is an annual contingency appropriation in the budget that is available to meet the costs of disaster-related damages to public infrastructure, and additional multi-year financing or risk transfer mechanisms.
C5.c.	Does the government conduct and publish a fiscal risk analysis that incorporates climate-related risks to public infrastructure assets?	The government does not conduct a fiscal risk analysis that incorporates climate-related risks to public infrastructure assets.	The government conducts and publishes a fiscal risk analysis that incorporates a qualitative assessment of climate-related risks to public infrastructure assets over the medium term.	The government conducts and publishes a fiscal risk analysis that incorporates a quantitative assessment of climate-related risks to public infrastructure assets over the medium term and policies to mitigate these risks, and a qualitative assessment of the risks that may arise over the long-term.

Annex 4. Government Commitments vs CCC Pathway 2025–35

Table 1 Government commitments compared to the CCC Pathway between 2025-2035		
Headline actions	Government commitment ¹	CCC pathway
Offshore wind	40 GW by 2030	40 GW by 2030
Electric vehicles	Phase-out of new fossil fuelled vehicle sales by 2030, with allowance for some hybrids out to 2035	Phase-out of all new fossil-fuelled vehicle sales by 2032
Heat pumps in homes	600,000 heat pump installations / year by 2028	900,000 heat pump installations / year by 2028 1.1 million installations / year by 2030
Low-carbon heat networks (all buildings) ²	2 TWh of low-carbon heat networks by 2030	25 TWh of low-carbon heat networks by 2030
Low-carbon hydrogen	5 GW (up to 42 TWh) by 2030	30 TWh by 2030
Carbon Capture and Storage ³	10 MtCO ₂ captured and stored annually by 2030, across four industrial clusters, including at least one power project	22 MtCO ₂ /year captured and stored in 2030, across at least five industrial clusters, including multiple power projects
Emissions reduction in manufacturing and refining	Around two-thirds by 2035, compared to 2018	73% by 2035, compared to 2018
Tree-planting	30,000 hectares / year by 2025	30,000 hectares / year by 2025 50,000 hectares / year by 2035
Peatland restoration ⁴	32,700 hectares / year by 2025	67,000 hectares / year by 2025
Greenhouse gas removals	Innovation support provided, in recognition that engineered removals will be needed, but no firm commitment on deployment yet	5 MtCO ₂ /year by 2030
Nuclear power ⁵	Final Investment Decision on at least one new nuclear power plant by the end of this Parliament	One new nuclear plant operational by 2030, and a further plant by 2035

Source: CCC analysis.

Notes:

¹ Based on actions in the Ten Point Plan, Energy White Paper, Industrial Decarbonisation Strategy and England Tree and Peat Action Plans between 2025 and 2035 and the CCC's Balanced pathway from the Sixth Carbon Budget.

² Government commitment on low-carbon heat network deployment is illustrative, and has been inferred from Government spending commitments, using assumptions around expected leveraged investment and the proportion of funding targeted at low-carbon networks.

³ The difference in carbon captured and stored annually largely comes from projects in the power sector in CCC scenarios, so other technologies could compensate for this shortfall.

⁴ Government peatland restoration commitments include Scotland, Wales and England. CCC peatland restoration numbers in 2025 are UK-wide.

⁵ The Balanced Pathway produced for the CCC's Sixth Carbon Budget assumed that two new nuclear power stations would be in operation by 2035, in addition to Hinkley Point C.

Annex 5. Types of Private Involvement in Infrastructure in the UK

- **Public-Private Partnerships (PFI/PF2)**—More than 700 projects were delivered by the Private Finance Initiative (PFI) launched in 1992 and the successor PF2 (2012) framework under which the public sector procurer awards a contract through competitive tender for the design, build, financing and operation of certain public infrastructure.¹ The contractor is typically established as a special purpose vehicle comprising the successful bidder (or more commonly a consortium of bidders) for the purpose of the project. In October 2018, the UK Government announced PFI contracts would no longer be used in England.
- **Concession-based and other user-pay models**—Concessions typically use project-financed structures similar to PF2 projects but, instead of the contractor's revenue coming from payments made by the procuring authority, revenue comes from user charges. This structure has been used in the UK for toll roads and river crossings.
- **Regulated private ownership of key assets**—Regulated Asset Base (RAB) models involve establishing a regulatory framework for a long-term licensed private operator of a network or utility infrastructure asset. It is used for monopoly or monopolistic businesses providing essential services, particularly in water, rail, power and airports. The model allows the licensed operator to recover a regulated price calculated on the basis of agreed expenditures to operate and maintain the asset, as overseen by an independent regulator. The model has also been used to deliver greenfields projects such as the 2016 GDP 4.2 billion Thames Tideway Tunnel sewage project—and could have future application to building new nuclear power plants and carbon capture, usage and storage (CCUS).² In 2018, the total RAB value across the UK electricity, gas, water and airport sectors was approximately GBP 160 billion (7.5 percent of GDP).³
- **Contracts for Difference**—The UK Government provides incentives for low carbon electricity generation through the Contracts for Difference (CfD) scheme. The scheme reduces the risks for renewable energy generators by providing confidence about future wholesale prices over a 15-year period when making large, long-term investments. Developers are paid a flat (indexed) rate for the electricity they produce calculated as the difference between the 'strike

¹ HM Treasury and Infrastructure and Projects Authority, *Private Finance Initiative and Private Finance 2 projects: 2018 summary data*, May 2019.

² The Energy White Paper includes a desire to bring a least one large-scale nuclear power project to final investment decision by the end of the current parliament. Following an industry consultation initiated in 2019, Government concluded that RAB remains a credible basis for financing large scale nuclear projects. The Government response is available at <https://www.gov.uk/government/consultations/regulated-asset-base-rab-model-for-nuclear>. The NAO recommended government consider a RAB model after assessing the experience of Hinkley Point C.

³ Department of Business, Energy and Industrial Strategy, *Contracts for Difference Policy Paper*, Updated March 2020. <https://www.gov.uk/government/publications/contracts-for-difference/contract-for-difference>

price' (a price for electricity reflecting the cost of investing in a particular low carbon technology) and the 'reference price' (a measure of the average market price for electricity in the UK market) for a period of 15 years. Bids from renewable energy generators are sought and approved in auction rounds. The fourth allocation round is expected in December 2021. CfD supports the most recently built nuclear plant, Hinkley Point C.

- **Other private engagement**—Types of involvement include contracting, private sector project integration services, and strategic partnerships (contracting for packages of small projects that would otherwise be too small to justify a project-financed structure).
- **Grants and incentives for private provision**—The UK Government also incentivizes delivery of infrastructure for use by the public through the provision of grants to private providers of infrastructure in new sectors, or to address regions of disadvantage. Examples include the provision of grants to private providers of electric vehicle charging stations that are available for public use⁴ and the GBP 1 billion mobile connectivity programme.⁵

⁴ Office for Zero Emission Vehicles, *Grant schemes for electric vehicle charging infrastructure* webpage updated January 2021, <https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles>

⁵ The Rt Hon Oliver Dowden CBE MP, *Mobile connectivity revolution to boost the Union*, June 2021. <https://www.gov.uk/government/news/mobile-connectivity-revolution-to-boost-the-union>

Annex 6. United Kingdom: Key Guidance on Incorporating Climate Impacts into Project Appraisal

Document	Content
<p>The Green Book: Central Government Guidance on Appraisal and Evaluation</p> <p>HMT (last updated Dec 2020)</p>	<p>Establishes the broad process for project development and the five-case model used in UK government. It sets out the requirements for options analysis, approach to cost-benefit analysis and monitoring and evaluation. It includes climate adaptation and mitigation examples throughout the document.</p> <p>Sections and annexes are included on the valuation of costs and benefits, and it makes high-level references to mitigation and accounting for GHG emissions, the approach to environment, natural capital, and biodiversity, and links to DEFRA supplementary guidance are provided (below). Energy efficiency and GHG estimation were first included in the Green Book in 2007.</p> <p>https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938046/The_Green_Book_2020.pdf</p>
<p>Accounting for the Effects of Climate Change Supplementary Green Book Guidance</p> <p>DEFRA (Nov 2020, initially 2009)</p>	<p>Includes guidance on the identification of how climate impacts and challenges can affect a project using a climate risk assessment, taking into account direct and indirect effects. It also supports the development of alternative policy options in response to climate challenges, focusing on adaptation.</p> <p>Provides guidance on performing appraisal under economic uncertainty including: incorporating climate change risks into the baseline and sensitivity analysis; and proportionate climate resilient appraisal.</p> <p>Contains an extensive guide to relevant information, data, guidance, and policy covering the national and devolved governments on climate adaptation.</p> <p>https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/934339/Accounting_for_the_Effects_Of_Climate_Change_-_Supplementary_Green_Book_..._pdf</p>
<p>Valuation of Energy Use and Greenhouse Gas and Supporting Toolkit</p> <p>DBEIS (Jul 2021)</p>	<p>Supports the assessment of proposals that have a direct impact on energy use and supply, and those with an indirect impact through planning, land use change, construction or the introduction of new products that use energy. It helps undertake options appraisal for use in business cases and for conducting impact assessments.</p> <p>An excel-based calculation toolkit is provided to convert increases or decreases in energy consumption into changes in GHG emissions and to value these changes. Data tables containing the latest published assumptions for carbon values, energy prices, long-run variable energy supply costs, emission factors and air quality damage costs over 2010-2100 are provided.</p> <p>https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002868/Valuation_of_energy_use_and_greenhouse_gas_emissions_for_appraisal-2021.pdf</p>

Document	Content
<p>Enabling a Natural Capital Approach DEFRA (last updated Aug 2021)</p>	<p>Chapter 3 focuses on incorporating the stock of natural capital and the benefits that it provides into project appraisal and options analysis. Guidance is provided on 12 featured tools that assess natural capital and undertaking environmental evaluations, including advice about which to use in different settings. Tools include natural capital atlases, DEFRA’s biodiversity metric, and the environmental valuation reference inventory.</p> <p>Available to government users only, the Services and Assets Databooks collate around 400 UK data sources, tools and studies for 8 natural habitat categories and 25 environmental effect categories. These include selected economic valuation evidence. Case studies summarize real-world examples of how natural capital is used. An excel template for natural capital assessments is also included.</p> <p>https://www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance</p>
<p>Construction playbook Cabinet Office 2018</p>	<p>The Construction Playbook sets out key policies and guidance for how public works projects and programmes are assessed, procured and delivered. Recognizing the design life of public works, contracting authorities should adopt the use of whole life carbon assessments (e.g. PAS2080⁶) to understand and minimize the GHG emissions footprint of projects and programmes throughout their lifecycle.</p> <p>https://www.gov.uk/government/publications/the-construction-playbook</p>

⁶ PAS 2080 is a global standard for managing infrastructure carbon and has been authored to meet World Trade Organization requirements. See <https://www.carbontrust.com/what-we-do/assurance-and-certification/pas-2080-carbon-management-in-infrastructure>

Annex 7. The Netherlands' Governance Approach for a Nation-Wide Energy Transition

Generally, there is no simple solution to resolving the complexities of the energy transition that must take place in the built environment. This transition requires factoring in aspects such as the spatial impact of renewable energy, the development of new and upgrading existing local, regional, and national energy grids, the varying preferences of local and regional legislative bodies, the rapidly evolving climate change ambitions and spatial planning and energy sector related regulations, but also technological and capacity challenges and developing cost curves. There is no such thing as a perfect and detailed blueprint, and countries are therefore developing pan-national public investment strategies to foster alignment of the capital spending strategy of SNGs and national governments. Below an example strategy that is currently being implemented in the Netherlands.

In order to develop a locally grown yet national carbon-neutral energy system that will be approved by local legislatures, all 12 provinces, 21 district water boards, and 352 local governments in the Netherlands are working together with regional and national energy network managers and social stakeholders on 30 regional energy strategies (RES) aimed at generating 35 TWh of renewable energy, transition the built environment from gas to electric heating, and upgrade the existing energy grid.

Given the complexity of this transition, the governments have jointly developed an adaptive and iterative investment coordination and planning process, that is reviewed every two years. Additionally, through an adaptive plan-do-check-act planning cycle, the RES aims to maintain alignment between investment plans of all stakeholders, and the climate- and energy legal and regulatory frameworks.

A National RES Programme was set up to facilitate the entire process and, supported by a EUR 22.5 mln. subsidy, acts as process coordinator, develops a clear delivery framework for all stakeholders, builds a common data and information base, supports capacity building of all involved entities, and develops communities of practice to share knowledge and experiences. The PBL Netherlands Environmental Assessment Agency reviews the combined results of all RESs at various project stages to evaluate if sufficient progress is made towards creating a carbon-neutral energy system. If these combined results are insufficient, all the relevant governmental entities have agreed on formal mechanisms to ensure compliance with the overall climate targets according to a previously agreed decision-making methodology that, as a last resort, would involve the central government intervening judicially to ensure compliance.

Source: Dutch National Climate Agreement (2019)

Annex 8. Climate Change and Green Budgeting

Budgets are a crucial instrument for climate action and the green transition, and governments are increasingly deploying green budgeting to align their policies with climate commitments. As is presented in the report “Green Budgeting: towards common principles,” the European Commission, the IMF, and the OECD worked jointly to define the main elements and features of green budgeting practices. While green budgeting can be pursued in various ways, green budgeting is more efficient when:

- It is inserted in a strategic framework laying out a country’s climate-related national plan.
- It uses budgetary policy tools to contribute to evidence-based decision-making.
- It relies on an institutional design with clearly defined responsibilities and a timeline for actions.
- It uses transparent reporting and independent oversight to ensure openness and accountability.

For reporting, reporting methods on green budgeting vary across countries, from tables in budget plans to comprehensive reports. A good practice in various countries is the publication of a ‘Green Budget Statement’. They can be a single document or incorporated in existing budget documents, depending on what is appropriate in individual country settings.

Over the last decade several countries have published Green Budget Statements parallel to the main budget using a variety of specially designed expenditure tracking methodologies to identify climate-related expenditures but without reporting their mitigation or adaptation impacts. Other countries have reported information on the impact of the annual budget on GHG emissions:

- Scotland’s Climate Change Act 2009 requires the government to submit to Parliament an assessment of the impact of proposed expenditures on GHG emissions.^[2]
- In Norway the Climate Change Act (2018) requires government to state in the annual budget the expected impact of the budget on GHG emissions and how Norway can achieve the climate targets set out in the Act.
- In Sweden, the Climate Change Act 2018 requires the government to submit an annual climate report to Parliament in the Budget Bill.^[3]

France has incrementally deepened the extent to which environmental issues are presented in annual budget documents. ^[4] In 2019 a methodology was piloted ex post on that year’s enacted State Budget and in 2021 a ‘Report on the Environmental Impact of the State’ was presented with the budget, the report rates these elements on a scale of -1 (unfavorable) to +3 (very favorable) with respect to each of the six environmental objectives in the EU Taxonomy of Sustainable Environmental Outcomes, resulting in three categories: green, mixed and unfavorable expenses.

^[1] United Nations Development Program, n.d. Knowing What You Spend. A guidance note for Governments to track climate finance in their budgets. Bain, N, Nguyen, L, and Baboyan, K. UNDP. Climate Change Financing Framework Technical Note Series.

^[2] Carbon Assessment of 2020-21 Budget. Scottish Government.

^[3] Grantham Research Institute on Climate Change and the Environment Climate Change Laws of the World.

<https://climate-laws.org/>

^[4] Lelong, M-L, and Wendling, C, 2020. France's 'Green Budget' for 2021. IMF PFM Blog, November 2, 2020.

<https://blog-pfm.imf.org>

Annex 9. Maintenance in the Transport Sector Addresses both Adaptation and Mitigation

Network Rail

- With respect to adaptation, Network Rail has KPIs for asset management and sustainability: *Asset Management Composite Reliability Index (CRI)*: a measure of the short-term condition and performance of assets. *Composite Sustainability Index (CSI)*: a measure showing the percentage improvement of asset sustainability compared to a baseline. Depending on the asset type, asset sustainability is measured either by remaining life of the asset or by asset condition score and is weighted by the replacement value of the asset.
- Network Rail has also launched a long-term decarbonization programme which looks at ways it can switch to greener energy supplies, generate renewable energy itself, and a broad range of other carbon reduction initiatives. It has set itself a target to reduce carbon emissions by 25 per cent by the end of March 2024.

Highways England

- Highways England has identified locations on its network vulnerable to repeat flooding and is working to mitigate the risks by installing sustainable drainage systems and supporting the development of natural flood management features on land adjacent to highways. One of its KPIs is a measure of network maintenance and resilience: a pavement condition target that 95 percent of road surface does not require further investigation. It met this target in 2019-20.
- Highways England has also set itself a net zero target for maintenance and construction emissions by 2040. In 2020 maintenance and construction of the network resulted in emissions of around 734 thousand tonnes of CO₂e, which are projected to fall to around 350,000 tonnes in 2040 with no additional action from Highways England. It sees a significant opportunity for it to catalyze Britain's construction industry to deliver the CCC's call for the construction industry to be largely decarbonized by 2040. Highways England will focus on the asphalt, cement, and steel sectors using a carbon management system to embed lean construction practices and the principles of the circular economy. Digital technologies will be used to increase the capacity of the existing network, minimizing new construction.
- Interim mitigation targets and actions for maintenance and construction emissions have been set to take account of emissions over the life cycle to avoid incentives to use materials or practices that may have lower construction emissions but higher life cycle emissions. Highway's England's targets include:
 - By 2022: the specifications Manual of Contracts Documents of Highways Works integrates net zero thinking; a zero-carbon materials innovation programme launched; a 2040 zero carbon road map for concrete, asphalt and steel developed.

- By 2025: commission a long-term delivery partner to design a major net zero road scheme
- By 2030: 40-50 percent reduction in emissions compared to 2020; only zero carbon plant on its sites and site cabins.
- By 2040: zero carbon HGVs deliver to its sites.

Net zero highways: our 2030 / 2040 / 2050 plan

[*net-zero-highways-our-2030-2040-2050-plan.pdf \(highwaysengland.co.uk\)*](#)

Network Rail Limited's Annual Report and Accounts 2020, July 2020.

[*https://www.networkrail.co.uk/wp-content/uploads/2020/07/Annual-report-and-accounts-2020.pdf*](#)

Annex 10. The UK Government's Ambition for Climate Capabilities Across Government

Excerpt from the Net Zero Strategy

