Infrastructure Progress Review 2024

NATIONAL INFRASTRUCTURE COMMISSION

Better infrastructure for all

May 2024

Our remit

The Commission provides government with impartial, expert advice on major long term infrastructure challenges.

The Commission's objectives are to:

- support sustainable economic growth across all regions of the UK
- improve competitiveness
- improve quality of life
- support climate resilience and the transition to net zero carbon emissions by 2050.

In fulfilling our purpose and objectives, we:

- **set a long term agenda** – identifying the UK's major economic infrastructure needs, and the pathways to address them
- **develop fresh approaches and ideas** – basing our independent policy recommendations on rigorous analysis
- **focus on driving change** – building consensus on our policy recommendations, and monitoring government progress on their delivery.

A fuller description of the Commission's remit can be found on our website at nic.org.uk/about/what-we-do/. This includes a table of devolved administration responsibilities by infrastructure sector.

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Full biographies can be found on our website at nic.org.uk/about/the-commission/

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Foreword

Looking back over the last 12 months, this report charts mixed progress. There has been continued expansion in the reach of digital networks, and devolution deals for several city regions to offer them the ability to plan their own infrastructure strategies, as the Commission has long advocated. On the other hand, take up of electrified home heating options remains too low, and policy changes on rail strategy have created uncertainty.

The Commission's second *National Infrastructure Assessment*, published last October, set out a costed package of recommendations covering many of these areas.

As we await the government's formal response to the second Assessment, this report doesn't just look back on progress over the last year – but also sets out the things we advise should be prioritised over the next five years.

We face a make or break time for the long term prospects of UK infrastructure.

Big decisions like ahead – particularly choices made in a refreshed National Infrastructure Strategy and associated spending commitments. These will set a trajectory that determines whether we get the infrastructure we all want for the future.

More specifically, they will determine whether the UK meets its own deadlines for goals such as growing regional economies, decarbonising the electricity grid and making the economy more resilient to the effects of climate change.

It's a critical period for making decisions on things that are of immediate concern to the public – the three Ps of prices, potholes and pollution:

- **Energy prices –** reducing the costs of heat pumps and continuing recent progress on generating more electricity from renewables should set household energy bills on a downward trajectory over the longer term. But this requires coherent policy and long term funding to cover the transition cost for less well off households.
- **Potholes –** the recent boost in funding for local transport should be sustained, giving all local transport authorities stable funding rounds to enable them to plan for better maintenance as well as improvements.
- **Water pollution –** decisions this year on future investment levels need to enable transformative change to fix interconnected sewage and drainage problems.

The pressing need for a comprehensive plan to sort out railway connections across and between the North and Midlands also looms large in many people's daily experience, and in this report we offer new analysis to help inform that evolving work.

Across all infrastructure sectors, a window remains to ensure that practical delivery plans are in place, backed up by the necessary public and private funding, to help achieve economic and environmental goals that will improve life for British households.

But the window is closing, at least if we don't want to delay those benefits and compound the disruption of recent years. The UK is not alone in facing these challenges. But we have every right to be ambitious for our infrastructure, and decisions can't be ducked if we're to turn aspirations into reality.

Sir John Armitt

Executive summary

The government's progress on infrastructure policy, funding and delivery has been mixed. Policies of sufficient scale and robust implementation plans are required to deliver the goals of net zero, supporting growth across regions, and boosting resilience, while improving rather than degrading the environment.

There has been some progress in areas the National Infrastructure Commission identified as priorities in last year's Infrastructure Progress Review. The government has made further steps forward in extending and deepening devolution arrangements across England. In planning and regulation, the government has revised its National Policy Statements for energy, national networks and water resources, and updated Ofgem's duties to include supporting the delivery of net zero. Digital network deployment has continued to make progress, with government on track to deliver its target of 85 per cent gigabit capable broadband coverage by 2025.

But other areas of policy and delivery have seen few developments, or worse, progress has reversed. Last minute changes to heat policy have created uncertainty and reduced the incentives to install a heat pump, which risks slowing the transition from fossil fuel heating. The government is not on track to meet its target for heat pump rollout. Scrapping the second leg of High Speed 2, without putting in place a concrete plan for improving connectivity and capacity in the North and Midlands, creates uncertainty which will inhibit economic growth in the affected regions.

The government has faced several years of disruption from external shocks such as the pandemic and the cost of living crisis, which has exacerbated delays to infrastructure planning and delivery. The government should accelerate planning and delivery to catch up and ensure the country's infrastructure is fit for purpose.

Government needs to provide policy stability, making faster decisions and committing to them for the long term. Ambitious goals should be matched with policies of sufficient scale to turn the dial and supported by robust implementation plans. Removing the barriers that slow down and increase the cost of infrastructure delivery is essential, alongside taking further steps on devolving power and funding to local areas.

As the second *National Infrastructure Assessment* highlighted, the UK faces an infrastructure gap between the assets we have today and the assets we will need to secure the future we want. The UK is not alone in this challenge. Globally many countries are facing ageing infrastructure systems which will need to be maintained, made more resilient and decarbonised. While the UK's infrastructure performs well in some areas, in others there are significant deficiencies that are holding back productivity and impacting quality of life.

These include under investment in transport systems in regional English cities, the failure to build major water resource reservoirs in England in the last 30 years, too many properties being at risk of flooding, and recycling rates which have stalled for a decade.

Infrastructure is pivotal to addressing some of the hardest policy challenges facing the UK and delivering the resilient, affordable and low carbon infrastructure services the public want. Required changes include cutting household carbon emissions through swapping gas boilers for electric heating and fully decarbonising power generation. Local and intercity transport must be significantly improved to ease the constraints on economic growth in our major cities. Finally, infrastructure can and should be more resilient, reducing the risk of drought and flooding, and as far as possible ensuring our systems and services adapt to the current and future effects of climate change.

To close the infrastructure gap, government, regulators and industry need to make interventions that meet the scale of the challenge and enable rapid delivery on the ground. Delivering low carbon and resilient infrastructure will require a significant increase in overall investment. The majority of this investment will come from the private sector if enabled by a supportive policy and regulatory environment. The costs as well as the benefits of transforming the UK's infrastructure will be borne by the public as taxpayers and billpayers. But making these investments now should lead to lower overall costs for households and businesses in the long term.

The Commission's second Assessment set out a comprehensive long term plan to upgrade the UK's economic infrastructure. Recent government policy has reflected the Commission's thinking in certain areas, although the government has yet to respond in full to the second Assessment so many of its recommendations are not monitored in this report.

This year's report reflects on progress over the last year and sets out actions for the government to take over the next Parliament. The Commission's priority is for government to respond in full to the second Assessment, by setting out a national infrastructure strategy alongside a clear, long term funding commitment, and to begin to implement the second Assessment's recommendations.

Investing for the future

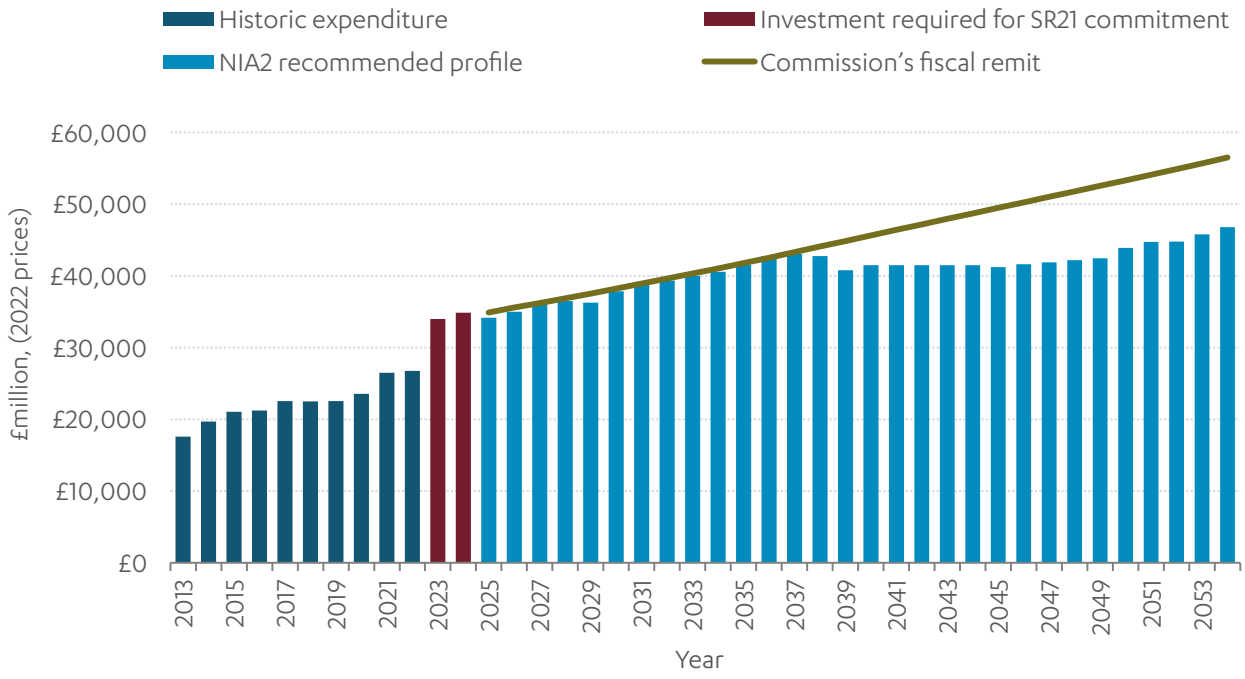
To deliver the recommendations in the second Assessment, the government will need to increase investment in economic infrastructure over a sustained period. This includes funding to support households through the energy transition to ensure it is affordable and fair. Over the last decade, public investment in economic infrastructure has averaged around £20 billion. At the last Spending Review, the government committed to increase this to around £30 billion for the years 2022-23 to 2024-25. This is a sharp rise, and the government should ensure that the funding gets spent.

Beyond 2024-25, the government's stated plan would freeze overall capital spending in cash terms.[1] If this was applied to infrastructure spending, it would not be consistent with the funding profile the Commission has set out to deliver the recommendations in the second Assessment, which would see public spending on infrastructure rise in line with inflation.[2]

The chart below highlights historic spending on infrastructure and the future spending levels required by the Commission's recommendations, in line with the Commission's fiscal remit at 1.3 per cent of GDP per year.[3]

Figure 1.1: Public investment should be in line with the Commission's fiscal remit to achieve ambitious goals for infrastructure

Historic public investment in economic infrastructure, government budgets, and the Commission's fiscal remit, 2013-2054

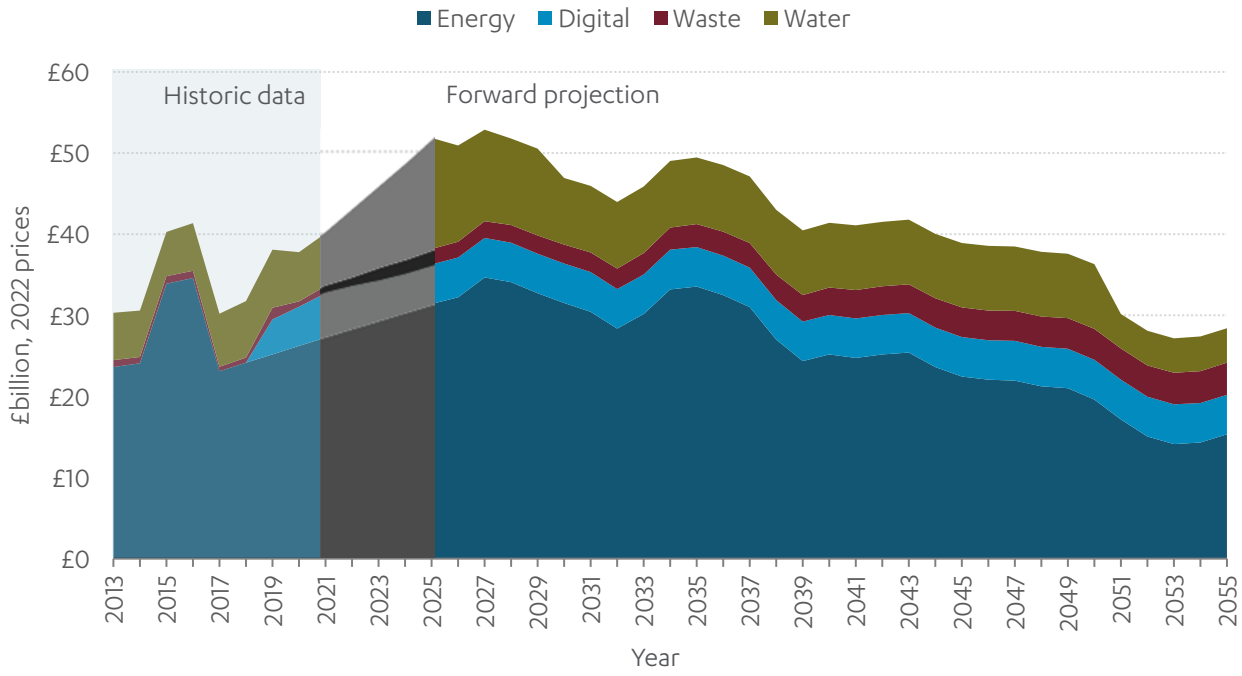


Source: Commission calculations, HMT Public Expenditure Statistical Analyses (2023), OBR Economic and fiscal outlook (March 2024)

Alongside public investment, there will need to be a sustained increase in private investment in order to close the infrastructure gap.[4] Key enablers to attract this investment in a competitive market are policy stability, regulation and planning reform. The chart below shows the projection of private investment required over the next 30 years.

Figure 1.2: Policy stability and clear regulatory direction are needed to deliver the increase in private sector investment required to close the infrastructure gap

Commission estimates of private sector (non household) investment in economic infrastructure, broken down by sector, 2013 to 2055



Source: Commission analysis

Delivering net zero

There has been some progress in creating an enabling policy environment in the last year. But it has not gone far or fast enough and in some cases progress has been hampered by policy uncertainty.

Delivering net zero requires major changes to energy infrastructure. The government has set a goal of decarbonising electricity generation by 2035, subject to security of supply.[5] To ensure that delivery can match the level of ambition, the government should move faster on supporting deployment of flexible technologies with clear business models and sufficient funding. Policy also needs to ensure that unabated gas use is not locked in over the long term.

The share of electricity generated by renewables has grown, and the government's Contracts for Difference scheme continues to support their deployment. The 2023 auction failed to procure any new offshore wind capacity,[6] but the government has responded positively to this setback by setting a higher maximum price for the next auction, reflecting higher financing and manufacturing costs. The government should also bring large onshore wind schemes back into the nationally significant infrastructure project system to speed up delivery and make the planning regime for onshore wind in England consistent with other technologies to increase access to one of the cheapest forms of energy.

More positively, government has accepted its Electricity Networks Commissioner's recommendations, including to require the National Energy System Operator to produce a strategic spatial energy plan. If fully and rapidly implemented, this should ensure that projects are not slowed down by insufficient transmission capacity.

Heating buildings still accounts for 24 per cent of UK fossil fuel demand.[7] The Commission has recommended that heat pumps should be the dominant solution for decarbonised heating. There has been some progress on funding, with the government increasing the grant available for installing heat pumps and allocating more funding between 2025 and 2028.[8]

But the government is not on track to meet its own target of delivering 600,000 installations per year by 2028. The current approach to scaling up deployment is inconsistent, and in some areas policy has gone backwards, such as the delay to implementing the Clean Heat Market Mechanism fewer than three weeks before the planned start date.[9] These last minute policy changes add uncertainty, discourage households from switching to low carbon heat, and discourage businesses from investing. A comprehensive strategy for the transition to electrified heating is needed, underpinned by long term funding sufficient to drive the required rate of installations.

The government's choice to wait until 2026[10] to make a policy decision on the role of hydrogen in heat compounds this uncertainty. As set out in the second Assessment, there is no public policy case for providing support for hydrogen heating, so the government should rule out any future support.

Achieving net zero will also require new networks for hydrogen and carbon capture and storage, and a plan for supporting engineered greenhouse gas removals. The government has set out long term targets for these sectors and announced up to £20 billion in funding to deploy carbon capture and storage technologies.[11] It has also made some progress on developing business models, but more ambition and faster deployment is required.

In particular, at least £40 million in development expenditure support is needed annually to enable the delivery of new hydrogen and carbon capture pipelines and storage required in 2035. Speed is also needed to develop hydrogen storage. Current plans mean the vast majority of the storage required will not be in operation until very close to 2035.

In some areas progress on delivery has been faster. The rollout of electric vehicle charging points is currently on track to meet the government's ambition of 300,000 public charge points by 2030, though the government should continue to address barriers to delivery given the challenging long term target. The Commission's analysis suggests that the number of public charging points installed annually must continue to grow at around 30 per cent per year.

Growth across regions: Transport

In the transport sector, progress on policy, funding and delivery is also mixed. While the government has taken encouraging steps forward in funding improved transport connectivity, more work is needed to significantly improve both local and interurban transport in an integrated way to improve economic growth in major cities. This is affordable within the fiscal remit that the Commission worked to in the second Assessment.

Significant additional funding has been announced for the mayoral combined authorities through five year City Region Sustainable Transport Settlements.[12] If this funding level is maintained for the next twenty years, it will broadly be in line with the level of increased investment recommended in the Commission's second Assessment. The government also committed to significantly increase investment in local road maintenance, also in line with the second Assessment. However, Transport for London still lacks a sustainable five year devolved transport settlement. It needs one urgently to plan for the future, while other authorities responsible for transport beyond the mayoral combined authorities should also receive five year settlements.

Trailblazer deals for Greater Manchester, the West Midlands, and the North East should provide much needed flexibility over the use of funding, making it easier for places to plan integrated long term strategies that can address local transport priorities in a way that is aligned to other policy goals such as housing, skills and economic development.[13] The government has also confirmed plans for level four devolution deals with West Yorkshire, South Yorkshire and the Liverpool City Region.[14]

Uncertainty has increased in interurban transport policy. During the last year, the government cancelled the second leg of High Speed 2 from Birmingham to Manchester, with funding diverted to other projects including some rail enhancements in the North and Midlands. A long term plan is needed to address the key connectivity, capacity and reliability issues on the network and should be prioritised to support improvements in productivity and economic rebalancing. The government's plans might address a number of issues but greater specificity is needed regarding the scope, cost, benefits and schedule for the schemes individually and as a package. The Commission's analysis suggests there are key corridors which will remain poorly served, such as links from Birmingham to Manchester and the North West. High Speed 2 Phase 1 will not address infrastructure constraints north of Handsacre, limiting growth in capacity for new passenger or freight services without new infrastructure investment.

The government should publish its third Road Investment Strategy as soon as possible. In the second Assessment, the Commission recommended that funding for this strategy should match the original funding allocation of around £27 billion for the second Road Investment Strategy.

Growth across regions: Digital

The government has made substantive progress towards its targets on network deployment. The government is on course to meet its 2025 target for 85 per cent gigabit capable broadband coverage this year and, at the current rate of deployment, should deliver its target of nationwide gigabit capable broadband coverage by 2030. On mobile, 5G coverage continues to improve, although the government should work with the sector to accelerate deployment of 5G networks over the coming years. The government should also work with operators to minimise any delays in reaching the 4G coverage targets proposed under the Shared Rural Network.

Environment and resilience

In most areas, action to get the policy, funding and delivery mechanisms in place to improve the environment and make the country more resilient to climate change has been too slow.

In the waste sector, delays to key policies have meant that recycling rates continue to stagnate,[15] and emissions from waste remain too high. Although the government has now announced the details of its collection and packaging reforms, there is a lack of clarity on how this will be delivered. More detail is also required on aspects of the funding local authorities will receive to support new burdens placed on them by the reforms.

Although water quality has improved over the last few decades, the water sector remains an area of public concern and there are still unacceptably high levels of water pollution. Only 16 per cent of water bodies achieved good ecological status in 2022.[16] The government is addressing some of this problem through its £60 billion Storm Overflows Discharge Reduction Plan. The Commission plans to consider how infrastructure investment can drive further improvements in the health of water bodies.

On water resources, the Commission has recommended the government should enable new water supply infrastructure, such as reservoirs, and take action to tackle leakage and reduce consumer demand for water. Together, these are the only ways of reducing the risk of severe drought and avoiding consumers paying for costly emergency supply measures. But water demand has plateaued rather than fallen, and despite company plans to address the issue, leakage is not falling by the rates required to hit industry targets.

Long term resilience to the challenges of climate change continues to be tested by real life events – with 12,000 homes being left without water after a power cut took a water treatment works offline in the wake of Storm Ciaran.[17] Asset maintenance issues also undermine performance in some sectors, including potholes in local roads.[18]

While the government has published a Resilience Framework, further action has been slow. To understand target levels of resilience, infrastructure operators need to agree clear resilience standards with government, but these are only planned to be delivered by 2030. This means that £400 billion of planned investment in transport, energy, water and digital and telecoms between 2025 and 2030 will not be able to adequately factor in resilience.

On flooding, current funding – which should be maintained in line with the Commission's funding profile – is not being strategically directed. Around 900,000 properties in England have a more than one per cent chance each year of being flooded by rivers and the sea and around 910,000 properties have a more than one per cent chance of flooding from surface water. This problem continues to worsen due to poor planning for new development and an unmanaged growth in impermeable surfaces.[19] While the government is investing in coastal and river flooding resilience in line with the Commission's proposed funding, there is still no long term risk reduction target to ensure this money is strategically directed. And on surface water flooding, the government has responded to the Commission's 2022 report on the issue, but has stopped short of setting long term targets for managing flood risk and has not yet implemented Schedule 3 of the Flood and Water Management Act 2010.[20]

The government has taken some welcome steps on reducing infrastructure's impact on the environment. It is now mandatory for smaller scale infrastructure projects to achieve at least ten per cent biodiversity net gain, with plans to extend this to nationally significant infrastructure projects in 2025.[21] This action is needed because biodiversity indicators in the UK show declines in the status of threatened habitats and species, as well as increased pressure from invasive species.[22] While economic infrastructure is not the principal cause of decline, it has contributed to it.[23]

Making better decisions, faster

Government must be able to make good decisions, fast. There need to be changes to consenting, predictable regulatory models that allow rates of return commensurate with the level of risk, and clearer strategic policy direction from government. All this can help secure private investment, although changes to public investment decisions are also essential.

While it is important that the UK maintains its system of independent economic regulation, it should be reformed. This is needed to retain investor confidence, improve outcomes for consumers and enable the transformational change required.

For the regulatory system to support policy objectives, strategic direction from government is needed through regular Strategic Policy Statements for each sector. At a time when the water and energy sectors need transformational change, rather than marginal efficiency improvements, regular Strategic Policy Statements provide clarity on the need to prioritise investment, especially when it is required ahead of need. These statements should set out a coherent long term vision for sectors, aligned with government's policy priorities.

To keep pace with the rapid action needed to reach net zero and build climate resilience, investment ahead of need is essential, supported by predictable regulatory models that allow rates of return commensurate with the level of risk involved.

The government has not consistently set clear strategic direction for regulators. It has given Ofgem a duty to consider the net zero target, and a new strategic policy statement for Ofgem has been designated; however, the statement fails to provide longer term direction on key issues for the energy transition. The government has also yet to review regulators' wider duties to ensure they are coherent and effectively balanced.

A sizeable proportion of the investment in energy and other infrastructure networks will be consented through the planning regime for nationally significant infrastructure projects. The Commission estimates that the nationally significant infrastructure project investment pipeline is in the tens of billions of pounds per year across transport, energy and water networks.

Currently the planning system constrains the roll out of infrastructure at the pace that is required. The past decade has seen average times for nationally significant infrastructure projects increase significantly. Planning costs are rising and uncertainty in the system has increased. In response, the government is taking forward a package of reforms to reduce consenting times, including strengthening the capacity of the planning system and introducing new premium planning services across England, and has committed to reduce average consenting time to the two and a half years achieved in 2012.

It will also be important to engage the public on schemes, and the government has taken positive steps in this direction by committing to publish voluntary guidance on community benefit for electricity transmission infrastructure. The government has only recently responded to the Commission's recommendations on longer term changes to further accelerate planning decisions,[24] though the Commission welcomes the revised National Policy Statements for energy, national networks and water resources.

Priorities

Policy, funding and delivery over the next five years will determine whether government is able to address critical infrastructure challenges at the pace required and begin to deliver the resilient, affordable and low carbon infrastructure the public want.

Over the next five years the government must also lay the foundations of longer term change. This includes building resilience into existing infrastructure services, preparing for growing flood risks, and supporting economic growth by setting out a long term cross modal transport investment strategy.

The government should respond to the second National Infrastructure Assessment by setting out a fully funded national infrastructure strategy which supports the goals of net zero, economic growth across regions, and resilience, while ensuring infrastructure services improve rather than degrade the environment.

Key Commission recommendations that need to be delivered over the next five years (taken from the second *National Infrastructure Assessment*):

Delivering Net Zero

To deliver net zero, the government must:

- support the delivery of 60GW of short duration flexibility in the electricity system by 2035, and continue to target at least 65 per cent of energy being generated by renewables in 2030;
- take action to deploy 30TWh of persistent low carbon flexibility by 2035, deploying multiple hydrogen fired generation and carbon capture and storage enabled generation projects by 2030 and shortening the length of capacity market contracts to ensure that unabated gas generation is not locked in beyond 2040;
- commit to core pipeline networks for carbon and hydrogen, introducing business models for their delivery and putting mechanisms in place to manage future network expansion;
- deliver changes in network infrastructure to support the net zero transition, improving

governance by establishing the National Energy System Operator in 2024 and giving it the planned duties to produce a Strategic Spatial Energy Plan and set up Regional Energy Strategic Planners;

- increase the resilience of the energy system by giving the Secretary of State powers to establish and control a strategic energy reserve that can be used to mitigate economic shocks;
- promote a strategic transition to low carbon heating through long term funding and zero per cent financing to support deployment of heat pumps and heat networks, ruling out government support for hydrogen heating and planning for the end of natural gas heating;
- support the decarbonisation of transport through accelerating the rollout of public charging points, establishing a review mechanism to reflect uncertainty in its transport and decarbonisation plans and committing to decarbonise freight.

Growth across regions

To support growth across regions, the government must:

- provide £22 billion for major transport projects in cities from 2028 to 2045, starting with Birmingham, Bristol, Leeds and Manchester – with those cities making a capital contribution and encouraging modal shift through demand management initiatives;
- by the next Spending Review, agree single, departmental-style financial settlements for existing mayoral combined authorities including a five year settlement for Transport for London, and by 2025 devolve five year transport budgets to all county councils and unitary authorities;
- prioritise maintaining and renewing the existing road and rail network before enhancements, while drawing up a 30 year investment pipeline, including an integrated strategy for interurban transport which addresses rail connectivity and capacity issues in the North and Midlands;
- make gigabit capable connectivity available everywhere by 2030 and support the market led deployment of 5G, while identifying and delivering the telecoms infrastructure required to meet the needs of the energy, water and transport sectors.

The environment and resilience

To deliver resilient infrastructure services, the government must:

- by 2025, publish a full set of outcome based resilience standards for energy, water, digital and transport services, requiring stress testing and committing to five year reviews;
- to inform the next round of funding settlements, require infrastructure operators to estimate the cost of resilience to future climate change, supporting the Met Office to make climate data accessible and standards bodies to update technical standards;

- on surface water flooding, work to better understand risk, devolve funding for joint costed plans to tackle the problem, and prevent the problem getting worse by ameliorating new development and unplanned increases in impermeable surfaces;
- set a long term measurable coastal and river flood risk reduction target, and from 2025– as is already the case for coastal flooding – ensuring new development is resilient to flooding from rivers with an annual likelihood of 0.5 per cent;
- require plans to deliver a combined additional water supply and demand reduction of 4,800 megalitres per day to make England resilient to a drought with an annual likelihood of 0.2 per cent;
- require infrastructure operators in the flood management, transport and water sectors to develop plans to maximise opportunities to improve natural capital by taking an integrated and strategic approach to maintenance and renewals across their network;
- implement the waste collection and packaging reforms to meet the 65 per cent recycling target by 2035, with targets and support for local authorities, and immediately banning new long term contracts for energy from waste plants without carbon capture plans.

Making good decisions, fast

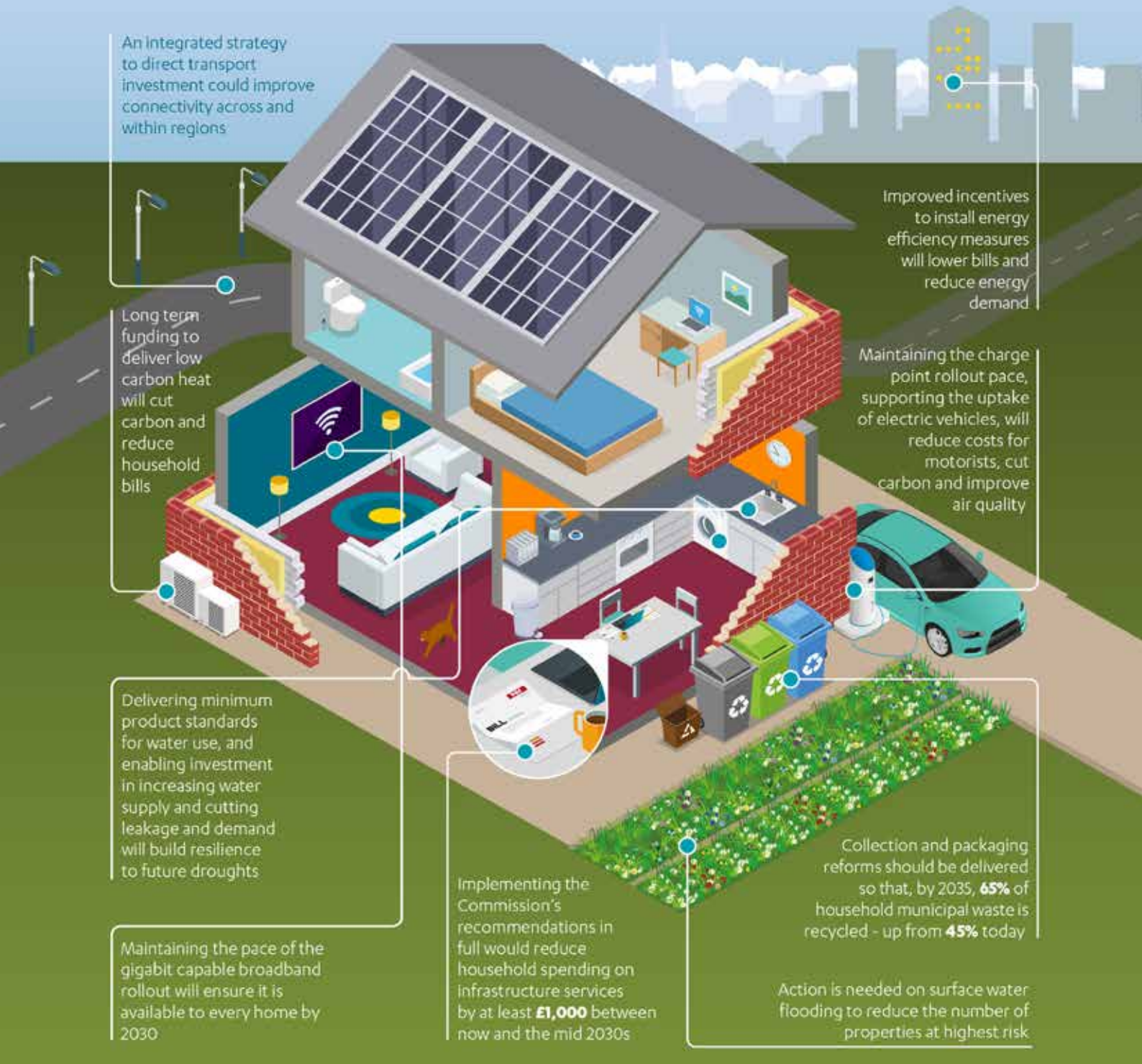
To strengthen the policy and regulatory environment to support infrastructure investment, the government should:

- on planning for nationally significant infrastructure, introduce a legal requirement for at least five yearly reviews of National Policy Statements, enabling modular updates to those statements and setting up a central coordination mechanism to monitor progress;
- improve support for major infrastructure by publishing a framework of direct benefits for affected communities and take a strategic approach to environmental management;
- empower regulators to facilitate strategic investment by setting out refreshed Strategic Policy Statements for regulators in each regulated sector once a Parliament and requiring regulators to enhance the role of competition;
- reform public spending frameworks by setting at least five year fixed budgets for capital, renewals and maintenance, separating capital spend from renewals and maintenance, and separating megaprojects' spending from that of the department that runs them;
- ask the Infrastructure and Projects Authority to incorporate new guidance from the National Infrastructure Commission's Design Group on project specific design principles.

The next five years will be critical for achieving the UK's infrastructure ambitions

Our recommendations will help improve quality of life and save money for people across the country

The examples below represent actions government must take on the Commission's recommendations over the next five years, and the expected outcome for a typical household



1. Approach to reviewing progress

The government established the National Infrastructure Commission to assess the UK's long term infrastructure needs, provide impartial, expert advice on how to meet them, and hold the government to account for delivery. The *Infrastructure Progress Review* is the Commission's annual monitoring report and sets out the Commission's views on the extent to which the recommendations government has endorsed have been progressed and delivered over the past 12 months.

The 2024 *Infrastructure Progress Review* reviews the government's progress over the past year against the recommendations from the 2018 *National Infrastructure Assessment* and the studies the Commission has published and which the government has responded to. The *Infrastructure Progress Review* is focused on assessing government progress against meeting those of its recommendations which government has endorsed, or where government has set out alternative proposals to the Commission's recommendations. It does not give an overall view on government's progress on infrastructure policy and delivery more widely.

The government's existing commitments

The government has most recently responded to the Commission's *Reducing the risk of surface water flooding* study.

The Commission expects government to respond to its second *National Infrastructure Assessment* in 2024.

The four tests

The Commission uses four tests, described below, to assess government's progress in delivering endorsed recommendations over the past year:

- **Taking long term decisions and demonstrating staying power:** The government should look beyond the immediate Spending Review period and set out its strategy over the next ten to thirty years, using adaptive plans to navigate uncertainty and achieve its goals. Decisions on infrastructure should be devolved to the appropriate level.

- **Policy goals must be matched by effective policies to achieve them:** There should be a specific plan for government policy ambition or endorsed Commission recommendations that is commensurate with the task and contains clear deadlines and identified owners.
- **Firm funding commitment:** Where necessary policy ambition should be supported by firm funding commitments commensurate with the level of investment needed to deliver the required infrastructure.
- **Removing barriers to delivery on the ground:** Infrastructure should be changing in line with the Commission's recommendations, providing better services to consumers and taxpayers now.

The Commission ranks progress against the four tests into three categories: not met, partly met, and met:

- **Not met:** No or limited action has been taken by government to meet the test, and government is not on track to meet the test over the coming years. Substantial and sustained action is required to get on course to meet the Commission's recommendation.
- **Partly met:** Material action has been taken that will bring about a real change, but not one that is fully commensurate with the test being met; to meet the Commission's recommendation more action will be needed.
- **Met:** Current policy fully meets the test and a substantial part of the Commission's recommendation is on track to be delivered.

Ranking against the test reflect the Commission's judgements. The judgements are supported by a comprehensive analysis of the evidence, which is summarised in the rest of this report. For policy to be fully on track to implement the Commission's recommendation, each test should be ranked as met.

The *Infrastructure Progress Review* does not take account of any changes in government policy which may have occurred after 2 May 2024.

2. Energy and net zero

While gas prices have fallen from the highs of 2022, the UK remains too reliant on high cost, high carbon natural gas. The UK can move away from fossil fuels and have decarbonised and secure energy. For most sectors, this means switching to electricity, but there will also need to be deployment of new technologies like hydrogen and carbon capture and storage. The pace at which the energy system is decarbonising needs to be accelerated to ensure that the UK not only meets its net zero target in 2050, but also interim targets like the sixth carbon budget.

Deployment of renewable electricity will reduce reliance on gas in the power system and cut emissions. While the failure to secure any additional offshore wind capacity in last year's auctions was a setback, the Contracts for Difference model remains the best way for the UK to bring forward renewable capacity.

Government should continue to focus on delivering renewable deployment at pace, as well as bringing forward firmer plans and finalised business models to deliver flexible generation for when the sun does not shine and the wind does not blow. Investment in transmission and distribution networks must also keep pace with demand. The plans to accelerate transmission infrastructure and connections to the network are welcome steps forward. Government should also continue progress on improving governance, including completing the setup of the National Energy System Operator and its critical system planning role.

Decarbonising buildings is the single biggest challenge on the path to net zero, requiring almost all households to engage in the transition. Government must step up the level of ambition on energy efficiency and heat. Current plans are insufficient to meet the target of 600,000 heat pump installations per year by 2028.

The Commission's view is that electrification is the only viable option for decarbonising buildings at scale, and the solution for most homes will be heat pumps. They are highly efficient, available now and are being deployed at scale in other European countries. The second National Infrastructure Assessment set out how policy should focus on building the market and supporting consumers to make the transition.

There needs to be a comprehensive, long term and funded plan to reduce energy demand and make the transition to electrified heating. While the increase to the subsidy for heat pumps is positive, other important elements of the transition are going backwards. Continuing uncertainty over the role of hydrogen in home heating is also contributing to slow progress in this area.

New networks to transport carbon and hydrogen are vital to support decarbonisation across the economy. The government has published a hydrogen transport and storage networks pathway, agreeing in principle with the strategic case for building a core network made by the Commission. The government has also published a vision for the evolution of the carbon capture and storage market. Government should make further progress in coordinating and supporting the delivery of this infrastructure, as well as increasing the pace of delivery of the business models required to support these new sectors.

Priorities over the next five years

Electricity system

- Continue deploying renewable generation through a pipeline of annual contracts for difference auctions, delivering at least 65 per cent of generation from renewables by 2030.
- Deploy a range of first of a kind engineered greenhouse gas removal technologies by 2030, and publish a detailed plan to deliver this.
- Introduce firm policy to deliver a total of 60GW of short duration flexibility by 2035, including completing the Review of Electricity Market Arrangements and bringing forward a final business model for long duration electricity storage.
- Establish a minimum of 8TWh of large scale hydrogen storage to be in operation by 2035.
- Set up the proposed business model to support hydrogen fired generation and ensure that by 2030, multiple large scale power stations are deployed for both gas generation with carbon capture and storage and hydrogen fired generation.
- Set policy to ensure that unabated gas generation generates less than two per cent of electricity by 2035 and is prevented from operating in the wholesale, balancing and capacity markets by 2040. Ensure that unabated gas is not locked in beyond 2040 by shortening the length of capacity market contracts from 2025.
- Complete the setup of the National Energy System Operator and Regional Energy System Planners. Ensure that the National Energy System Operator brings forward the first strategic spatial energy plan by 2025.
- Develop a strategic energy reserve to support resilience to economic shocks, taking the necessary actions to develop a reserve that can be used to generate 25TWh of electricity by 2040.

Heat and energy efficiency

- Increase incentives for households and businesses to switch to low carbon heat, by delivering a long term funding scheme and interest free financing to reduce the upfront costs, and ensuring the costs of running a heat pump are lower than the cost of running a boiler.

- Commit long term funding to deliver low carbon heat across the public sector estate, social housing and households on lower incomes.
- Rule out government support for hydrogen heating to help industry plan and invest, and avoid further delaying the decarbonisation of heat.
- Plan for the end of the use of natural gas for heat, including ending new connections to the gas network from 2025, regulating to end the use of fossil fuel heating in large commercial buildings by 2035, and ending the sale of all new fossil fuel boilers in 2035.
- Begin planning for the process of decommissioning or repurposing the gas network and disconnecting customers, including ensuring a mechanism for local democratic input, to inform development of the RIIO-3 price control which will begin in 2026.
- Improve incentives for households and businesses to install energy efficiency measures, through zero cost financing and a plan to tighten and enforce minimum standards in the private rented sector.

New infrastructure networks

- Ensure policy actively encourages industrial decarbonisation at the pace required to hit carbon budgets.
- Set out visions for initial core carbon and hydrogen networks by the end of 2024, as well as providing support for development expenditure and establishing a process for awarding business model contracts beyond the first two allocation rounds.
- Speed up delivery of the planned business model for hydrogen pipeline networks.

State of the sector

The energy sector covered by the Commission largely consists of two key networks: electricity and natural gas.

The electricity system includes infrastructure that generates electricity, such as wind turbines, solar panels, nuclear power stations and gas fired power stations. Because electricity supply needs to match demand at all times of the day and year, flexibility is required. This is provided by generation through flexible sources, storing electricity, or reducing demand through demand side response. The electricity transmission and distribution networks supply the vast majority of homes and businesses.

In order to deliver a low cost, low carbon energy system, gas generation will need to be replaced primarily with wind and solar power, supported by low carbon flexibility. This will come in the form of technologies such as batteries, demand side response and flexible generation through hydrogen and gas with carbon capture and storage.

Additional capacity in the electricity transmission and distribution networks will be required to meet the higher levels of electricity demand from electrifying heat, transport and industry.

More than 17 new nationally significant electricity transmission projects will be required in England and Wales by 2030 to support electrification, a more than fourfold increase on historic rates.[25] Lack of electricity network capacity is already leading to increased costs for consumers. By 2030, network constraint costs caused by insufficient capacity are estimated to rise to between £1.4 billion and £3 billion per year, unless the capacity of the transmission network is expanded.[26]

The natural gas network is connected to around 85 per cent of homes.[27] Natural gas is used to heat most homes and businesses, as well as to generate electricity. Other sources of energy, such as oil and biomass, are also used to heat buildings, but in smaller quantities. Some homes are also heated with electricity.

Moving away from gas heating will be essential for reducing carbon emissions in homes, as well as improving air quality and permanently reducing heating costs for households. Seven million buildings need to switch from fossil fuel heating systems to heat pumps or heat networks by 2035.[28]

The sector also includes new infrastructure to support hydrogen and carbon capture and storage. This infrastructure will be essential to decarbonising the electricity system, as well as being used to decarbonise some industry where electrification is not feasible. Carbon capture and storage will also be key to facilitating engineered greenhouse gas removals. Enabling these uses will require infrastructure to produce, transport and store hydrogen, as well as to capture, transport and store carbon.

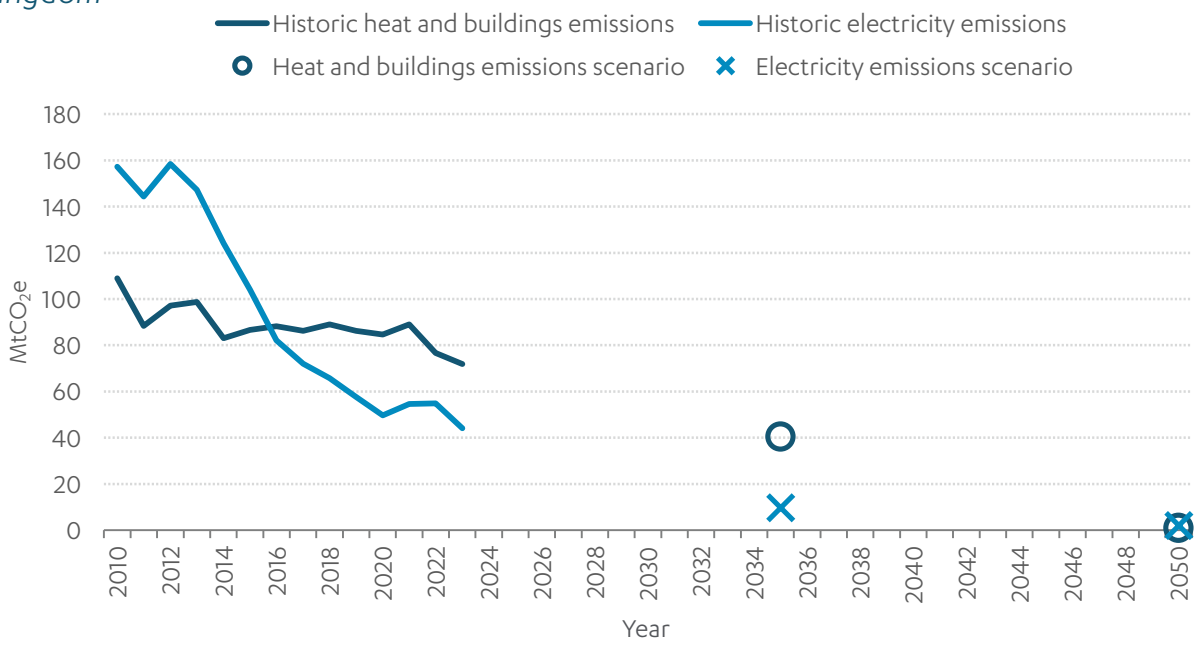
Greenhouse gas emissions from the energy sector have reduced (figure 2.1), driven primarily by the successful move away from using coal to generate electricity. However, emissions remain too high, driven by the continued use of gas for electricity generation and heating.

Emissions from electricity will need to fall to near zero by 2035 to meet the sixth carbon budget. Emissions from heat need to reduce by around 50 per cent by 2035 from 2019 levels, and to near zero by 2050. In addition to reducing carbon emissions, moving away from gas for electricity generation and heating should lead to lower costs for households and businesses, and reduced vulnerability to energy shocks.

In 2023, emissions from heat and buildings and from electricity generation were roughly 20 per cent lower than in 2021. This is most likely driven by high fuel costs. In particular, the reduction in emissions from heating is most likely driven by lower use of heating in buildings, rather than a transition to cleaner fuels.

Figure 2.1: Emissions reductions have been driven by electricity in recent years, but progress has stalled

Actual and potential emissions in the government's net zero delivery pathways, United Kingdom



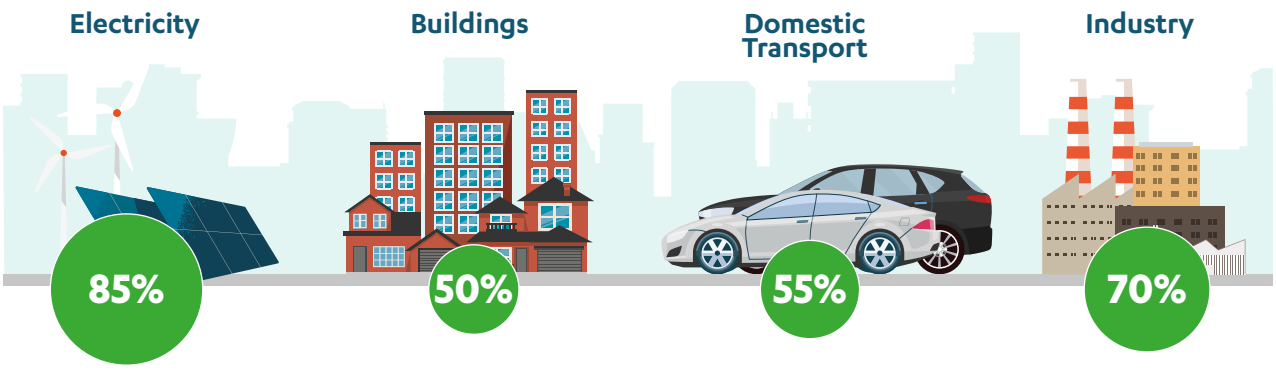
Source: Department for Energy Security and Net Zero – Final UK greenhouse gas emissions (2023), Climate Change Committee Sixth Carbon Budget (2020). Note: Energy sector emissions include Energy from Waste

The cost of energy to households and businesses remains elevated, but has fallen significantly in the last year, driven by reductions in the price of gas, which affects the cost of electricity and heat. In the absence of government intervention, energy costs for a typical household would have peaked at £4,279 a year between January and March 2023.[29] Direct subsidy from government reduced this to £2,500 a year. This has fallen to £1,690 a year between April and June 2024.[30]

The Commission has set out a more detailed overview of the energy sector in the Second National Infrastructure Assessment: Baseline Report Annex B: Energy and the Commission's historic data on sector performance is available online.[31]

Currently, around 80 per cent of the UK's energy demand is met by fossil fuels

Every sector of the economy will need to make substantial reductions in fossil fuel use to lower emissions:



Progress against the Commission's recommendations

Electricity system

Overview of key government policy

The government has committed to decarbonise the power system by 2035, subject to security of supply. To support the delivery of a decarbonised power system, the government has:

- set technology specific targets for low carbon generation, including 50GW of onshore wind by 2030[32]
- agreed to deliver annual contracts for difference auctions and has reopened these auctions to onshore wind and solar projects[33]
- made changes to the National Planning Policy Framework to loosen the effective ban on onshore wind in England.[34]

The government is conducting its Review of Electricity Market Arrangements, and has issued a second consultation narrowing the range of potential options to reform electricity market design.[35] As part of this second consultation, the government said that a limited amount of new unabated gas capacity was likely to be needed during the transition to a decarbonised system, in order to ensure security of supply.

In 2021, the government and Ofgem published an updated Smart Systems and Flexibility Plan, which estimated that a tripling of low carbon flexibility capacity would be needed by 2030.[36] The plan set out several actions to reduce barriers to deployment. As part of this work, the government has consulted on a policy framework to de-risk investment in long duration electricity storage.[37]

The government and Ofgem have also set out a number of policies to improve governance of the energy system. The 2023 Energy Act legislated to give Ofgem a statutory net zero duty[38] and also legislated for the set up of the National Energy System Operator.[39] This is expected to be established in summer 2024[40] and will take over the operation of the electricity network, as well as taking on a larger role in planning the energy system, including producing a strategic spatial energy plan. Ofgem also announced in November 2023 that they would proceed with the creation of Regional Energy System Planners, to be delivered by the National Energy System Operator.[41]

In November 2023, government published a Transmission Acceleration Action Plan.[42] This set out actions to reduce the time taken to build network infrastructure, based on the recommendations in the Electricity Networks Commissioner's report. Government and Ofgem also jointly published a Connections Action Plan, intended to reduce the time taken for customers to connect to the electricity network.[43]

The government has set an ambition for up to 24GW of new nuclear power to be delivered by 2050, and reiterated this ambition in the nuclear roadmap published in January 2024.[44] The government is supporting investment in the new nuclear plant at Sizewell, and has made £2.5 billion in funding available.[45]

The project is seeking to reach a final investment decision before the end of this Parliament. Government is also running a competition to select preferred designs for Small Modular Reactors, with the hope of deploying the first reactors by the mid-2030s.[46]

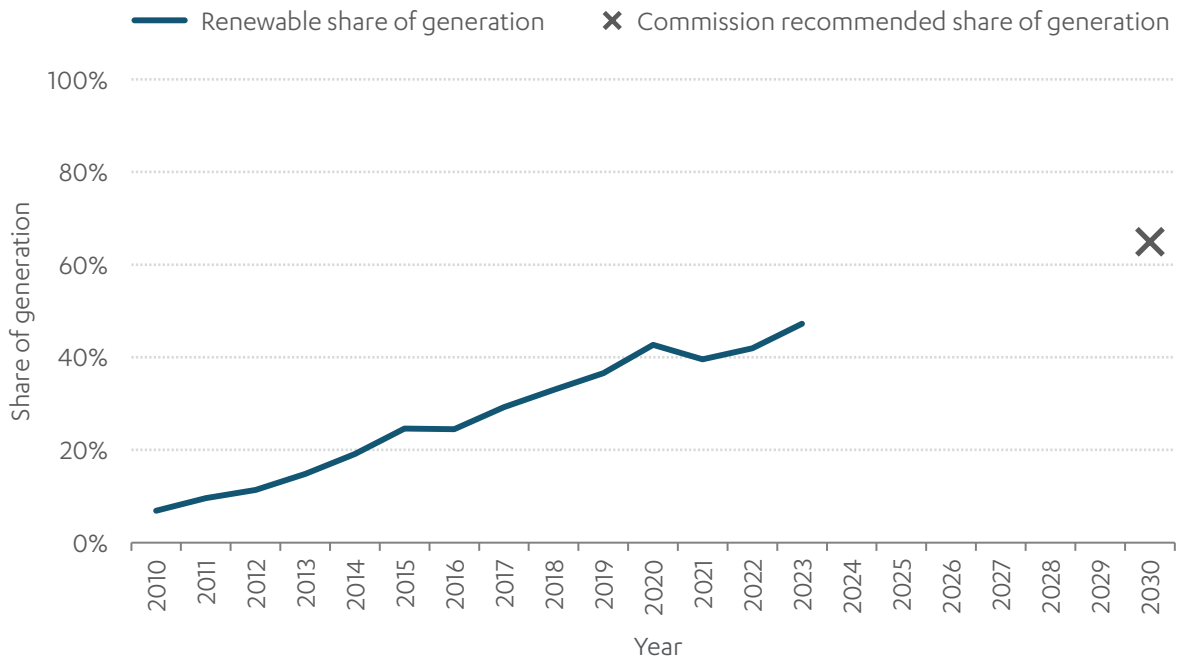
Change in infrastructure over the past year

The share of electricity generated by renewables was 47 per cent in 2023. This is the highest share to date, driven by a reduction in fossil fuel generation, particularly gas.

The volume of electricity generated by renewables in 2023 was 135TWh – the highest volume to date, equal to 2022. The government remains broadly on track to deliver 65 per cent of generation from renewables by 2030.

Figure 2.2 Renewable deployment is broadly on track to deliver the Commission's recommendation

Historic share of generation and Commission target of 65 per cent by 2030, United Kingdom



Source: Department for Energy Security and Net Zero (2023), Energy trends: UK renewables

The government's contracts for difference scheme continues to procure new renewable capacity at low prices. The fifth round of auctions in 2023 awarded contracts to 3.7GW of low carbon generation, including 1.5GW of onshore wind, primarily in Scotland, and 1.9GW of solar.[47]

However, the auctions failed to bring forward any new offshore wind capacity. The government is looking to rectify this by setting a higher maximum price for next year's auctions.[48] In order for the government to hit its target of 50GW of offshore wind by 2030, this will require markedly increased ambition in future auction rounds. Energy UK has estimated that at least 10GW of offshore wind will need to be procured in each of the next two auction rounds for this target to be hit.[49]

No onshore wind projects in England were successful in this year's auctions. Onshore wind capacity in England increased by only 7MW in the year to December 2023.[50] According to government's Renewable Energy Planning Database, eight onshore wind projects submitted planning applications to build projects in England during 2023. Six of these were applications to replace existing turbines. The remaining projects have applied to build two turbines with a total capacity of 2.5MW. One of these applications has been denied permission, and the other is awaiting a decision.[51]

Assessment of progress

Government is facilitating a rapid deployment of renewable electricity generation and has ambitious commitments and policy in place to support delivery over the next decade. Government is also taking action to bring forward flexible generation, including through the Review of Electricity Market Arrangements. It is critical that this is completed quickly and accompanied by appropriate funding so that technologies can be deployed at pace.

A small role for unabated gas in 2035 is consistent with the pathway set out in the second National Infrastructure Assessment. Where unabated gas capacity is needed to support security of supply, government should put measures in place to ensure that this capacity is only generating when truly necessary and has a clear pathway to decarbonisation. Government should also take action to ensure that unabated gas use is not locked in for longer than it is needed on the system through capacity market contracts that extend beyond 2040.

Ambitious deployment of hydrogen generation and gas with carbon capture and storage will also be essential in minimising the role of unabated gas. Government should move faster to ensure the delivery of multiple large scale projects by 2030, in order to meet the 30TWh of persistent flexible generation that is needed by 2035, as set out in the second Assessment. In particular, greater urgency is required to bring forward policy decisions on support for these technologies and firm funding envelopes.

A coherent plan to bring together government's policies to decarbonise the power sector would provide additional certainty and clarity on the pathways for individual technologies. This should include an intention to bring forward at least 8TWh of hydrogen storage, as recommended in the second National Infrastructure Assessment. Government should also take action to develop a strategic reserve of energy in the longer term, as recommended by the Commission and the House of Lords Science and Technology Committee.[52]

There has been progress on removing barriers to deployment. The Connections Action Plan and the Transmission Acceleration Action Plan, if fully and rapidly implemented, should help to ensure that projects are not slowed down by insufficient transmission capacity or an ineffective queueing system. However, the changes to planning policy in England to enable onshore wind are not sufficient to enable delivery. This is impeding deployment of one of the cheapest renewable technologies, leading to higher bills for consumers.

- **Taking long term decisions and demonstrating staying power: Met.** The government has set a clear goal of a fully decarbonised electricity system by 2035 and is taking action to ensure this can be achieved, including speeding up deployment of transmission infrastructure to support increased electricity demand. The government has also recognised the critical role of flexibility in delivering a decarbonised system, and has set out assessments of how much flexible capacity will be needed that are similar to those in the second National Infrastructure Assessment.
- **Policy goals must be matched by effective policies to achieve them: Partly met.** Policy mechanisms are in place to fund renewable technologies, and other policies are in train to ensure that flexible technologies can come forward. These need to be brought forward more quickly to ensure that delivery can match the levels of ambition on decarbonisation. More attention also needs to be paid to an overarching plan for meeting government's commitment to decarbonise the electricity sector by 2035. This should include measures to ensure that unabated gas generation is not locked in for the long term, including not issuing capacity market contracts for unabated gas that would extend beyond planned dates for decarbonisation.
- **Firm funding commitments: Partly met.** The contracts for difference scheme has brought forward significant renewable generation. While this year's auctions failed to bring forward any new offshore wind capacity, the mechanism remains fit for purpose. The decision to increase the administrative strike price for the 2024 auction round should increase the likelihood of bids from offshore wind developers, but a step change in deployment will be required if the government is to hit their target for 50GW of offshore wind by 2030. Additional funding will be needed to deploy flexibility solutions to ensure security of supply. In most cases, the business models are being developed, but it is not yet clear how much money will be made available. Government must ensure these technologies can be deployed at the scale required.
- **Removing barriers to delivery on the ground: Partly met.** The government is on track to reach the level of renewable deployment recommended by the Commission. There has also been progress on reform to the planning system and ensuring that transmission network capacity can be delivered to support the deployment of renewables. The connections action plan should help to reduce the time taken to connect to the grid, though initial indications are that the queue to connect to the network is still growing at pace and more action will be needed. Action in other areas has been insufficient. In particular, not enough has been done to enable onshore wind in England, where changes to the planning system to enable deployment are not sufficient to unlock delivery. Onshore wind should be brought back into the Nationally Significant Infrastructure Project system, as well as being treated in the same way as other technologies in the local planning system.

Heat and energy efficiency

Overview of key government policy

The government has set a target of 600,000 heat pump installations a year by 2028,[53] and has set out some policies to deliver this.

The government plans to introduce the Future Homes Standard in 2025, and consulted in December 2023 on how this could be implemented.[54] This will require new build homes to be installed with low carbon heating from 2025.

The Boiler Upgrade Scheme offers grants of up to £7,500 for households and small non-domestic properties in England and Wales that install air source heat pumps. The maximum grant was increased from £5,000 in October 2023.[55] As part of the previously announced £6 billion of funding for energy efficiency and heat between 2025 and 2028, an additional £1.5 billion of funding has been allocated, increasing the annual funding to £500 million.[56]

Government is also taking some steps to make installing a heat pump easier, including consulting on new permitted development rights to reduce barriers to installation.[57]

Some policies intended to deliver low carbon heating have been rolled back. In September 2023, the government announced that new fossil fuel heating installations in off gas grid homes would be banned from 2035 instead of in 2026.[58] The government also announced that around a fifth of homes would be exempt from switching to low carbon heating, but have not set out how this exemption would work.

The government has delayed the implementation of the Clean Heat Market Mechanism, an obligation on manufacturers of fossil fuel heating appliances to also sell a specified number of heat pumps.[59]

The government intends to make a decision on the role of hydrogen in heat by 2026. There is not yet an appraisal framework for how this decision will be made, and government will not have the previously expected evidence from large-scale trials to support this decision.[60] Two hydrogen village trials were cancelled in 2023 in Whitby and Redcar.[61] The smaller H100 hydrogen trial in Fife has been delayed and is now due to begin supplying homes in summer 2025, though this uses a newly built network rather than converting existing gas infrastructure.[63]

The government has announced an ambition to reduce energy use in buildings and industry by 15 per cent by 2030, compared to 2021 levels.[62]

To deliver energy efficiency improvements, the government has several existing schemes for social housing, public sector buildings, and low income households that are off the gas grid. There are also two energy efficiency schemes delivered through energy companies, including the Great British Insulation Scheme (previously known as ECO+) which was launched in 2023 and delivers improvements to a wider range of households than are eligible for other schemes.[63]

In September 2023, the government announced that they would no longer pursue higher minimum energy efficiency standards for landlords.[64] These measures were originally consulted on in 2020.[65]

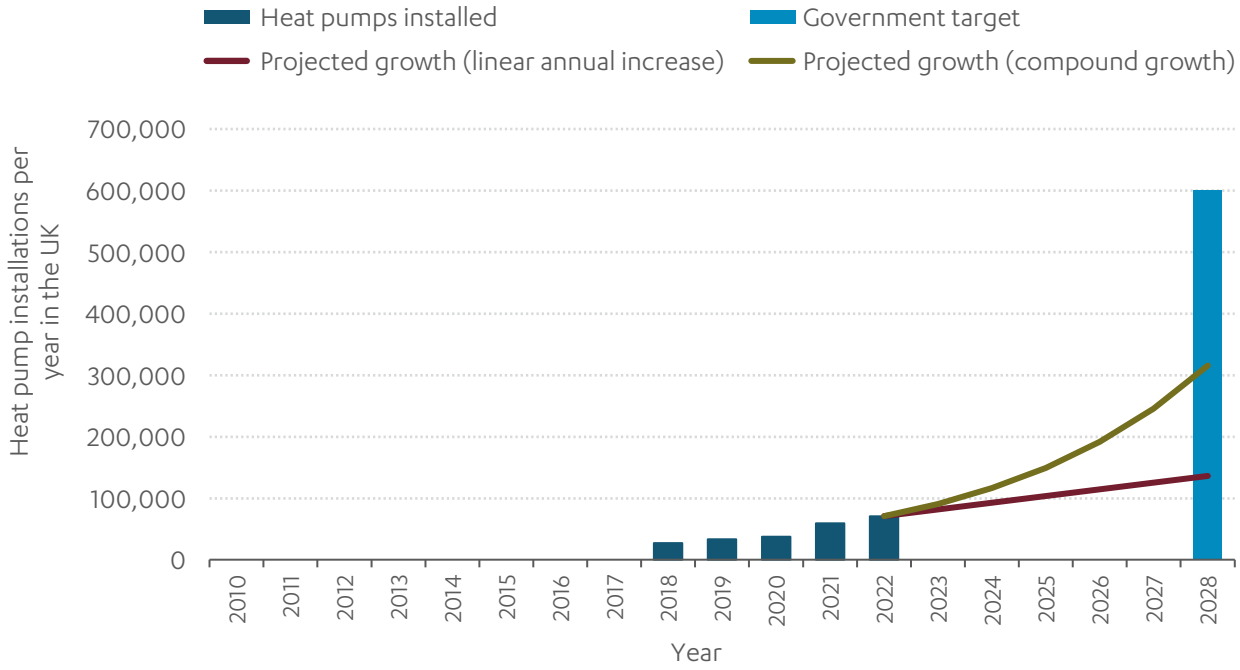
Change in infrastructure over the past year

Heat pump installations increased to 71,000 in 2022, a 19 per cent increase on the previous year.[66] However, even assuming a 30 per cent increase in installations per year – roughly the average over the last five years - the target for 600,000 heat pump installations per year will not be met (figure 2.3).

There is evidence that the government's recent increase to the value of the Boiler Upgrade Scheme grant has increased take up. There were 7,290 applications for the scheme between October and December 2023, a 75 per cent increase over the previous three months.[67]

Figure 2.3: Heat pump installations are growing, but the government's target is unlikely to be met

Number of heat pump installations in buildings, 2018 to 2022, United Kingdom

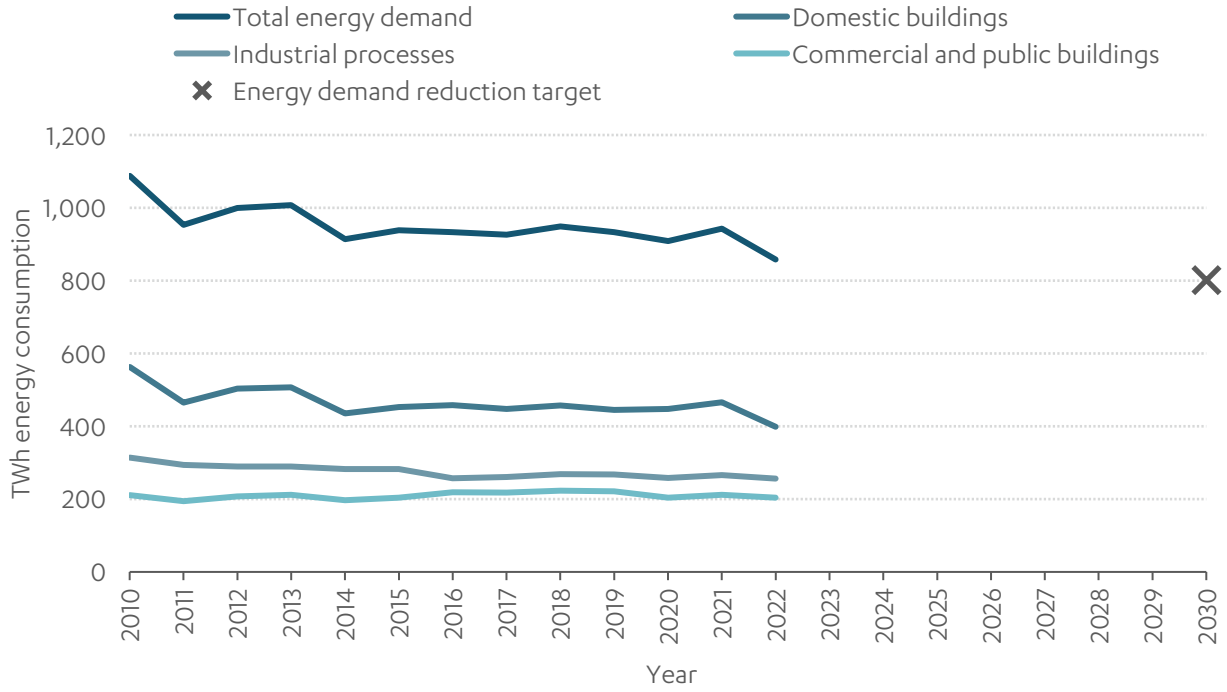


Source: Climate Change Committee – Mitigation Monitoring Framework (2023), Department for Business, Energy and Industrial Strategy (2020), The Ten Point Plan for a Green Industrial Revolution

Energy demand from domestic buildings fell significantly in 2022.[68] This is most likely to be driven by high energy costs rather than improved energy efficiency. The average energy efficiency rating of homes has not significantly improved since 2020, and the proportion of homes with key insulation measures, such as loft and wall insulation, has also remained flat.[69]

Figure 2.4: Energy demand fell significantly in 2022, driven by domestic buildings

Total energy consumption from domestic and commercial households and industrial processes 2010 to 2022 and government 2030 target, United Kingdom



Source: Department for Energy Security and Net Zero – Digest of UK Energy Statistics, Table 1.1, 1.1.5 (2023)

Assessment of progress

Government is not on track to deliver its commitments on heat.

Government's current policies are not sufficient to deliver its stated targets for 2028, nor to switch seven million buildings from fossil fuels to electrified heating by 2035, as is required to meet the sixth carbon budget.

The increase in the maximum subsidy for heat pumps in the Boiler Upgrade Scheme is welcome and in line with the recommendation in the second Assessment. But funding alone cannot overcome the barriers to deploying clean heat, and the promised amounts are not sufficient to deliver the required change. Other barriers to electrifying heat include low public awareness, a nascent supply chain and the continued failure of government to make progress on reducing the running costs of a heat pump relative to a gas boiler. Recent decisions to delay or reverse regulatory policy will also slow the transition and make it harder for government to meet its targets. These policy changes add uncertainty, discourage households from switching to low carbon heat, and discourage businesses from investing in the sector. These decisions will also necessitate speeding up an already ambitious deployment trajectory in later years.

Waiting until 2026 to make a decision on the role of hydrogen in heat compounds this uncertainty. As the Commission set out in the Assessment, there is no public policy case for providing support and government should therefore rule out providing public support for hydrogen heating.

These challenges must be urgently resolved to meet the sixth carbon budget. Government has said that they are confident they can meet their target for deployment of 600,000 heat pumps a year by 2028 despite recent changes in policy. Government must set out how this will be possible, as deployment is clearly off track.

While energy demand from buildings and industry has decreased in the last year, primarily driven by high energy costs, there is no concrete plan for sustained demand reductions through increased energy efficiency. Government is relying heavily on centrally managed funding pots which are not big enough or sufficiently long term to drive meaningful change. Government should ensure that funding streams for energy efficiency are sufficiently long term to allow the industry to plan ahead, and devolved to local authorities for delivery rather than being centrally managed.

There are particular weaknesses in policy to support the owner occupied and private rented sectors. Cancelling higher energy efficiency standards in the private rented sector has created material uncertainty for landlords and tenants. There is no effective policy to replace these regulations and tenants will pay higher energy bills as a result.

Government must begin planning to decommission or repurpose the gas grid. This should include ending new connections to the gas grid from 2025 and ruling out government support for hydrogen for heat. Failing to plan for this transition risks placing higher costs on vulnerable households. As households and businesses switch to electrified heat, the costs of running the gas network will be shared between a smaller number of remaining gas users. An unplanned transition may mean that those last remaining users are households who would find it most difficult to switch, and are least able to bear the additional costs of running the network.

- **Taking long term decisions and demonstrating staying power: Not met.** Government has set out some actions to drive heat pump deployment and energy efficiency, but there is limited detail beyond 2028. Recent announcements have added to confusion about the long term direction of policy. These include the announcement that 20 per cent of homes would be exempted from transitioning to low carbon heat in 2035 and the decision to delay the implementation of the clean heat market mechanism just weeks before implementation. Waiting until 2026 to make a decision on the role of hydrogen in heating is also creating long term uncertainty for the sector.
- **Policy goals must be matched by effective policies to achieve them: Not met.** Policies to deliver low carbon heating such as the increased Boiler Upgrade Scheme grant should deliver progress in the short term. But these policies are not sufficient for the task at hand and, as the National Audit Office has observed, the overall pathway for decarbonising heat is not clear.[70] Current policy for decarbonising heat relies heavily on centrally controlled funding pots, and is not supported by effective regulatory, financial or enabling policy. A concrete plan is needed for improving energy efficiency in homes, particularly in driving action for owner occupiers and the private rented sector.
- **Firm funding commitments: Not met.** There is no long term plan for the amount of government funding that will be required to deliver the transition to low carbon heat. Government's funding announcements for energy efficiency and heat are material but will not be sufficient to deliver the upgrades required. Longer term, stable funding is required to deliver the scale of change needed.

Government will also need to spend more, use non fiscal measures to drive improvements, or accept a lower level of energy efficiency in buildings than its targets imply.

- **Removing barriers to delivery on the ground: Not met.** There has not been sufficient action to remove barriers to the installation of low carbon heat and energy efficiency, beyond action to increase funding. Promised action to rebalance the prices of electricity and gas has not yet taken place. This is critical to ensuring that the running costs of a heat pump are lower than those of a gas boiler. Consumer information, financing and logistical barriers such as planning permission remain issues, though government is taking some actions to address these, such as the recent consultation on new permitted development rights for heat pumps.

New infrastructure networks

Overview of key government policy

In line with the Commission's recommendation, government has set an ambition to store 5Mt of carbon each year through engineered greenhouse gas removals by 2030.[71]

In 2023, the government began development of a business model for engineered greenhouse gas removals, based on a contracts for difference model.[72] The government is also developing a similar business model for bioenergy with carbon capture and storage, which can produce electricity as well as negative emissions.[73]

The government has set an ambition to capture and store 20-30Mt of carbon per year by 2030, and has identified four industrial clusters where carbon capture and storage will initially be deployed.[74] The government has developed business models for transporting and storing carbon, as well as for power and industrial uses of carbon capture.[75] In March 2023, government announced that they would enter negotiations with the first eight projects over support.[76]

No bioenergy with carbon capture and storage projects entered negotiations for support in the first round of projects, though two projects did pass the deliverability assessment. Government has since consulted on potential transitional support arrangements for biomass generators, until they are able to convert.[77] Bioenergy with carbon capture and storage plants are not expected to be operational until at least 2030.

The government has also set an ambition for up to 10GW of low carbon hydrogen production capacity by 2030,[78] and is funding this capacity through the Net Zero Hydrogen Fund. The first 11 hydrogen production projects were allocated £2 billion of revenue support in December 2023, with the first projects expected to become operational in 2025.[79]

The government's transport and storage networks pathway was also published in December 2023, agreeing in principle with the Commission's strategic case for building a core network.[80] The government has also made progress on design options for hydrogen transport and storage business models, but these are not set to be agreed until 2025.

Assessment of progress

Government is making progress on developing the business models that will underpin the new networks that are needed to meet net zero, and has set out strategies for the carbon capture and hydrogen sectors. A long term plan for the engineered greenhouse gas removals sector is still needed, and the funding position underpinning some of the business models is unclear. More ambition and faster policy development will be required to support these technologies in order to meet the sixth carbon budget and government's power sector decarbonisation targets.

- **Taking long term decisions and demonstrating staying power: Partly met.** Government has set out long term targets for engineered removals, hydrogen production and carbon storage and removals. Plans are in place to support the carbon capture and hydrogen sectors, but a detailed plan has not been produced for engineered greenhouse gas removals. Government should also set out a vision for an initial core network to connect producers, users and stores of hydrogen, and emitters and stores of carbon in different parts of the country.
- **Policy goals must be matched by effective policies to achieve them: Partly met.** Government is making progress on business models to support development of the sector, but these are moving too slowly to give confidence that targets for 2030 and 2035 can be met. Government should also do more to ensure that there is demand for low carbon infrastructure, supporting users in switching away from fossil fuels.
- **Firm funding commitments: Partly met.** The government has announced up to £20 billion of funding for deployment of carbon capture and storage technologies, but has not announced how this will be allocated. Other business models have not been accompanied by firm funding envelopes, or are accompanied by funding envelopes that are too short term and relatively small. Government should also provide development expenditure support to help projects get to the stage where they can apply for a development consent order. At least £40 million per year will be required to enable the delivery of new hydrogen and carbon pipelines and storage.[81]
- **Removing barriers to delivery on the ground: Partly met.** These are nascent technologies, so delivery on the ground is limited, but government is beginning to develop an understanding of the practical barriers to deployment and how these might be mitigated, including through commissioning research on planning barriers for hydrogen projects. However, more needs to be done to ensure that hydrogen and carbon capture and storage infrastructure can be deployed in a timely fashion.

3. Growth across all regions: Digital

Government has made a genuine commitment to improve digital connectivity across the country. Delivery of gigabit capable broadband networks is progressing rapidly and, in 2024, coverage was extended to over 80 per cent of premises. This reflects significantly increased investment from operators in recent years. If operators deliver on their published plans, and government maintains the £5 billion subsidy programme for underserved areas, government will likely achieve its target to deliver nationwide coverage by 2030.

On mobile, 4G coverage from at least one operator now extends to around 93 per cent of the UK landmass, and the Shared Rural Network agreement aims to increase this to 95 per cent by 2026. Mobile network operators are also extending their 5G networks across the UK, and coverage outside of premises from at least one operator now stands at 85 to 92 per cent, a marked increase from 2022. The government has also published the Wireless Infrastructure Strategy, articulating the future framework for mobile policy in the UK, and aiming to ensure that market conditions are sufficient to deliver 5G networks. Nonetheless, certain coverage challenges remain, in particular on the rail network, and there are reports of potential delays to meeting the Shared Rural Network target.

Over the next five years, government should ensure that deployment of standalone 5G networks gathers pace. Furthermore, government must continue to ensure that all nations and regions have adequate fixed and mobile networks, even in hard to reach areas – this will be even more important as legacy networks such as 3G and the Public Switched Telephone Network, are decommissioned.

Better digital connectivity will be vital for supporting the needs of other infrastructure sectors. Government should set out plans for how the telecommunications needs of the energy, water and transport sectors will be met, and ensure that the required infrastructure is in place.

Priorities over the next five years

- Government should ensure that gigabit capable connectivity is available nationwide by 2030 by continuing to support network competition and market deployment, alongside delivering the £5 billion Project Gigabit programme to provide coverage to premises that are hard to reach.
- Government must ensure the right conditions are in place to accelerate the market led deployment of 5G. By the end of 2025, government should:
  - improve the consistency of approvals for 5G masts by planning authorities, including by allocating funding for local authority digital champions and publishing a list of the best and worst performing local authorities for site approvals
  - work with Ofcom to encourage further use of the Shared Access Licence regime to speed up access to spectrum and open up opportunities for new services, including where increased power may be needed in some locations, and to ensure it supports localised private networks
  - develop options for subsidising 5G coverage in uncommercial areas should new use cases demonstrate the need for nationwide coverage.
- Government should set out a strategy for how the specific telecommunications needs of infrastructure sectors will be achieved, including for energy and water by 2025, and road and rail by 2026, including:
  - the most cost effective network deployment models, and the extent to which infrastructure can be shared between different sectors
  - a spectrum authorisation approach that ensures access to adequate spectrum, whether dedicated national bands or shared spectrum for infrastructure users
  - clear responsibilities within government for delivering telecoms strategies
  - consideration of whether dedicated networks and spectrum or upgrades to existing networks can meet specific public policy goals, including consistent and reliable rail passenger connectivity.

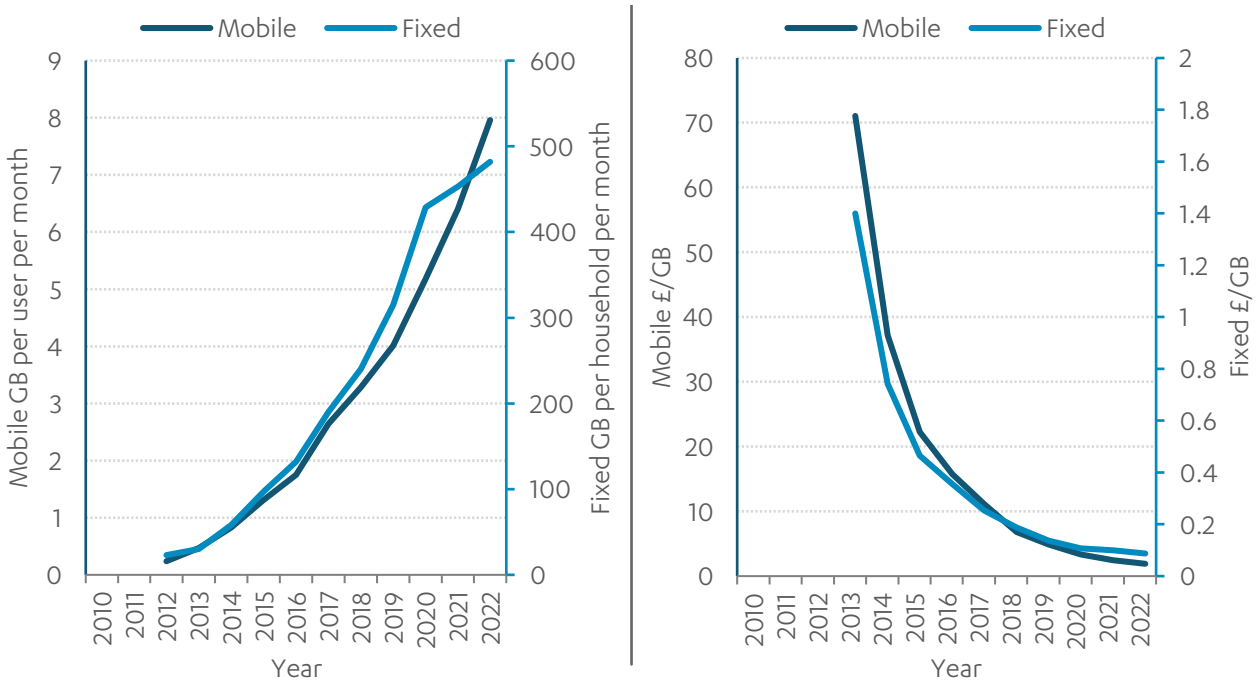
The digital sector

Digital infrastructure covered by the Commission focuses on services accessed by consumers and businesses in two categories: fixed broadband and mobile connections. There is a long term trend across these sectors of increases in consumption being matched by reductions in unit prices (Figure 3.1). Consumers pay less for mobile services than they did a decade ago, although marginally more for fixed data and voice services.[82] Recent above inflation price rises for subscription packages have raised questions about the transparency of changes in prices of broadband and mobile services, and Ofcom has consulted on introducing measures to make in-contract price changes clearer to consumers at the outset.[83]

The UK has seen strong progress on gigabit capable connectivity in recent years from around five per cent in 2018[84] when government published its long term strategy for broadband, to 82 per cent today.[85] On resilience, the UK's digital infrastructure generally performs well, however there has only been a marginal improvement in 2023 on the number of outages or disruptions (1,209) compared with 2022 (1,281).[86]

Figure 3.1: Data consumption has grown rapidly over the past decade, and unit prices have fallen at the same time[87]

Data consumption and unit price of data, 2012 to 2022, United Kingdom



Source: Ofcom (2023): Connected Nations (2023)

Note: The Commission has set out a more detailed overview of the digital sector in its Second National Infrastructure Assessment: Baseline Report Annex A: Digital, and the Commission's historic data on sector performance is available online.[88]

Fixed connections

Overview of key government policy

The government's 2020 National Infrastructure Strategy set out a goal to deliver a minimum of 85 per cent gigabit capable coverage by 2025.[89] The Levelling Up White Paper built on this target and set an aim to deliver gigabit capable coverage to at least 99 per cent of premises by 2030.[90] Gigabit capable coverage refers to connections that can provide download speeds of one gigabit or higher and can either be delivered through a full fibre connection or a hybrid fibre coaxial cable used by Virgin Media O2.

In March 2021, the government announced Project Gigabit, a £5 billion fund to support the rollout of gigabit capable broadband to hard to reach premises.[91] The 2020 Spending Review allocated £1.2 billion of this funding for the years between 2021 and 2025.[92] The government has set out the first phases of its procurement programme to extend coverage to hard to reach premises,[93] and has issued a call for evidence on reaching the hardest to reach 0.3 per cent of premises.[94] As of April 2024, more than £1.38 billion of contracts have been signed to cover over 784,000 premises. Government's announced investment into gigabit contracts so far stands at over £1.9 billion, covering up to one million premises. This is on top of the one million premises already connected by Building Digital UK earlier this year.[95]

Alongside Project Gigabit, both government and Ofcom have undertaken significant policy reform to ensure that the investment signals are right to support rapid deployment of gigabit capable networks. Ofcom published the Wholesale Fixed Telecoms Market Review 2021, which set out a series of decisions designed to support investment in gigabit capable networks, including policies to allow pricing flexibility and promote competition between networks, where viable.[96] Ofcom has begun work on the next regulatory review round, which will consider whether regulations continue to create the right environment to promote competition and investment in gigabit capable networks.[97]

The government has also continued to remove barriers to deploying new gigabit capable networks. The Product Security and Telecommunications Infrastructure Act received Royal Assent in December 2022. This made changes to the Electronic Communications Code to make it easier for operators to reach agreements to access private land to deploy telecoms infrastructure and has strengthened the rights of operators to upgrade and share existing apparatus to deploy new networks.[98]

Decommissioning legacy networks – including the analogue copper network known as the Public Switched Telephone Network – is an industry led initiative, and is not the result of a specific government decision or policy. However, in 2023 the government signed an agreement with operators to protect the most vulnerable customers when upgrading phone lines to the new digital network.[99] This agreement was designed to prevent individuals being forced to switch over until enhanced protections are in place and ensure that vulnerable households have better access to emergency services during power outages.

Commission recommendations

The Commission recommended that government set out a nationwide full fibre connectivity plan by spring 2019, including proposals for connecting rural and remote communities, to ensure that full fibre connectivity would be available to 15 million homes and businesses by 2025, and to 25 million by 2030 (with nationwide coverage by 2033). Network deployment to a significant number of premises would likely be commercially unviable, so the Commission also recommended that rollout of full fibre to these premises should be partly subsidised by government. The government endorsed this recommendation in the Future Telecoms Infrastructure Review (2018) and subsequently set targets for the roll out of gigabit capable networks that were more ambitious than the Commission recommended.[100]

To accelerate delivery of fibre networks, the Commission recommended that Ofcom should promote network competition through deregulation where possible, and by allowing access to Openreach infrastructure for alternative providers. The Commission also argued that government should improve processes for obtaining wayleaves for telecommunications providers, promote the appointment of digital champions by local authorities, and work with Ofcom to allow for copper switch off by 2025.

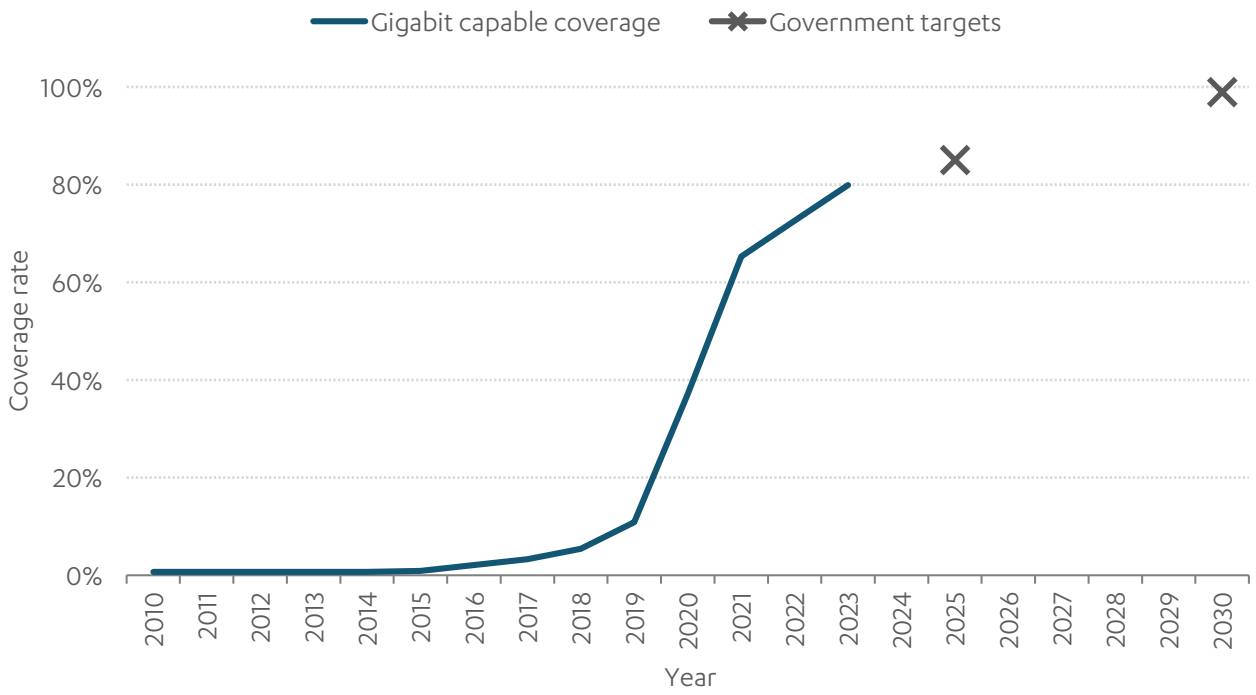
Change in infrastructure over the past year

Progress on gigabit broadband coverage has continued over the past year. Gigabit capable coverage has increased from 70 to 82 per cent (Figure 3.2), with full fibre coverage increasing to 65 per cent.[101] However, coverage remains markedly lower in rural areas than urban areas across the four nations, except for Northern Ireland, where 84 per cent of rural premises have access to gigabit capable broadband (versus 96 per cent in urban areas), the highest figure of any UK nation.[102]

Industry has also made a series of positive commitments on gigabit capable rollout. Openreach has committed to spend £15 billion to deliver full fibre to up to 30 million premises across the UK by the end of 2026, including aiming to reach six million hard to reach homes and businesses across the country.[103] As of April 2024, Openreach's full fibre coverage footprint stood at almost 14 million premises, including 3.5 million in rural areas (more than half of its hard to reach target).[104] Virgin Media O2 is rolling out full fibre in its own network and as part of their nexfibre joint venture; as of February 2024, their combined footprint has reached approximately four million homes.[105] Despite the challenging investment climate facing some smaller network operators and a period of consolidation, the 'alt nets' are also supporting investment in fibre networks with 65 per cent of premises passed so far.[106] The third largest provider, CityFibre, has passed three million homes, 37 per cent of its target of eight million premises by 2025.[107]

Figure 3.2: Government is on track to deliver its gigabit capable targets

Historic gigabit coverage and government targets, 2010 to 2030, United Kingdom



Source: thinkbroadband (2024), UK Superfast and Fibre Coverage

Assessment of progress

Government is currently on track to meet its target of 85 per cent coverage of gigabit capable networks by 2025, with coverage now at over 80 per cent. Operators' network deployment plans remain ambitious over the next few years and government is also likely to meet its target of nationwide (99 per cent) coverage by 2030 on current rates of deployment. While not all of these plans will come to fruition, due to competitive dynamics and wider market conditions, the plans are nevertheless an indication of the confidence of operators overall to continue to invest in network rollout. The 2030 target will be more challenging to meet as it requires the completion of fibre rollout in both commercial and hard to reach areas.

Government is taking a long term approach, with funding and market frameworks in place to deliver clear plans. Reaching the targets will depend on the government continuing its own programme to support connections in under served areas and on government and Ofcom ensuring a pro investment policy and regulatory framework remains in place. Securing higher take up levels for new broadband networks will be vital in ensuring that firms can make a return on their sizeable investments. While take up rates are increasing, take up of gigabit capable services where they were available at the end of 2023 was only around 42 per cent, while take up of full fibre networks was around 28 per cent.[108]

- **Taking long term decisions and demonstrating staying power: Met.** Government's goals for 85 per cent gigabit capable coverage by 2025 and 99 per cent coverage by 2030 look to the long term and account for future proofing the network. Ofcom's wholesale market review in 2021 provided stability of regulation by setting out a long term strategy and a 'fair bet' principle for network investments.
- **Policy goals must be matched by effective policies to achieve them: Met.** Government and Ofcom have undertaken significant policy and regulatory reform to support the rapid deployment of gigabit capable networks by commercial operators. However, government should try and ensure that the pace of deployment in rural areas matches that of urban areas, so that rural areas are not pushed to the back of the queue in the deployment of gigabit broadband, and there needs to be consideration on how the final one per cent of premises, the hardest to connect, will have their needs met.
- **Firm funding commitments: Met.** The £5 billion funding for Project Gigabit aligns with the Commission's own estimates. But it is important that government allocates the remaining funding through future Spending Reviews as needed. Market structures and regulation continue to incentivise significant private sector investment in the networks.
- **Removing barriers to delivery on the ground: Met.** Good progress continues to be made in rolling out gigabit capable networks. Project Gigabit has now ensured that 82 per cent of UK premises are able to access a gigabit capable connection, and government has set up the Barrier Busting Task Force to identify and remove barriers to deployment on the ground. In addition, government has consulted on the best method for reaching some of the hardest to reach premises, which may require alternative technologies such as satellites.[109]

Mobile connections

Overview of key government policy

In 2020, government reached the Shared Rural Network agreement with mobile network operators to increase 4G coverage across the country and reduce both total and partial 'not spots'.[110] To do this, the agreement includes a target that, by 2026:

- 95 per cent of the UK landmass will have 4G coverage from at least one operator
- 90 per cent of the UK landmass will have 4G coverage from all operators
- collectively operators will provide additional coverage to 16,000 kilometers of road.

The deal includes over £500 million of public investment, which is matched by over £500 million of private sector investment.

In March 2023, the government published its Wireless Infrastructure Strategy,[111] setting out its approach to 5G and 6G networks. The strategy sets an ambition for the UK to have nationwide coverage of standalone 5G to all populated areas by 2030, with the following measures included in the strategy to meet this goal:

- strengthen the investment climate for 5G, including by reviewing existing regulations on spectrum and net neutrality to ensure they are fit for purpose
- £40 million funding for regions and local authorities to establish themselves as 5G Innovation Regions to promote investment and adoption of 5G
- increase the adoption of 5G services by government and public sector
- work with Ofcom to improve reporting on 4G and 5G coverage.

The Wireless Infrastructure Strategy also set out a roadmap for 6G policy up to 2032.

Following the recommendations of the telecoms diversification taskforce,[112] the government has stated its ambition for 2G and 3G networks to be switched off by 2033 at the latest, and stated its intention to work with businesses and vulnerable groups to ensure a smooth transition away from these legacy networks.[113]

Commission recommendations

In the second *National Infrastructure Assessment*, the Commission made two recommendations on mobile infrastructure. The first of these, relating to 5G networks, recommended that supporting a market based approach to deployment was the correct strategy for government.[114] However, the Commission identified a number of areas where government could go further to accelerate network deployment, including:

- improving the consistency of approvals for 5G masts by planning authorities, including by allocating funding for local authority digital champions and publishing a list of the best and worst performing local authorities for site approvals
- working with Ofcom to encourage further use of the Shared Access Licence regime to speed up access to spectrum and open up opportunities for new services, including where increased power may be needed in some locations, and to ensure it supports localised private networks
- developing options for subsidising 5G coverage in uncommercial areas, should new use cases demonstrate the need for nationwide coverage.

In addition, the Commission recommended that government identify the specific telecommunications needs of the energy, water and transport sectors, and ensure that infrastructure is delivered to meet these needs by 2030 for energy and water, and 2035 for road and rail sectors. Ensuring these sectors have the right telecommunications assets[115], are resilient in the face of a changing climate and preparing for net zero, and bring benefits such as improved operational efficiency and support for critical functions. Strategies for how this will be achieved should be set out by the end of 2025 for energy and water and by the end of 2026 for road and rail, including:

- the most cost effective network deployment models, and the extent to which infrastructure can be shared between different sectors
- a spectrum authorisation approach that ensures access to adequate spectrum, whether dedicated national bands or shared spectrum for infrastructure users

- clear responsibilities within government for delivering telecoms strategies
- consideration of whether dedicated networks and spectrum or upgrades to existing networks can meet specific public policy goals, including consistent and reliable rail passenger connectivity.

In its study *Infrastructure, Towns and Regeneration*, the Commission made two recommendations on mobile coverage which have been accepted by government:

- Ofcom should consider crowd sourced data based on real world usage to improve understanding of mobile coverage and produce insights that can help with further optimising mobile coverage
- government should partner with towns to run innovation pilots for new communications technologies, including 5G use cases.

In *Connected Future,* the Commission also recommended the expansion of future proofed mobile coverage to the UK's rail and motorway networks.[116]

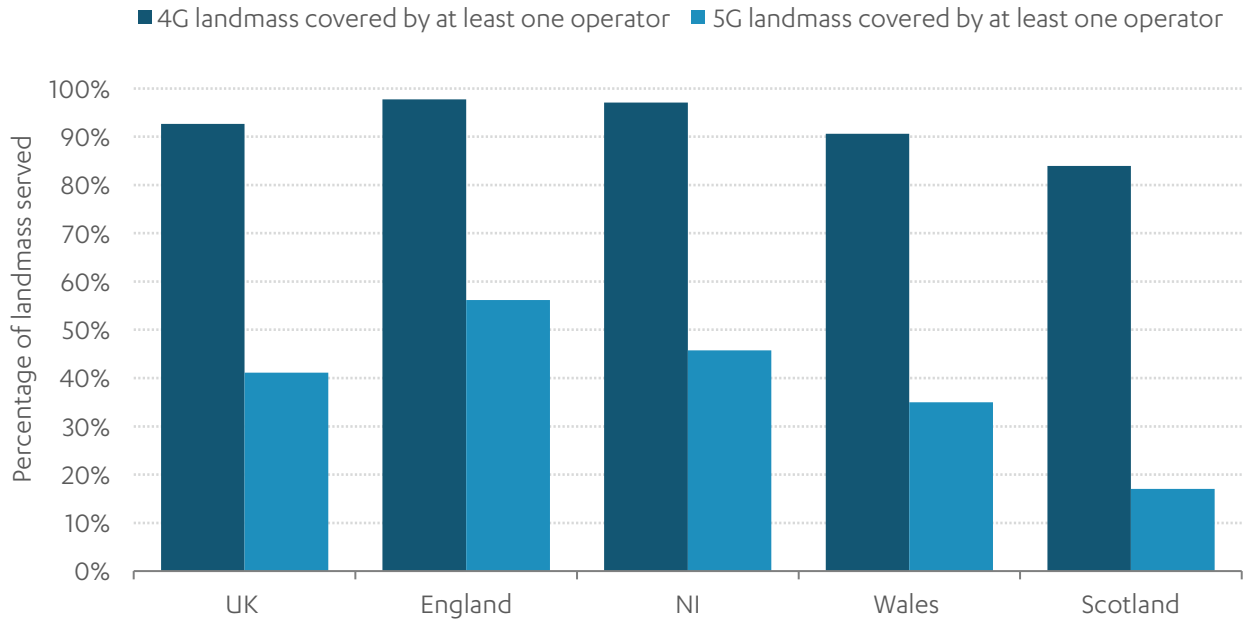
Change in infrastructure over the past year

UK 4G landmass coverage from at least one operator has remained largely flat over the past year, reaching 93 per cent (up from 92 per cent in 2022), and has increased to 71 per cent for coverage from all operators (Figure 3.3), compared to 70 per cent in 2022.[117] Mobile Network Operators have deployed more than 190 new sites since 2020 to meet the Shared Rural Network coverage commitment.[118] However, significant disparities between the nations continue to persist (Figure 3.3), largely due to lower coverage levels in rural areas and the higher proportion of rural landmass in some nations. In addition, there have been reports that three network operators may ask government to extend the 2026 deadline to meet their obligations.[119] Coverage on B roads has improved slightly since 2022, pushing up the overall level of coverage across the road network.[120] By comparison, coverage on the rail network remains poor, although at present Ofcom does not report data annually, so it is difficult to analyse how this has changed over time; government has committed to improve coverage reporting on the railways in the Wireless Infrastructure Strategy.[121]

5G coverage continues to grow, increasing from 67 to 78 per cent of the outside of premises being able to receive, respectively, a very high to high level confidence of coverage from at least one operator in 2022, to 85 to 92 per cent being able to do so in 2024.[122] There are now over 18,500 5G deployments in place in the UK, a greater than 50 per cent increase on the 12,000 reported in 2022.[123] 5G deployment has been focused on urban areas, where 34 per cent of sites now have 5G deployed on them, compared with 20 per cent in suburban areas and 10 per cent in rural areas.[124] While to date 5G deployment has predominately been non standalone,[125] around 2,000 mobile standalone 5G sites were deployed by the end of 2023.[126] The number of shared access licences, which are used by private networks, has reached approximately 1,500, up from 900 in 2022.[127] As of April 2024, there are approximately 500 active shared access licences in the 3800 MHz to 4200 MHz bands, which are suitable for 5G technology. [128]

Figure 3.3: There is now good 4G coverage of the UK landmass by at least one operator, and geographic 5G coverage is now available across over 40 per cent of the UK's landmass[129]

Percentage of 4G and 5G landmass covered by at least one operator, 2023, United Kingdom



Source: Ofcom (2023), Connected Nations 2023

Assessment of progress

As the Commission has not yet received government's response to the recommendations made in the second Assessment, it is too early to make an assessment on their progress. Nevertheless, government policy has yielded good results in improving nationwide mobile coverage. The Shared Rural Network sets out a clear, long term plan for 4G mobile connectivity across the country. While there has been some improvement in road coverage, coverage on the rail network remains poor, and there has been no release of coverage data since 2019. The reporting of coverage on the rail network should improve following measures set out in the Wireless Infrastructure Strategy, which should make it easier for the Commission to assess progress in this area.

- **Taking long term decisions and demonstrating staying power: Met.** There is a long term strategy in place for 4G coverage and government has articulated a long term strategy for both 5G and 6G, through the Wireless Infrastructure Strategy.
- **Policy goals must be matched by effective policies to achieve them: Partly met.** There are clear goals for 4G coverage and plans to deliver them through the Shared Rural Network. The government also set out its ambition for standalone 5G coverage to reach all populated areas by 2030. However, the government should work with the sector to accelerate 5G standalone deployment so that planned investment is delivered. On 4G, reports that an extension to the Shared Rural Network deadline may be required are concerning, and government should work with operators to ensure that the end of 2025 deadline to deliver combined coverage to 95% of the UK can be

met. Government should also help to identify how new networks can benefit other sectors of the economy, including other infrastructure sectors within the Commission's remit. The Commission recommended that government sets out the telecoms needs (including mobile) in the energy, water and rail sectors as part of the Second National Infrastructure Assessment, and the Commission looks forward to receiving government's response to this, as well as the other recommendations on telecoms which were made in the report.

- **Firm funding commitments: Partly met.** There is clear funding in place for the Shared Rural Network agreement from government and the private sector. In the Wireless Infrastructure Strategy, government has set out an ambition for nationwide standalone 5G coverage. Although the current investment climate for new mobile networks is challenging, competition between operators and operators' plans for roll-out indicate that there will likely be significant network investment over the next few years. Despite the potential benefits of 5G, there is not yet a case for public funding due to the present lack of strategically important use cases. Many uses can currently be supported by other telecoms technologies (such as 4G or WiFi), although this may change as new 5G standards are released and if new use cases emerge. Government should consider the options for subsiding 5G coverage in uncommercial areas should new use cases demonstrate the need for nationwide coverage.
- **Removing barriers to delivery on the ground: Partly met.** There continues to be some increases in coverage from 4G networks, with additional sites being deployed to deliver the Shared Rural Network, although coverage is still poor on mainline rail routes. 5G networks are at an earlier stage of deployment, and while standalone networks have only started to be deployed recently, this should accelerate over the coming years. There has been some progress in removing barriers to delivery in these areas, such as on planning, but this does remain a blocker which is slowing the deployment of 5G networks in particular.

4. Growth across all regions: Long term plan for rail

To support stronger economies in the North and Midlands and redress regional disparities, the government needs a new long term plan for rail with a steady delivery pipeline, as part of an integrated interurban transport strategy.

Rail journeys between major cities in the North and Midlands can be slow and the services unreliable. A long term plan must address the key connectivity, capacity and reliability issues on the network and be prioritised to support improvements in productivity and economic rebalancing. The government's plans could address a number of these issues but greater specificity is needed regarding the scope, cost, benefits and schedule for the schemes individually and as a package.

Areas with poor connectivity that are not addressed by the government's current plans, such as the Transpennine Route Upgrade and Midlands Rail Hub, include lines connecting Birmingham to Manchester, Liverpool and the North West, and connecting Birmingham to Yorkshire via the East Midlands. For the latter, the government is considering how to integrate proposals for improvements in this area together.

High Speed 2 Phase 1 will not address infrastructure constraints on the West Coast Main Line north of Handsacre, limiting any growth in capacity for new passenger services without new infrastructure investment. In addition, the Commission's analysis suggests that without improvements, capacity could act as a constraining factor on growth in cities in the North and Midlands, such as Birmingham, Manchester and Leeds. Both connectivity and capacity issues are being compounded by poor reliability and frequent knock-on delays, affecting many of the same locations. The Commission's analysis should be further developed by the government, assessing the costs and benefits of options to address these issues, to inform a long term plan for rail, as part of an integrated interurban transport strategy. This long term plan should be supported by a renewed focus on delivering mature schemes through the Rail Network Enhancements Pipeline. An adaptive strategy should facilitate, rather than postpone, key decisions.

A long term plan is imperative

The government should bring forward a comprehensive and long term plan for rail as part of an integrated interurban transport strategy

The plan should first prioritise the maintenance and renewal of the existing network including providing appropriate levels of resilience to climate change impacts. It should also set out how rail improvements will address the capacity and connectivity challenges facing city regions in the North and Midlands and in turn how this can support improved economic outcomes.

Effective prioritisation of projects – within the fiscal envelope set by government for the Commission in the second Assessment[130] – is needed as part of this process. Spreading investment thinly across too many projects risks undermining the desired outcomes. An appropriate balance needs to be found between project design specifications, such as maximum line speed, the number of stops and cost.

A refreshed and regularly updated Rail Network Enhancements Pipeline, which at present has not been updated since 2019,[131] could be expanded to then provide clarity about the delivery timescales, each project's stage of development and the associated cost range – with already well developed schemes being delivered first to realise benefits sooner. This would enable the long term strategy to be sequenced through a steady delivery pipeline while retaining a degree of flexibility in the plan to adapt if necessary.

Having certainty over the long term pipeline of rail enhancements and renewals is important for three reasons. First, it enables local authorities to complement new transport infrastructure with investment to support regeneration and better local transport, providing a greater return on the investment. Second, it gives confidence to the supply chain to invest in the capacity and capability to deliver these projects, ultimately driving down unit costs. Third, it can act as a strong signal to the market and incentivise the crowding in of private sector investment.

Given the timeframe to take projects from their early stages to delivery, it is imperative that uncertainty is not a reason for inaction.

The Commission proposes tests for new projects to ensure they maximise the contribution of transport investment to economic and sustainability outcomes

As part of establishing a firm and clear long term plan, it is crucial that future schemes are subject to detailed consideration and planning. To facilitate this, the Commission suggests that enhancement schemes:

- Are prioritised based on a clear alignment with a spatial growth strategy – to tackle the most pressing connectivity, reliability and capacity challenges between cities in the North and Midlands.

- Represent good value when considering whole life costs including construction, maintenance and net operational subsidy requirements. The strategy should also be affordable within the fiscal envelope set by government for the Commission in the second Assessment.*
- Only be committed to when there is a good level of design maturity and understanding of the costs, benefits and risks in business cases – with schemes progressing sequentially through the Rail Network Enhancements Pipeline process.
- Form part of an adaptive strategy, ensuring the portfolio is robust to a wide range of plausible futures. Proposals should solve the problem once and for the long term, avoiding the need to improve parts of the network several times.
- Be clear on the intended use of released capacity from early in the project. This should inform the development of the design and operational plans. For example, a dedicated intercity line could facilitate significant new capacity for local services to access city centres or unlock additional train paths for freight.
- Be assessed as an entire investment programme to ensure contribution to environmental, social and economic outcomes. For example, supporting decarbonisation and improving resilience to the effects of climate change.
- Consider solutions that could be provided by alternative modes of transport more cost effectively. Projects should also be planned as part of the wider transport system, being effectively integrated with other modes.

Alongside these tests, government should carefully consider the governance and delivery arrangements for future rail projects to learn lessons and ensure that project design and management, supply chain contracting and oversight are set up to manage costs and ensure value for money.

The UK has a productivity problem which transport investment, including rail, should help to address

Productivity performance is regionally imbalanced and Britain's second cities underperform internationally

The UK has a persistent productivity problem: the productivity gap compared with France, Germany and the United States has widened since 2008.[132] Productivity also varies significantly within the UK: our second cities lag behind London and the South East[133] and the productivity gap with comparable second-tier cities in other countries is sizable.[134]

* The second Assessment proposes rail investment sufficient to deliver significant improvements of the scale of the Integrated Rail Plan for the North and Midlands, an increase in renewal and maintenance expenditure to improve performance and provide a proportionate level of resilience to climate change and provision for rail improvements on other network priorities.

Taken together the population of the three largest built-up areas outside Greater London – Greater Manchester, the West Midlands and West Yorkshire – have a population of over seven million.[135] Improving the productivity of these second city regions, while maintaining economic performance in higher productivity regions, would have a significant effect on national productivity and reduce regional disparities.

A well functioning transport system is a necessary, but not sufficient, condition to support improved economic outcomes in the UK's second cities. Transport can support improvements to productivity and economic growth in two main ways: enabling the efficient movement of goods and services to support trade and specialisation, and expanding the labour markets of cities to enable dense clusters of economic activity.[136] In turn, this can help attract new private sector investment, foreign direct investment and create jobs which can drive improved regional performance.[137]

Rail can play a key role by enabling trips both from the suburbs and nearby towns and cities to city centres and by enabling long distance connections between cities. Shorter distance trips enable access to dense and congested city centres for employment and leisure. Long distance connections support the movement of goods and services between places. Although the network is more commonly used for passenger transport,[138] rail is also an important means for transporting bulk resources and goods across the country and the government has set a target for growing rail freight by 75 per cent by 2050.[139]

Transport needs to be aligned to regional and local economic strategies encompassing skills, land use and housing, that can support and attract high value firms and high skilled labour. However, transport investment can redistribute economic activity and potentially widen, rather than narrow regional disparity.[140] The distributional effects of transport projects need to be carefully considered, with integrated transport, economic and spatial development plans.

As outlined in the next chapter, to improve productivity in Britain's major cities outside of London, the Commission has already recommended £22 billion investment to upgrade the capacity and performance of the urban public transport networks in the second Assessment with the initial focus on Birmingham, Bristol, Leeds and Manchester. Mass transit, using buses, trams and rail, or a combination of these, can improve transport capacity in cities.

As the rail network plays a role in both local and national transport systems, joined up planning between local, subnational, pan-regional, and national authorities and different transport agencies will be vital. Arrangements such as those proposed in the Trailblazer deeper devolution deals for Greater Manchester,[141] the West Midlands[142] and more recently the North East[143] can support more effective joined up planning and decision making. Evidence and insight from pan-regional partnerships and sub-national transport bodies, such as Transport for the North and Midlands Connect, will be crucial to informing a long term plan.

Rail reform needs to improve reliability and passenger experience

Cancellations are more likely in the UK than Europe and are getting worse, with punctuality also declining

Reliability is one of the key determining factors for people's travel choices and user satisfaction.[144] Without improvements to reliability and perceptions of it, confidence in using the rail network and overall train passenger numbers are likely to be negatively affected over the long run.

Cancellations are more than twice as likely in the UK than the EU[145] and have nearly doubled since 2015-16.[146] In 2023-24, only around 86 to 87 per cent of services arrived at their final destination punctually, having improved during the pandemic when fewer trains were run (measured as the Office for Rail and Road's Public Performance Measure). This is the same as in 2019-20 but down by around five percentage points compared with the years between 2008-09 and 2013-14.[147] Both industrial action and severe weather, amongst other factors, have affected punctuality and reliability in recent years.[148]

Rail reform presents an opportunity to significantly improve the passenger experience

The creation of Great British Railways will establish a single organisation to own the infrastructure, receive fare revenue and plan and run the network. The intention is to improve punctuality and reliability, make the railways easier for users – through measures such as integrating ticketing – and improve efficiency and service integration. Fare simplification and pricing will also be under the control of this single body, which could enable it, in conjunction with government, to set a fares policy based on government objectives such as affordability for passengers, as well as promoting growth objectives. These operational changes are in addition to providing a clear, long term plan for rail infrastructure improvements and decarbonisation of the network.[149] All of this will be essential to providing an improved service and supporting better long term outcomes. It is important that rail reform progresses in a timely fashion to realise these benefits.

Delay pinchpoints cluster near major stations and junctions

Rail reform is only a partial solution to improving performance, with infrastructure also acting as a constraining factor on capacity and reliability. Pinchpoints and bottlenecks constrain capacity for long distance, local and freight services. This can be exacerbated by a mix of slower and faster traffic operating on the same line which limits the capacity compared to a more uniform service pattern. The Commission's analysis of reactionary delay – an indicator of areas prone to reliability issues – highlights stations and major junctions in Birmingham, Sheffield, Leeds, Manchester, Crewe, Wolverhampton and York as major bottlenecks that lead to performance issues in the North and Midlands.[150]

Connectivity and capacity: the infrastructure challenge for rail in the North and Midlands

More capacity is needed to facilitate greater employment density in city regions and better connect cities to their suburbs and nearby towns

City centre accessibility for Britain's second cities, measured by the share of population that can access the city centre in 30 minutes, is well below the European average for similar places.[151] This relative underperformance is partly due to the size of transport networks but also lower housing density in Britain's cities, reinforcing the need to consider transport and spatial development plans together.

Ensuring there is sufficient transport capacity and connectivity to accommodate future employment growth in dense city centres is crucial to grow Britain's second cities and their wider city regions. A key contributing factor to better economic outcomes is growing the tradable service sector, which tends to locate in city centres.[152] Rail's role in getting large numbers of commuters into city centres, alongside improvements in mass transit, is crucial to supporting agglomeration.[153]

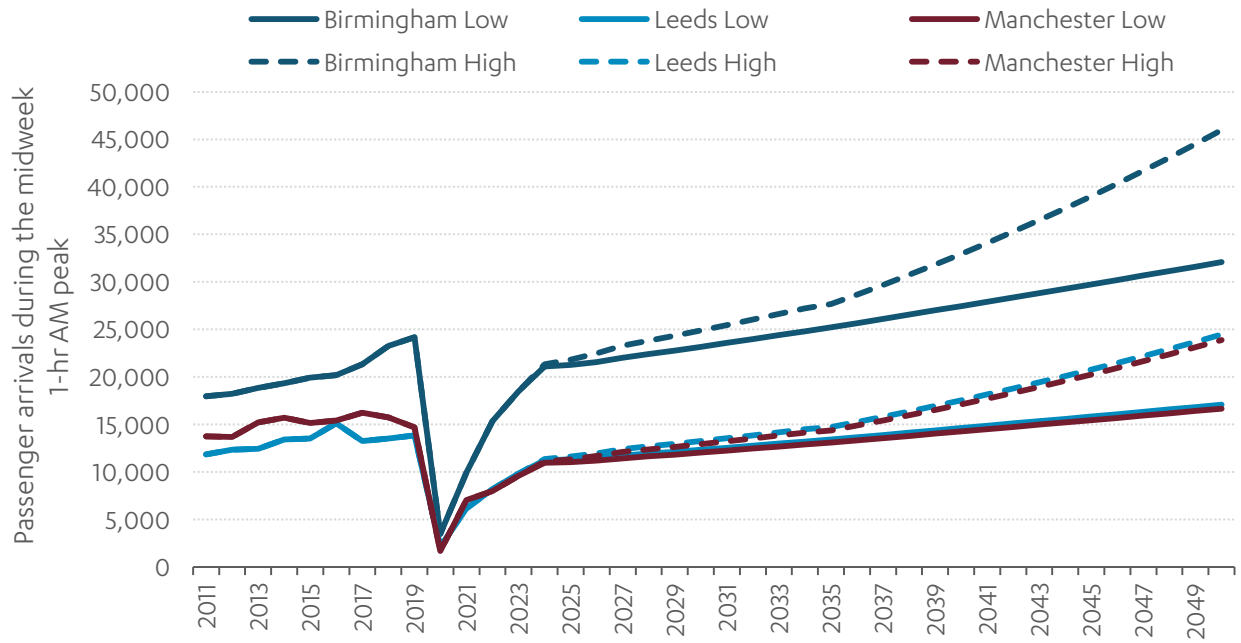
In the most recent statistics, October and December 2023, rail use has now recovered to around 80 to 90 per cent of the levels seen before the Covid-19 pandemic. The range reflects the difficulty in making a direct like for like comparison between 2019 and 2023 due to the changes in accounting for trips made on the Elizabeth line, where the central section opened in 2022 (see the endnote for more details).[154] Rail passenger forecasts produced for the Railway Industry Association suggest rail passenger numbers could grow at an average of between 1.6 and 3 per cent per year, as a compound average growth rate, to 2050, driven by economic, social and demographic factors as well as the attractiveness of the rail service provided.[155] However, growth rates for each individual city and for specific services within a city will vary depending on a number of factors, including the spatial distribution of population and economic growth, and any capacity that may be provided with the development of other forms of public transport in major cities, as the Commission previously recommended.

In 2019, Birmingham, Leeds and Manchester were the three cities with the highest proportion of rail services with passengers in excess of standard class capacity in the North and Midlands – between 21 and 38 per cent of all services during the one hour morning peak.[156]

Applying the above national growth projections to current passenger levels in the morning peak provides an indication of the level of passenger numbers that could be expected in the morning peak in the future. The analysis suggests that over the next two decades overall passenger arrival numbers could be significantly higher than in 2019 as shown in Figure 4.1. For example, by 2045 Birmingham could have between 23 and 61 per cent more passenger arrivals during the morning peak than in 2019, Manchester between 5 and 38 and Leeds could see an increase of between 14 and 50 per cent. Withough uplifts in capacity, this could lead to significantly worse crowding outcomes.

Figure 4.1: Demand could be significantly higher than in 2019 in cities in the North and Midlands. Without investment in capacity this could lead to worse crowding outcomes

Projections of the demand, to 2050, for rail travel to Birmingham, Leeds and Manchester during the morning peak by applying national level growth rates to each city



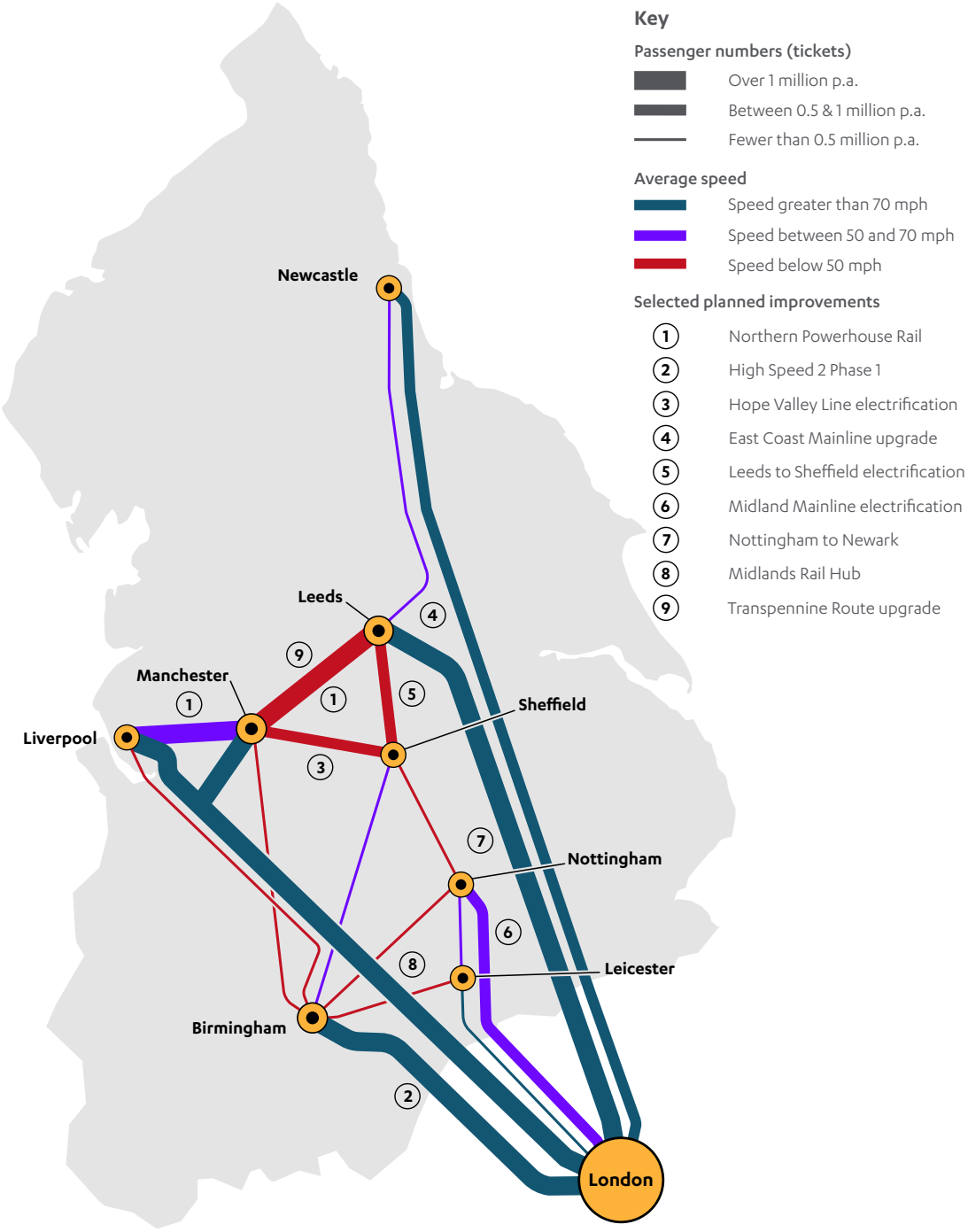
Sources: Department for Transport (2023), Rail Passenger numbers and crowding on weekdays. Office of Rail and Road (2023), Passenger journeys by operator. Steer for the Railway Industry Association (2024), Research on Long-Term Passenger Demand Growth.[157] Published arrivals data is used as a starting point, with recent national observed changes from the Office of Rail and Road applied and then projected forward using Steer's future scenarios.

Improved connectivity between major city regions can support improved trade in services and specialisation

Improving connectivity between cities can also support better economic outcomes by increasing the propensity for business interaction and increased competition, which in turn can lead to specialisation and the development of clusters in some sectors.[158] These effects can be seen through improvements on both the road and rail network and as such underscores the importance of planning these modes in an integrated way. The simple graphical representation, in Figure 4.2, of the largest built-up areas in the Midlands and North shows connections between them are slow. The connectivity they provide is much poorer than to London. This mirrors the Commission's findings in the *Rail Needs Assessment* which found that rail services in the North and Midlands can be slower than those in the South and other comparable countries.[159] This is likely due to less direct or slower services provided by the infrastructure but may also be due to service patterns and stopping frequency. Figure 4.2 also shows the relative importance of different connections based on recent ticket sales. It highlights the importance of London as a destination as well as the Transpennine route from Liverpool to Leeds and Sheffield via Manchester, despite its relatively slower connections. Also notable is the lack of journeys made between the East and West Midlands and between the Midlands and the North compared to those across the North – although improvements in connectivity and capacity may increase the number of rail journeys between them.

Figure 4.2: Connections between cities in the North and Midlands can be slow and the level of interaction is variable

Schematic representation of the rail network between major cities in the North and Midlands, showing speed and usage. Cities selected are those in the North and Midlands with a built-up area population of over 500,000



Sources: National Rail (2024), National Rail Journey Planner. Rail Data Marketplace: Office of Rail and Road (2024), Origin and destination matrix (ODM) 2019-20.[160] The Commission's analysis of normalised average journey speeds between central stations of city pairs and ticket sales data between pairs of built-up areas. Built-up areas are used to represent travel to and from the wider city regions. For example, trips to and from West Yorkshire built-up area are represented by Leeds station on the map. The ticket sales for travel between these places should not be taken to be the utilisation of services between these places due to the passengers using the services for travel to or from intermediate destinations along the route.

The Commission's analysis indicates that east-west links with relatively poorer connectivity include Birmingham to Nottingham and Leicester; across the Pennines from Liverpool to Leeds and Sheffield via Manchester; north-south links from Birmingham to Manchester and Liverpool, and; from Birmingham to Yorkshire via the East Midlands.

Schemes proposed by the government could improve several of the identified issues but greater clarity is needed

Some proposed projects should improve the issues identified by the Commission's analysis. Projects already in the advanced stages of development and delivery, such as the Transpennine Route Upgrade or the Midland Main Line electrification, should proceed as planned.

Development work is underway on the Midlands Rail Hub to improve capacity between Birmingham and Leicester and other destinations,[161] Northern Powerhouse Rail to improve connectivity and capacity across the North[162] and the Hope Valley Railway Upgrade between Manchester and Sheffield.[163]

However, some projects proposed in government's Network North are relatively immature and lack firm details of the costs, benefits and delivery schedules. Here, greater clarity is needed through the development of business cases and detailed optioneering work. An example of this is the work being undertaken by the Department for Transport, Network Rail and other stakeholders aiming to bring together proposals for rail improvements between the Midlands, Yorkshire and the North East.

Planning is needed to integrate High Speed 2 Phase 1 into the rail strategy and maximise benefits from this investment

The government has decided to cancel High Speed 2 Phase 2 from Birmingham to Manchester but to accommodate growth in passenger demand over the long term, a 'do nothing' scenario north of the proposed connection of High Speed 2 and the West Coast Mainline at Handsacre is not sustainable. The existing infrastructure is a constraint on future passenger and freight growth. Capacity and connectivity cannot be materially improved north of Birmingham without further infrastructure investment.

The West Coast Mainline provides connectivity between London, Birmingham, the North West of England and Scotland and is the busiest rail freight corridor in the UK – and one of the busiest in Europe – with over 40 per cent of the UK's rail freight using the West Coast Main Line at some point on its journey.[164] It is already running at a higher intensity of operation than major fast lines in other European countries, impacting reliability.[165] There are a number of specific bottlenecks between Manchester and Birmingham that limit capacity growth. These include Colwich junction, Crewe and the southern approach to Manchester.[166]

This prohibits any new growth in passenger services or any significant additional capacity on the line between Birmingham and Manchester and Liverpool without infrastructure investment – whether regional services for commuting or intercity services between the North West

and Birmingham or London. The requirement for freight paths on the West Coast Main Line could increase substantially and so improvements in capacity could also support growth in rail freight.[167]

There are also other improvements proposed at either end of the Birmingham to Manchester corridor – such as Northern Powerhouse Rail and the Midlands Rail Hub – which would benefit from improvements to north-south connectivity and capacity.

Options for addressing these issues have been considered previously as part of the strategic alternatives to Phase 2 of High Speed 2, commissioned by the Department for Transport, and other possible solutions are being explored through the review commissioned by the mayors of the West Midlands and Greater Manchester. The government should maximise the benefits from High Speed 2 infrastructure between London and Birmingham by examining options to increase capacity north of Birmingham.

The government has committed to complete High Speed 2 Phase 1 to Euston.[168] The necessary funding must now be secured for the tunnelling from Old Oak Common to Euston to avoid incurring greater costs from stopping and restarting work.[169] Permanently terminating High Speed 2 services at Old Oak Common has not been planned for and would provide poorer connectivity to many onward destinations in London. This is due to the poorer north-south connectivity offered by the Elizabeth Line at Old Oak Common in comparison to the multiple options provided by a High Speed 2 service stopping at both Euston and Old Oak Common. This also presents a greater resilience risk in the case of disruption on, or closure of, the Elizabeth line, as there are fewer alternatives at Old Oak Common for onward travel. If High Speed 2 terminated permanently at Old Oak Common, this would further increase the number of users on the Elizabeth Line travelling east to London, limiting its potential to support wider passenger growth in future.

5. Growth across all regions: Transport

Transport networks are important for connecting people across the country with economic opportunity and social activities. However, constraints on transport infrastructure continue to hold back our regional cities, preventing them from achieving their economic potential, entrenching regional inequalities, and impacting quality of life. Long term decisions and funding are required to improve transport services within and between cities, at the same time.

Policies to improve urban transport need to be matched by an integrated long term strategy for interurban road and rail which prioritises maintenance and renewal, and targets underperforming sections of the network to improve capacity and connectivity. To decarbonise surface transport and support the transition to zero emission electric vehicles, government needs to ramp up the rollout of charging points across the country.

This chapter assesses progress towards implementation of the Commission's past recommendations across the transport sector. This is in addition to the issues discussed in the previous chapter on rail.

Priorities over the next five years

- Government should offer necessary financial support to mayoral combined authorities to ensure the stability and reliability of their existing public transport networks over the next two years.
  - during this two year period, the government should work with mayoral combined authorities to consider the long term sustainability and resilience of existing funding models for public transport systems, and the extent to which additional or new sources of funding will be necessary to secure this
  - this funding model should recognise the full value of public transport systems to people, the economy and the environment, and consider the revenue models used by urban transport systems in comparable countries.
- Government should commit long term capital funding of £22 billion for major transport projects in cities from 2028 to 2045. The initial focus of this funding should be cities which are likely to have the greatest need for increased capacity. Commission analysis suggested that these cities are Birmingham, Bristol, Leeds and Manchester. However, other cities are also likely to be able to make the case for investment, likely on a smaller scale, and so, a proportion of the £22 billion should be made available to these cities too. The long term funding should be conditional on the following:

- cities committing to introduce a demand management scheme, in a way that is designed to work best in the local context. The exact form and sequencing of the demand management scheme should be a decision for the individual city, and revenue raised should be retained by the local area for investment in public transport and active travel
- a local contribution of at least 15 to 25 per cent towards the total cost of the investment – although there are scenarios where a higher contribution may be expected, particularly for less expensive investments. Government and the UK Infrastructure Bank should work with cities to investigate and facilitate financing mechanisms and funding sources that could include a combination of business rates retention, third party contributions, forms of land value capture, and new income streams, to support the delivery of local public transport infrastructure.

- Government needs to move faster in devolving powers and funding for local transport to local authorities. To that end:
  - by the next spending review, government should have agreed single multiyear financial settlements for existing mayoral combined authorities to invest in local priorities, and then continue to roll these out to new mayoral combined authorities
  - all county councils and unitary authorities that remain responsible for strategic transport planning should be provided with devolved five year transport budgets by the end of 2025, sufficient to cover maintenance, renewals and small to medium enhancements
  - £8 billion a year should be available for devolved transport budgets for local authorities outside London, consisting of a combination of central government grants and locally raised funds
  - government should replace short term funding deals for Transport for London with five year funding settlements, sufficient to enable both the renewal and enhancement of London transport.
- Government should develop an integrated strategy for interurban transport to frame the development of Control Period 8 for rail (2029 to 2034) and Road Investment Strategy 4 (2030 to 2035). This strategy should incorporate:
  - a long term vision for network performance and resilience which prioritises maintenance and renewal of the existing road and rail networks, ensuring proportionate resilience to climate change impacts
  - a pipeline of strategic improvements to the road network over the next 30 years, with improvements targeted at underperforming sections of the network, aligning schemes with complementary policies for economic growth and giving initial priority to interventions in regions with underperforming productivity.
  - as set out in the previous chapter, a new comprehensive and long term plan for rail enhancements to address the capacity and connectivity challenges in the North and Midlands, alongside completion of East West Rail and a portfolio of targeted network enhancements across the country.

- Government must accelerate deployment of public electric vehicle charge points to reach its expectation of 300,000 public charge points by 2030 and keep pace with sales of electric vehicles.
- Government should, by 2025, establish a monitoring and review regime for its transport decarbonisation plans that reflects the uncertainty in carbon emissions outcomes from surface transport. The need for action to ensure decarbonisation targets are met should be reviewed annually, and all relevant information made publicly available. Carefully designed, adaptive policies that can be introduced, if necessary, should be prepared as part of the work on the integrated transport strategy.
- Government should support industry to decarbonise road freight by 2050, through ensuring the sector is prepared for the infrastructure requirements of zero emission heavy goods vehicles.

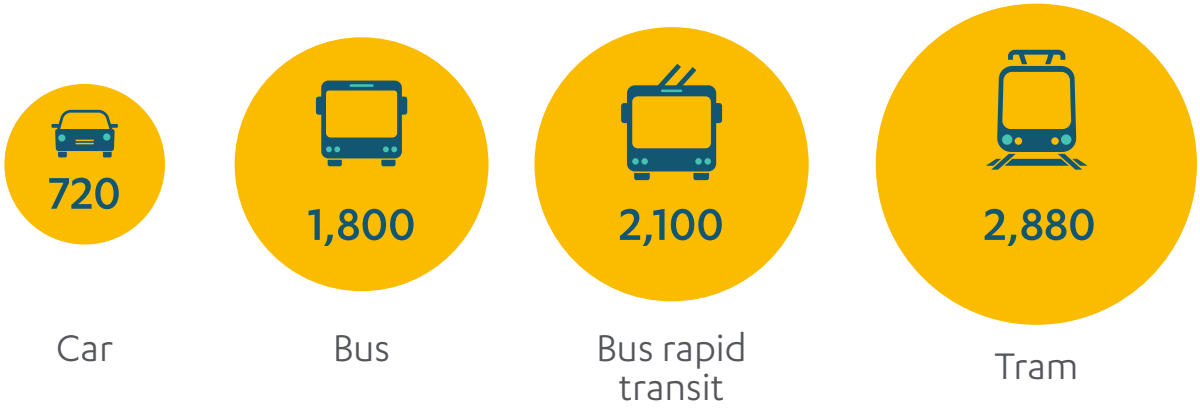
State of the sector

Transport infrastructure connects people, communities and businesses, and is essential to economic growth, productivity and quality of life. It includes the roads and rail used by transport services, stations used by passengers to access the network, fuelling infrastructure like electric vehicle charging points, and ports and airports.

Improving transport capacity and connectivity is the principal mechanism through which infrastructure can improve productivity across the UK, and support more balanced regional growth. Cities must be well connected to each other so that they can trade in goods and services, and freight distribution networks need to operate efficiently. Urban areas should be able to meet their potential for economic growth and enable people from different communities to access jobs and opportunities. Improving cities' growth potential will also benefit their surrounding regions.[170] To remove the constraints that congestion places on labour market and growth capacity in some cities, modal shift will be required from cars to other forms of travel.[171]

Figure 5.1: Mass rapid transit can move people around dense urban areas efficiently

Typical maximum capacity per lane (inbound passengers per hour)



Source: National Infrastructure Commission (2018), National Infrastructure Assessment

The 30 years before the Covid-19 pandemic saw overall transport passenger miles and freight mileage gradually increasing.[172] Modes of transport have followed different patterns, but the overall trend has been a steady long term increase, driven primarily by a rise in journeys by private car.[173] The pandemic changed travel patterns dramatically. Although total volume of travel has now reached close to pre-pandemic levels, not all modes of transport have recovered equally.[174] In October to December 2023, rail usage had recovered to between 80 and 90 per cent of pre Covid levels.[175] As of September 2023, road traffic levels had recovered more significantly, only 2.7 per cent below pre-pandemic levels.[176] The extent to which transport patterns will revert to previous trends, or whether changes in behaviour will become permanent, remains unclear but will be critical for future policy.

Lower overall patronage on local public transport systems has meant that revenue remains below pre pandemic levels in many places. And recovery patterns vary between cities. Combined with inflationary pressures on operating costs, this has created financial challenges for public transport systems.[177] There is a risk of a 'doom loop' for public transport, with insufficient funding requiring cuts to services, which then further reduces patronage and therefore revenues.[178] Without further support or an increase in overall patronage, levels of service will be difficult to maintain.

Transport remains the biggest contributor of greenhouse gases by sector, estimated to have produced 112MtCO_2e in 2023, almost 30 per cent of the UK's total carbon emissions.[179] This represents a decrease of 1.4 per cent from 2022.[180] This is the first time emissions have fallen since 2020, when travel was heavily restricted due to the Covid-19 pandemic.[181] The majority of emissions from transport are from road transport. Therefore, transitioning to a zero emissions fleet of vehicles is central to reaching net zero.

The Commission's historic data on sector performance is available online.[182]

Progress against the Commission's recommendations

Overview of key government policy

HS2 cancellation and Network North

As set out in the previous chapter, the cancellation of the later stages of High Speed 2 has created significant uncertainty for both urban and interurban transport networks. There are adverse consequences for certain cities, which have based their economic growth plans around delivery of the project in full. The government's Network North plan sets out a programme of new rail schemes, but greater specificity is needed regarding the scope, cost, benefits and schedule for the schemes individually and as a package. The previous chapter covers the need for a new long term plan for rail.

Urban transport

Further devolution and bigger local transport budgets are essential for better maintenance and continued transport enhancements across the country. This will give local authorities the freedom to identify local priorities, such as fixing potholes, zero emission buses and road improvements, and the resources to address them. Government should move away from centrally allocated funding pots for transport and instead implement flexible, long term, devolved budgets for all local authorities that are responsible for strategic transport. This will also help places develop locally led infrastructure strategies through which transport investment can be considered against long term goals and planned alongside housing and land use development to support growth.

The Commission welcomes the increased funding for the second round of the City Region Sustainable Transport Settlements, which now totals over £15 billion. The government originally announced over £8.5 billion at the 2023 Spring Budget, but announced an uplift of £6.5 billion in October as part of Network North reallocations. This includes an uplift to the second round of funding worth £5 billion, and an allocation of £1.5 billion for the new East Midlands Mayoral Combined County Authority, once established. The government also confirmed its intent to allocate £2 billion to the delivery of West Yorkshire Mass Transit in the third round of the City Region Sustainable Transport Settlements.[183] Commission analysis suggests that if this level of funding were maintained for the next 20 years, it would broadly match the level of increased investment in local public transport as recommended in the Second National Infrastructure Assessment. But to ensure cities are able to realise their full potential for economic growth, funding must be complemented by long term strategy. Government should agree a pipeline of mass transit schemes with the cities that the Commission has highlighted as likely to have the greatest capacity need: Birmingham, Bristol, Leeds and Manchester. Government should also consider other cities where there is likely to be a need for increased capacity or connectivity.

The Commission also welcomes progress made in agreeing the 'trailblazer' deals for Greater Manchester and the West Midlands, which will see both combined authorities given single funding settlements covering whole spending review periods.[184] The first settlements are expected to be implemented at the next Spending Review.[185] The announcement of a similar deal for the North East Mayoral Combined Authority is also welcome. Although the initial agreement with the North East will not include funding for transport, it is government's ambition to eventually broaden the deal to one single multi-departmental funding settlement, including a consolidated local transport budget, subject to authorities demonstrating an appropriate level of fiscal sustainability and broader institutional capacity and capability.[186] And government has also confirmed its intent to agree level four devolution deals with West Yorkshire, South Yorkshire and Liverpool City Region, which will make those regions eligible to agreeing 'trailblazer' deals with single funding settlements.[187] It is important that government makes single funding settlements available to all regions with level four devolution deals, widening and deepening devolution to local areas in terms of both funding and powers. This will give local authorities the freedom to identify local priorities and predictable resources around which they can build locally led strategies, which align transport infrastructure investment with their economic development and housing plans.

Government has the right tools to achieve its ambition to agree devolution deals with every area that wants one by 2030.[188] To keep up momentum, government should now extend City Region Sustainable Transport Settlements beyond the mayoral combined authorities to all local transport authorities, and roll out 'trailblazer' style deals to all mayoral combined authorities. But government will have to move quickly and set out further, similarly ambitious deals, to reach its 2030 ambition.

The government has also announced new funding for local transport authorities in the North and Midlands as part of Network North, which reallocated the savings associated with cancelling the later stages of High Speed 2. The new Local Transport Fund will see local transport authorities receive a share of £4.7 billion in the seven years from April 2025, to be spent on local transport solutions.[189] Funding is expected to be predominantly capital and will include a resource element to ensure local transport authorities can deliver their plans. This increased funding is welcome, but to provide local authorities with certainty and deepen devolution, government should roll in and replace all existing competitive allocations, rather than creating a new fund. Moreover, the Local Transport Fund only covers authorities in the Midlands and North.

Critically, however, new funding for local transport priorities should not be secured by forgoing the connectivity and capacity benefits that could be realised through major strategic projects. Commission analysis in the second Assessment demonstrates that funding for both local transport projects and interurban projects is possible under the Commission's fiscal remit of 1.3 per cent of GDP per year, so government should not have to choose between the two.

The government's £250 million capital funding settlement for Transport for London for 2024/25 is also welcome. But an annual settlement is a sticking plaster, and will not be sufficient to enhance London's world class public transport network. To enable the enhancement and expansion of London's transport services to support housing and economic growth, short term funding deals for Transport for London should be replaced with five year funding settlements.

Freight

In the Transport Decarbonisation Plan, the government committed to ending the sale of smaller new, non zero emission heavy goods vehicles from 2035, and to mandating that all new heavy goods vehicles be fully zero emission at the exhaust from 2040.[190] The decarbonisation of freight poses a distinct challenge, but the government has confirmed that it expects that battery electric heavy goods vehicles will be capable of meeting the needs of the majority of use cases by the 2035 and 2040 phase out dates.[191] Hydrogen technologies may play a role in harder to decarbonise applications.[192] The government has invested £200 million in a new zero emission heavy goods vehicle and infrastructure demonstrator programme, which is expected to deliver up to 370 zero emission heavy goods vehicles and around 57 refuelling and electric charging sites.[193] But government must now ensure the sector is prepared for decarbonisation, and should prepare detailed assessments of the infrastructure required to support uptake of battery electric or hydrogen heavy goods vehicles. Further details on the roles of government and industry in preparing for this transition are expected in the forthcoming zero emission heavy goods vehicle and coach infrastructure strategy.

Roads

The national road network is essential for connecting places – the road network reaches every settlement in England. The UK's economy is structured around the existing network – economic growth is dependent on the road network providing good transport links between major cities. The National Audit Office has found that progress on the implementation of the second Road Investment Strategy has been slow from the outset, due to delays caused by the Covid-19 pandemic and inflationary cost pressures beyond levels that could have been anticipated.[194] Due to these pressures, schemes like the Lower Thames Crossing have been delayed and projects earmarked for the third Road Investment Strategy are now expected to be pushed back by five years, to the fourth Road Investment Strategy.[195] Government has also delayed publication of the draft of its third Road Investment Strategy, which was expected by the end of 2023. To provide certainty to industry, developers and local authorities, government should publish the third Road Investment Strategy as soon as possible. Funding for this strategy should also match the original funding allocation of around £27 billion for the second Road Investment Strategy.

In the second *National Infrastructure Assessment*, the Commission said that government's first priority should be to maintain existing networks by investing adequately in maintenance and renewal, including ensuring resilience to climate change impacts. As well as the national road network, this should also apply to local roads – where there has been a historic backlog of maintenance spending. As part of the Network North strategy, the government has committed to increase funding for local roads by £8.3 billion.[196] But government should also plan and invest in enhancements to the networks aligned to an integrated strategy for interurban transport, targeting underperforming sections of the network with enhancements that can facilitate trade in goods and services. Commission analysis suggests that it is possible to fund maintenance and renewal adequately and pursue significant network enhancement within the Commission's fiscal remit.

Change in infrastructure over the past year

Rolling out electric vehicles

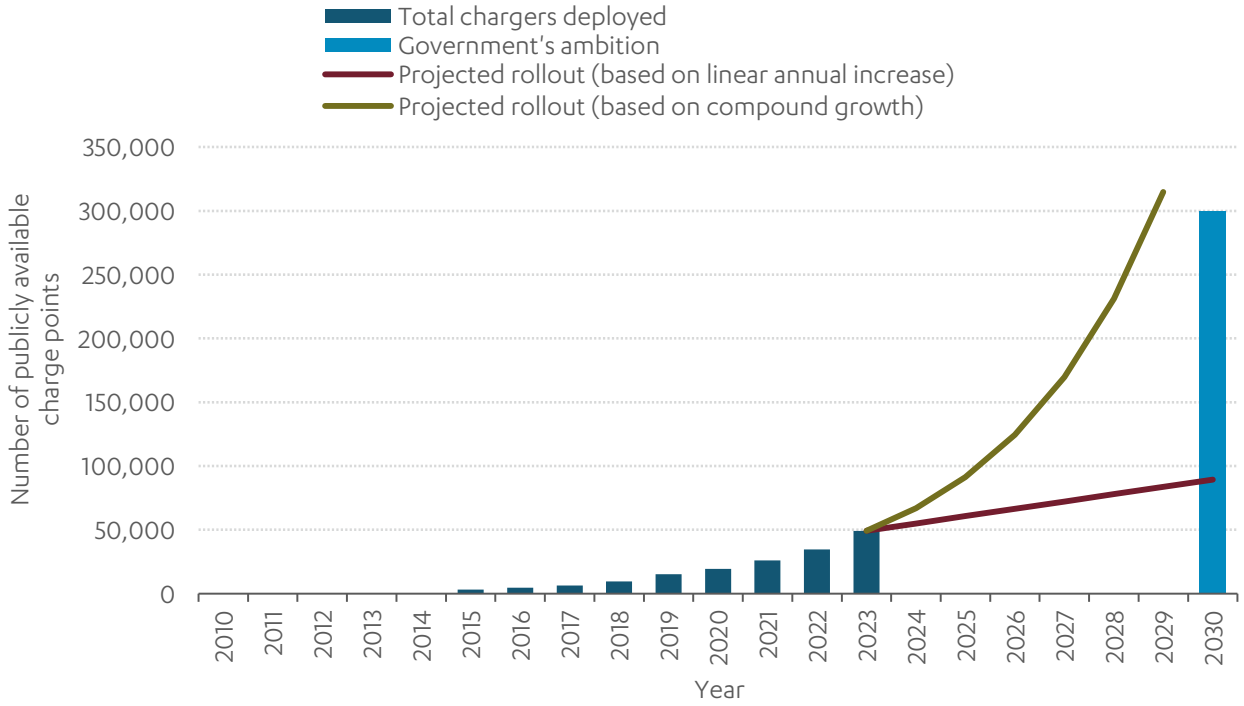
The transition of the fleet to zero emission electric vehicles is crucial for decarbonising the transport sector. Zero emission vehicles deliver better air quality and reduce noise pollution.[197] They are also more efficient and typically cheaper to run.[198] For consumers to switch to electric vehicles, they must have confidence that they will have adequate access to charging infrastructure. The government expectation of 300,000 public chargers being available by 2030 should enable this. Access to public charge points is particularly important as many drivers will not be able to charge their vehicles at home.

Deployment of electric vehicle charge points has been increasing in recent years. At the beginning of April 2024, there were 59,670 electric vehicle charging points across the UK.[199] This represents a 49 per cent increase in the total number of charging devices since April 2023.[200] Government expects that 280,000-720,000 chargers are likely to be needed by 2030. Even to reach the lower end of this range, growth would need to continue on approximately this trajectory.

Commission analysis suggests that to reach 300,000 chargers by 2030, the number of public charge points installed annually must continue to grow at around 30 per cent per year.[201] At present, charge point deployment is ahead of this figure. But maintaining this growth will become more challenging in later years. For example, in 2029, roughly 75,000 charge points will need to be deployed – more than four times as many as in 2023. Government must continue to address any barriers to deployment, such as issues in securing timely connection to the electricity network due to capacity limitations and slow progress in creating more capacity. With less than six years left to meet its ambition, government and Ofgem must address these barriers to deployment.

Figure 5.2: A rapid increase in charger deployment will be needed to meet the government's goal

Publicly available electric vehicle charge point rollout, 2015 to 2030, United Kingdom



Source: Department for Transport (2024), Electric vehicle public charging infrastructure statistics: January 2024

The government has also finalised its main policy to drive the transition to electric vehicles, the zero emission vehicle mandate.[202] The finalised mandate requires that:

- 80 per cent of new car sales are zero emission by 2030 and 100 per cent by 2035
- 70 per cent of new van sales are zero emission by 2030 and 100 per cent by 2035.

In 2030, the remaining 20 per cent of new car sales and 30 per cent of new van sales are now expected to be a mix of hybrid and purely petrol or diesel cars, rather than just hybrid as initially proposed.[203] It is nonetheless important that the share of petrol and diesel cars in the fleet reduces as quickly as possible to maximise impacts on emissions and air quality, including offsetting any increases associated with traffic growth.

Sales of pure electric and hybrid vehicles have grown significantly over the last few years, rising from three per cent of new car registrations in 2019 to almost a quarter in 2023.[204] While the market share of battery electric vehicles in March 2024 has fallen slightly from March 2023, the long term trend will continue to be towards increased uptake of electric vehicles, due in part to the implementation of the zero emission vehicle mandate.[205] Government must therefore continue to ensure the deployment of sufficient charging infrastructure to ensure consumer confidence.

Road and rail performance

To serve passengers across the country, the road and rail networks should be stable and reliable. But the condition of local roads across the country is in decline, affecting most journeys. The backlog of maintenance issues – and the cost of this backlog – is increasing. Analysis suggests the one time catch up cost to clear the backlog of maintenance issues in England would be £16.3 billion and take ten years to complete.[206] On rail, as set out in the previous chapter, reliability is increasingly an issue.

To limit further disruption, it is essential that transport networks are better maintained and renewed with resilience in mind. This will likely be more expensive in the future due to climate change, ageing assets and increased demand. Government should also publish outcome based resilience standards by 2025 to inform future regulatory settlements and infrastructure operators' climate change adaptation plans.

Assessment of progress

- **Taking long term decisions and demonstrating staying power: Not met.** Significant changes to the government's transport plans over the last year have exacerbated uncertainty for the transport sector, particularly cancelling the later phases of High Speed 2, and the lack of clarity around delivery of the Network North proposals. More progress has been made in urban transport, with greater devolution through the trailblazer deals and increased funding through the City Regional Sustainable Transport Settlements – this should provide a foundation for further progress on devolution and investment in a longer term mass transit pipeline to address shortfalls in public transport capacity. The government has also watered down the zero emission vehicle mandate. While the finalisation of the mandate is welcome, last minute changes raised concerns about the staying power of the policy. To provide certainty to manufacturers and consumers, government must now stick to its decarbonisation plans.
- **Policy goals must be matched by effective policies to achieve them: Partly met.** Government now has many of the frameworks it needs to achieve its policy goals, but further detail and faster action is needed to actually deliver the desired transport outcomes. The announcement of a second round of City Region Sustainable Transport Settlements and further detail on the 'trailblazer' devolution deals for Greater Manchester and the West Midlands are welcome. And the City Region Sustainable Transport Settlements should now be extended beyond the mayoral combined authorities, and the 'trailblazer' deals rolled out to all mayoral combined authorities. Local authorities must be given the freedom to identify local priorities, and the

resources to fund the right solutions through flexible, long term, devolved budgets. While progress is being made in electric vehicle charging infrastructure rollout, government must actively monitor this and other key transport decarbonisation indicators, ensuring policies remain adequate to deliver decarbonisation at the pace needed, with adaptive measures developed ready to be deployed if required. The government also continues to add further detail on how it will prepare the freight sector for decarbonisation by 2050, and will publish a zero emission heavy goods vehicle and coach infrastructure strategy this year, which should clearly set out the roles of government and industry.

- **Firm funding commitments: Partly met.** It is welcome that funding for urban transport under the first and second rounds of the City Region Sustainable Transport Settlements has been increased, offering greater certainty. And increased flexible funding allocations through the new Local Transport Fund are welcome too. But to provide longer term certainty, government should roll in and replace all existing competitive allocations across England, as it has done through the City Region Sustainable Transport Settlements, rather than creating new funds. Government's £250 million capital funding settlement for Transport for London for 2024 is positive – but still represents a short term deal rather than the long term certainty of a five year funding settlement, sufficient to enable both the renewal and enhancement of London transport. Government has introduced new funding schemes to support the rollout of public and private electric vehicle charging infrastructure, including rapid charging on motorways and A roads.[207] Less positive is the lack of detail on individual schemes to be delivered using the reallocated savings associated with cancelling later stages of High Speed 2; Commission analysis in the second Assessment suggested that funding of local and urban priorities was affordable alongside strategic rail enhancements under the Commission's fiscal remit of 1.3 per cent of GDP per year, so government should not have to choose between the two.
- **Removing barriers to delivery on the ground: Not met.** Slow progress on implementing the second Road Investment Strategy has delayed key projects, such as the Lower Thames Crossing. And the lack of clarity on strategic priorities for interurban road and rail networks does not provide the certainty that industry, developers and local authorities need. A new, comprehensive and fully costed integrated plan for investment in strategic roads should include measures to address the planning and management issues identified by the National Audit Office. Significant additional funding for cities is welcome, particularly the confirmation of £2 billion for West Yorkshire to develop a new tram network, but to ensure delivery, government urgently needs to work with cities to develop long term plans to address shortfalls in public transport capacity, and unlock the full potential of cities' economic growth through a longer term pipeline of investment in mass transit, focused on priority cities. Electric vehicle charging infrastructure, while seeing significant progress in availability, still faces deployment barriers – with less than six years left to meet its ambition, government must continue to address these, including enabling timely grid connections.

6. The environment: Flood resilience

2023 saw 11 named storms in the UK,[208] including Storm Babet which brought heavy rain and widespread disruption due to flooding.[209] Climate change is likely to increase the frequency and severity of flooding in future and the government must intensify its preparations. A more strategic and joined up approach is needed to address the growing risks posed by flooding, with a clear focus on delivering infrastructure to manage flood risk. To better direct flood resilience measures and ensure better maintenance of existing flood risk management assets, long term reduction targets are needed, accompanied by long term funding.

Priorities over the next five years

For flooding from rivers and the sea, the government should take a more strategic and long term view to tackle flood risk at a national and local level. By 2025, it should set clear, measurable targets for reducing flood risk over the longer term. This should use as a starting point the Commission's proposed standard of protection against flooding with an annual likelihood of 0.5 per cent and 0.1 per cent for densely populated areas.[210]

The government should make use of evidence such as the Environment Agency's second National Flood Risk Assessment and its Long Term Investment Scenarios, as well as discussions with local communities, to better understand what cost effective risk reduction looks like and how this might differ between areas. Any long term targets that are set should then be used to inform the levels of funding government provides for flood risk management, in line with the profile set out by the Commission,[211] as well as funding for wider resilience measures.

In line with the Commission's solutions hierarchy,[212] the government should maximise the use of nature based solutions. It should also ensure that all new development from 2026 is resilient to flooding from rivers with an annual likelihood of 0.5 per cent for its lifetime and does not increase risk elsewhere.

While the government states it has partly or fully accepted many of the Commission's recommendations in relation to surface water flooding, its response stops short of making a firm commitment to change and lacks pace in delivering the measures needed to reduce risk.[213] It should:

- implement Schedule 3 of the Flood and Water Management Act 2010 now and complete its review of unplanned increases in impermeable surfaces by the end of 2024, committing to acting fast to address issues where necessary

- take a more strategic approach to minimising future surface water flood risk by committing now to setting long term targets to reduce the proportion of properties at risk, and using the second National Flood Risk Assessment to identify new areas of risk
- require local authorities and water companies to produce joint plans which are fully costed, follow the Commission's recommended solutions hierarchy, and are subject to regular review by the Environment Agency, with input from Ofwat
- clarify that water companies should be investing in solutions to manage surface water flooding, including sustainable drainage
- devolve more funding to local authorities to address surface water flood risk.

State of the sector

Flooding affects people's lives and health as well as causing economic damage. They impact the infrastructure that people rely on for services like power and transport. The Commission has assessed three types of flooding: river flooding, flooding from the sea and surface water flooding (also known as flash flooding).

As of March 2023, more than 900,000 properties had a greater than one per cent chance per year of being flooded by rivers and the sea, while 910,000 properties had a similar chance of experiencing surface water flooding.[214] This is an increase from the previous year, where approximately 820,000 properties were at a similar risk of flooding from rivers and the sea, and 825,000 properties at similar risk of surface water flooding.[215] The Environment Agency has explained that this change is due to improvements in how it accounts for properties such as flats in shared buildings in its risk modelling, rather than an increase in overall flood risk.[216]

The number of properties at risk of flooding will grow as climate change increases the frequency and severity of rainfall in the UK, and the government must act with urgency to prepare for this. New development may also continue to add to the risk of flooding, particularly where Environment Agency advice is not followed, or where conditions set by local planning authorities to mitigate against flood risk are not followed by developers or monitored by local planning authorities. The Commission's historic data on changes to investment in flood infrastructure and in flood risk over time is available online.[217]

The Environment Agency has responsibility for 96,000 flood risk management assets, including sea walls and flood barriers.[218] In the National Audit Office's 2023 report on resilience to flooding, it highlighted the need for adequate funding for maintenance of high consequence flood assets, where the Environment Agency has estimated a shortfall of £34 million in maintenance funding for 2022-23.[219] It is vital that existing flood risk management infrastructure is maintained, where cost effective, and that this forms part of the wider strategy of flood protection and resilience. It is important that, where possible, maintenance is undertaken in a way that improves natural capital, in line with the Commission's recommendation in the second Assessment.[220]

Surface water flooding is more localised and challenging to predict than other types of flooding, and public awareness is low.[221] The National Audit Office's 2023 report on extreme weather highlighted that, unlike other forms of extreme weather such as drought or heatwaves, the government does not have good forecasting data for surface water flooding and the public often does not know which government agencies it should report this type of extreme weather to.[222] This is concerning given the speed with which surface water floods can occur, and the Commission's research has shown that few households think they are at high risk.[223]

In January 2024, the Public Accounts Committee published its report on resilience to flooding and made a number of recommendations, including that government needs to provide more leadership in addressing surface water flooding and unlock barriers to implementing Schedule 3 of the Flood and Water Management Act 2010, in line with the Commission's recommendations from its surface water flooding study.[224] The Committee also highlighted its concerns over ongoing new development in areas of flood risk without sufficient mitigation,[225] mirroring the Commission's recommendations from the second National Infrastructure Assessment.[226]

Figure 6.1: Numbers of properties in areas at high, medium and low risk of flooding by different flood risk categories as of March 2023[227]

Annual likelihood of flooding	Surface water flooding	Flooding from rivers and the sea
Number of properties at low risk (0.1 per cent to 1 percent)	2,515,000	1,153,100
Number of properties at medium risk (1 per cent to 3.3 per cent)	539,600	685,000
Number of properties at high risk (greater than 3.3 per cent)	368,800	215,000

Progress against the Commission's recommendations

Overview of key government policy

The government's response to the Commission's surface water flooding study

In November 2022, the Commission recommended a package of measures to manage surface water flooding, with the effect of reducing the number of properties at high risk of surface water flooding in 2055 by 60 per cent, and boosting protection levels for thousands more. The Commission's study set out the case for long term flood reduction targets which would help to provide strategic direction and accountability, as well as inform joint local plans and investment decisions.

In March 2024, the government published its response to the Commission's surface water flooding study.[228] While it is positive to see the government acknowledge the problem of surface water flooding and the underlying causes, its response lacks the urgency and joined up approach that is needed to effectively address the growing risk posed by this type of flooding.

The government stated that it has partially or fully accepted all of the Commission's recommendations, but it will not meet many of the timelines the Commission called for. In many instances, government action stops at agreeing to undertake a review or consultation rather than making a firm commitment to change. Surface water flooding is a growing risk and will only get worse with the impacts of climate change. The government should act now to address this and reduce further impacts to people, property and infrastructure.

The government has committed to consult on the use of sustainable drainage systems in new developments in spring 2024, and to finalise its plans for implementing Schedule 3 by the end of this year. This comes over a year after government set out its intention to implement legislation to end the automatic connection of new development to existing drainage systems.[229] The government should not delay this any longer and move to implement Schedule 3. The government will also be undertaking a review on unplanned increases in impermeable surfaces by the end of 2024 but it has not committed to implementing any policy decisions following this.

The government has taken a similar approach in responding to the Commission's recommendation that it implement a long term target for reducing risk. It has set out its intention to review a range of evidence, including the enhanced data that the Environment Agency's second National Flood Risk Assessment and Long Term Investment Scenarios will offer. The government will then decide, by the end of 2025, whether a long term target for flood risk reduction is merited.

The government has also set out its plans to consult on wider scale reforms to local flood risk management planning, to improve transparency and accountability, and has committed to make any changes by 2026. This is later than the Commission's recommended date of 2025 and the response stops short of including a commitment to remove barriers to effective joint working between different flood risk management authorities.

The government's response also does not accept the case for devolving capital funding directly to local authorities to implement joint local plans now, instead opting to consider this for future investment. Improved joint working and further devolved funding will be necessary to reduce the risk of surface water flooding, along with better identification of new areas of flood risk as soon as possible.

Flooding from rivers and the sea

The government has not yet set a long term, measurable target to reduce the number of properties likely to be flooded by rivers or the sea. Instead, it uses the more general measure of the number of properties that are 'better protected' through current flood risk efforts at a local or regional level.[230] This measure does not take account of the number of properties that see their level of flood risk worsen over time, although the government has set out its intention to use the Environment Agency's second National Flood Risk Assessment to provide a better understanding of 'net' change in flood risk from 2025 onwards.[231] Government should use this opportunity to set a long term target for reducing flood risk. This will be vital for providing a clear direction of travel, and therefore greater certainty, to the sector. Unlike the current 'better protected' measure, a long term target would require government to have a full understanding of the national level of flood risk at any given time. It would also allow more accurate monitoring of the trajectory of government progress in reducing flood risk.

The government is investing £5.6 billion in flood and coastal risk management between 2021 to 2027. This includes £5.2 billion that government committed for the 2021 to 2027 programme, as well as an additional £400 million for innovation, recovery and incident management.[232] While this is broadly in line with the Commission's funding profile, government should commit to providing similar levels of funding through to 2055, to support work towards achieving a long term flood risk reduction target. It should also ensure the level of funding is maintained to deliver the target rather than reducing the target to match the funding. This certainty of funding would support the sector to better prepare for the impacts of climate change.

The Environment Agency expects to complete its second National Flood Risk Assessment by the end of 2024.[233] This, and the accompanying Long Term Investment Scenarios, due by the end of 2025, will provide an important opportunity for government to use this improved analytical capability to set out the number of properties for which flood risk will be reduced over the long term. This would allow a more strategic approach across catchments and greater transparency by publicly setting out the areas that are most at risk, and delivering improvements there first.

While the government previously published updated planning guidance to improve consideration of flood risk,[234] the standards it has set for levels of flood resilience for new development fall short of the targets suggested by the Commission.[235] Under the government's current guidance, the required level of flood resilience for new development differs depending on the type of flood, with a lower standard of resilience for flooding from rivers than from the sea.[236] This means that new development may still be at medium to high flood risk over its lifetime and may adversely impact on levels of flood risk for surrounding areas.

The Commission awaits a response from the government on these renewed recommendations as part of a wider response to the second Assessment.

Change in infrastructure over the past year

Of the £5.6 billion government has committed to flood resilience, in 2022-23 it invested £770 million across a range of flood and coastal erosion projects. In the same period, 26,400 properties were better protected from flooding and coastal erosion,[237] and the Environment Agency reports that it has worked with risk management authorities to deliver 107 significant projects to address flooding from rivers and the sea, and surface water flooding.[238] This is slower progress than is needed to tackle the future risk of flooding in future and government must speed up its delivery of flood risk management projects. This will also help to ensure the government spends the funding it has allocated to the sector from 2021 to 2027.

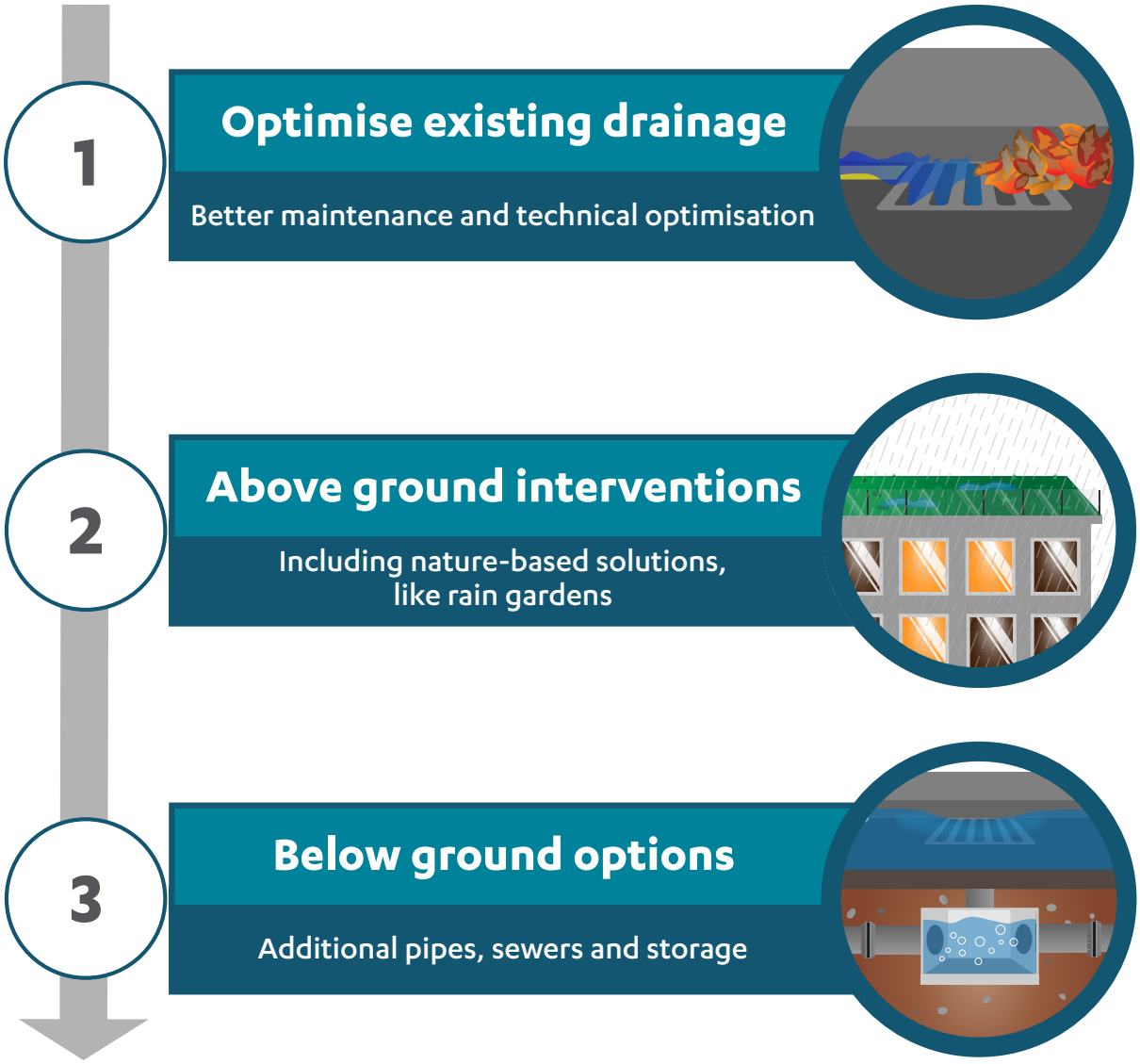
In 2023, the government announced that it would allocate £25 million in funding for a new natural flood management programme, with the aim of contributing to launching 260 natural flood management projects between 2021 and 2027.[239] This is positive progress and the government should continue to support the expansion of nature based and catchment solutions, recognising the wider benefits they bring beyond flood management, as the Commission has previously recommended. Given the uncertainties in the performance of natural flood management solutions, and how their effectiveness may vary over time, the Environment Agency should ensure they are adequately monitored, and continue to build the evidence base on their performance.

In late 2023, the Environment Agency launched its Property Flood Resilience 2 Supplier Framework. This provides access to suppliers trained to a consistent standard in how to survey properties for flood risk and install property level flood resilience measures.[240] The Environment Agency also reports that it is planning to take more of a strategic, leadership role in tackling surface water flooding, helping to share best practice in the sector.[241]

Drainage and wastewater assets owned by water and sewerage companies also have a key role to play in helping to reduce the risk of surface water flooding by investing in solutions to improve drainage. The economic regulator, Ofwat, is currently carrying out its price review of companies' business plans for the period covering 2025 to 2030,[242] and the sector should use this opportunity to ensure that drainage assets can handle the increased levels of rainwater that are likely to occur in the future. Drainage and Wastewater Management Plans must address surface water management, including by setting out the levels of investment needed for asset maintenance and enhancement. Investment in asset enhancement should be in line with the funding profile set out by the Commission in its report on surface water flooding, equivalent to approximately £240 million per year to 2055.[243]

In 2023, government announced that an initial round of funding, totalling £26 million, had been allocated from its Frequently Flooded Allowance. This is ringfenced from the £5.2 billion capital investment programme and will go towards 53 projects across England in areas repeatedly impacted by flooding.[244] It is crucial that the rest of this allowance, when allocated, is accompanied by a longer term approach to supporting local communities at risk of repeated flooding.

Figure 6.2: The Commission's recommended surface water flood risk reduction intervention hierarchy



Assessment of progress

The government's progress on flood risk management infrastructure in the past year has been slow and the need for a more strategic approach is becoming increasingly clear. The Environment Agency has benefitted from the stability of a budgetary settlement from 2021 to 2027. However, as the end of that period approaches, a longer term plan is needed to ensure that the sector has the direction and certainty it needs to prepare for the future.

- **Taking long term decisions and demonstrating staying power: Not met.** The government has not yet set out measurable targets, or investment plans for flood resilience beyond its 2021 to 2027 investment cycle, as the Commission recommended in the first Assessment from 2018. This risks a continued approach to flood risk management that is ill equipped for the impacts of climate change.

For surface water flooding, the government has only partially accepted the Commission's recommendation to set a measurable, long term target for reducing flood risk, instead favouring further analysis of the evidence base for different indicators for flood risk.[245] The Commission does not believe this should prevent the government from committing to setting long term targets in principle and urges it to undertake this work as soon as possible.

- **Policy goals must be matched by effective policies to achieve them: Not met.** The National Audit Office's recent report has highlighted that the government is failing to meet the short term flood risk targets it has set to 2027, due to a range of factors including inflation.[246] This emphasises that a change in approach is needed. The government must use the opportunity provided by the completion of the Environment Agency's second National Flood Risk Assessment at the end of 2024, and Long Term Investment Scenarios at the end of 2025, to take a more strategic approach to managing future flood risk.

  The Commission remains concerned at the pace of government plans to address the impact of new development and urban creep on surface water flood risk. The number of properties at risk of surface water flooding is increasing, compounded by the impact of climate change. To limit this, the government should implement Schedule 3 now, and take steps to reduce the growth in unplanned impermeable surfaces or otherwise increase the funding it provides for flood resilience measures. The government's own review from January 2023 recommended that Schedule 3 be implemented as set out in legislation.[247]

- **Firm funding commitments: Partly met.** The government has allocated £5.6 billion for the period covering 2021 to 2027,[248] which includes £200 million to support innovation in the flood sector.[249] Though this is a doubling of funding levels prior to 2021,[250] this commitment does not provide the certainty needed to allow risk management authorities to address flood risk over the longer term as it is not underpinned by a clear long term target. In the second Assessment, the Commission outlined that a rolling programme of around £1 billion to £1.5 billion per year will be needed to protect households and businesses from flooding over the next 30 years.[251]

  Having long term targets in place can help to provide confidence that investment in flood infrastructure is providing value for money. It will also help to limit the risk of funding falling short of the amount needed to achieve government targets.

  Managing the condition of existing infrastructure so that it is fit for purpose is an important part of flood resilience. In the second Assessment, the Commission set out the need for funding to be set aside for maintenance and renewal of infrastructure, including calling for this to be accounted for as a separate category of spend, planned through five yearly budgets, and distinct from capital and operational expenditure.[252] While this is not being tracked for the purposes of this review, it is vital that asset maintenance and renewal is factored into any long term investment plans that the government makes.

The Commission's surface water flooding study urged government to clearly link funding to level of flood risk in local areas. This would direct investment to where it will have the greatest impact, with funding devolved to local authorities, in partnership with water companies. The study also found that the government's current funding model, which is reliant on grant in aid, is not effective for smaller surface water flooding schemes as it is often disproportionately time consuming to make a bid, and is not synchronised with water company business planning periods.[253] The government has not accepted these recommendations, but it is yet to clearly set out its alternative vision for how funding will be more effectively deployed.[254] It must do this as soon as possible.

- **Removing barriers to delivery on the ground: Partly met.** The Environment Agency and other flood risk management authorities continue to deliver flood resilience schemes. However, the Environment Agency failed to meet its annual target for properties better protected between 2022 and 2023, with a shortfall of nine per cent.[255] It has cited a number of factors for this, including local council resourcing, supply chain disruption and inflation across the construction sector.[256] The Environment Agency has also revised its forecasting for the number of properties that will be better protected between 2021 and 2027. This is down from 336,000 properties as originally set out to 200,000 properties, a reduction of 40 per cent.[257] This suggests that the impacts of the government's investment will be lower than expected and underlines the need to ensure there is sufficient capacity across risk management authorities to deliver the infrastructure required, a theme also highlighted by the National Audit Office.[258]

  For surface water flooding, an important aspect of reducing flood risk is through managing and enhancing the drainage infrastructure already in place.[259] This requires local authorities and water companies to work together on single, joint plans for investment in solutions to manage surface water flooding. While the government has committed to enhance cooperation following the Commission's surface water flooding study,[260] its approach is unlikely to be effective in removing barriers to joint working. The government has also failed to provide clarity on the important role that water companies have to play in helping to manage the risk of surface water flooding now, choosing instead to wait until 2027 to consider this as part of a wider review of the strategic policy statement for Ofwat.

7. The environment: Water

As the climate changes, the risk of drought in the short to medium term is increasing. 2024 is a critical year for the water sector as the economic regulator, Ofwat, concludes its next five year price review determining investment for 2025 to 2030. Funding must be made available for both new supply infrastructure and initiatives to reduce water leakage and demand. Government should also rapidly conclude its planning for water efficiency labelling, to enable the introduction of labels in 2025. Over the next five years government should also go further on coordinating initiatives to reduce water demand, including by introducing minimum product standards for water efficiency.

Priorities over the next five years

Government and Ofwat should ensure plans are in place to increase supply and reduce demand by at least 4,800 million litres per day by 2050. Action to deliver this twin track approach should include:

- ensuring that at least 1,300 million litres per day is provided by the 2030s through (i) additional strategic water transfers and (ii) additional supply infrastructure through the Regulators' Alliance for Progressing Infrastructure Development and the price review process
- the water industry maintaining its objective to halve leakage from 2017-18 levels by 2050, with Ofwat agreeing five year commitments for each company (as part of the regulatory cycle) and reporting on progress
- enabling companies to implement compulsory metered charging beyond water stressed areas by 2025, by amending regulations as appropriate and requiring all companies to systematically roll out smart meters as a first step in a concerted campaign to reduce water demand including introducing a mandatory water efficiency label and minimum product standards.

State of the sector

The water industry has a duty to deliver water that is safe and of a quality acceptable to consumers in homes and businesses across the country. Average water bills in England in 2024-25 rose by 6.3 per cent, 2.1 per cent above the annual rate of inflation.[261] However, as the infrastructure performance data published alongside this review highlights, in real terms, water bills are still lower than they were almost two decades ago.[262] Despite lower bills, water supply has become more reliable.

Although rates of unplanned outages in 2022-23 more than doubled compared with the previous year, customers are still five times less likely to experience unplanned supply interruptions now than in the early 1990s.[263] Significant drinking water quality incidents are rare, and the UK was one of only six countries to receive the maximum score in a 2022 global index measuring drinking water safety.[264]

However, in other areas the industry is not meeting expectations. The industry also provides drainage and wastewater services and the impact of wastewater on water bodies remains unacceptable to the public. While environmental water quality has improved in recent decades, as the box below highlights, significant issues remain to be addressed, including through regulatory action. Additionally, over the coming decades the UK faces a real and growing risk of water shortages, especially in the south and east of England. Too much water is being abstracted from some environmentally sensitive rivers and aquifers, so alternative sources need to be found.

Water quality

Water quality in rivers, lakes and coastal waters has improved over the last few decades, but progress has now stalled. Only 14 per cent of rivers meet the criteria for good ecological status.[265] The number of serious pollution incidents also remains unacceptably high.[266] The impact of water companies on the environment remains a concern for the public, especially in relation to the discharge of untreated sewage into rivers and seas. Public distrust has been exacerbated by historic inadequate monitoring of the scale and length of spills. The latest available data, for 2023, highlights that spills were up 54 per cent on the previous year, though this was partly because 2023 was the sixth wettest year since records began.[267] Spills harm the environment, can be dangerous for bathers and damage public trust in water industry performance.

In 2022 the government published a Storm Overflows Discharge Reduction Plan to support the industry to address this issue. This was extended in 2023 to target faster action at high priority sites, including bathing waters. This action is also supported by the Environment Agency's Water Industry National Environment Programme. To ensure value for money for bill payers, action on storm overflows will need to be coordinated with the Commission's proposed investment in addressing surface water flooding.

The factors influencing environmental water quality are complex and often interrelated. As set out in the second National Infrastructure Assessment, the Commission is interested in understanding how far a strategic programme of infrastructure investment can contribute to improving the health of England's water bodies. This could inform the government's planned review of water company investment in sewer overflows by 2027.[268]

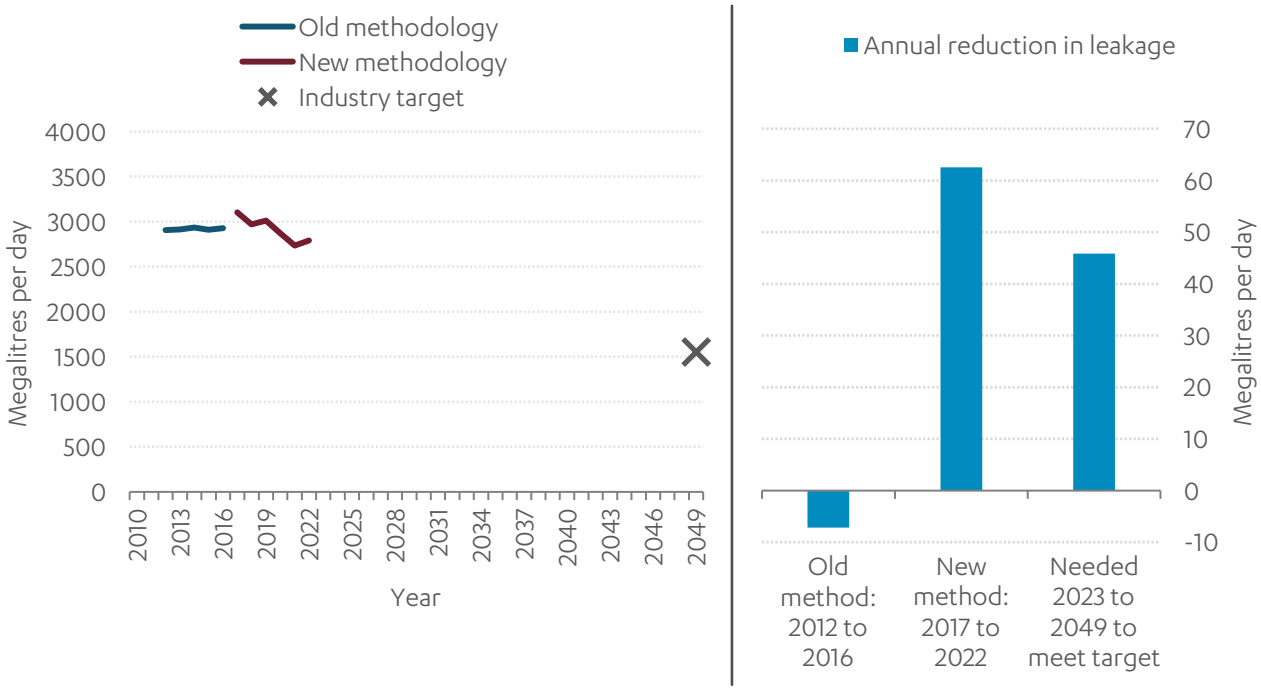
The Commission has recommended that making England resilient to an extreme drought in the face of rising population, environmental and climate pressures to 2050, would require additional capacity of about 4,000 million litres per day.[269] In revised draft Water Resources Management Plans in 2023, water companies suggested this gap is now in excess of 4,800 million litres a day.[270]

The water industry manages these and other challenges through five yearly planning cycles including Water Resources Management Plans and Drainage and Wastewater Management Plans. All these feed into water company business plans which are assessed by Ofwat's price reviews. These determine water company investment over a five year period. The next price review, completed this year, will cover the period 2025 to 2030.

The Commission's historic data on sector performance is available online.[271]

Figure 7.1 Leakage has increased despite a target to halve leakage by 2050

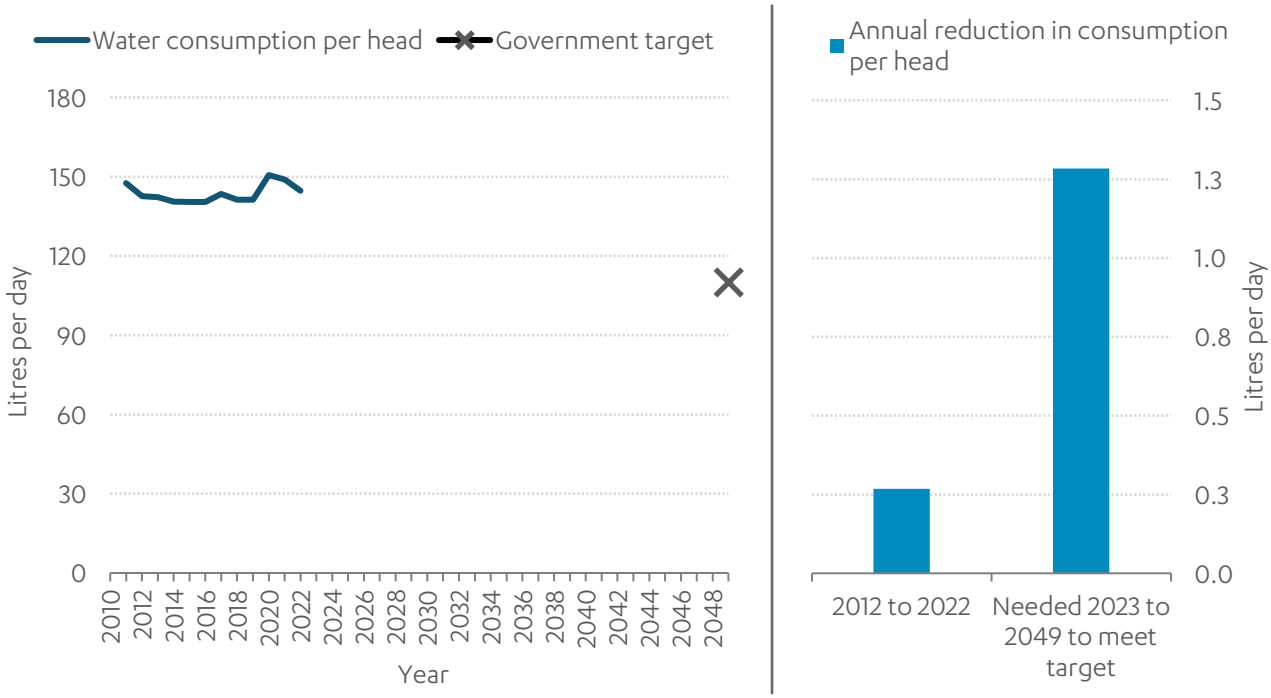
Historic and target rates of leakage 2011 to 2049 (Left chart), Rates of change 2012 to 2049 (Right chart)



Source: Ofwat (2022), **PR24 Cost Assessment Master Dataset, Wholesale Water Base Costs**, and water company performance reports 2022-23.

Figure 7.2 Water consumption is not falling fast enough to hit government targets

Historic and target rates of water consumption per head 2011 to 2049 (Left chart), Rates of change 2012 to 2049 (Right chart)



Source: Consumer Council for Water (2015), **Delving into water**; Consumer Council for Water (2020), **Water, Water Everywhere? Resilience Report 2019-20**; Consumer Council for Water (2022), **CCW 2021-22 Company Performance Data Appendices and water company performance reports 2022-23**

Progress against the Commission's recommendations

In the National Infrastructure Strategy in 2020 the government responded to Commission recommendations on improving drought resilience. It acknowledged the long term challenge and endorsed the Commission's recommendation of securing resilience to a drought with a 0.2 per cent annual probability.[272] It has also issued an updated Strategic Policy Statement for Ofwat calling on the regulator to increase drought resilience in line with the Commission's recommendation and to support the 'twin track' approach of managing demand and increasing supply.[273]

The sector is taking action to tackle leakage. At Price Review 19, water companies agreed to reduce leakage by an average of 16 per cent by 2025[274] and to halve leakage by 2050.[275] Planned leakage reduction activity includes installing sensors in water pipes, replacing mains which are more likely to burst, water pressure management, and working with customers to find and fix leaks in pipes on their property.[276]

The government has set interim targets to reduce leakage and use by 2037-38 through the Environment Act 2021. These are set on a trajectory towards reducing household use to 110 litres per person per day, non household use by 15 per cent and leakage by 50 per cent by 2050.[277] Government did not accept the Commission's recommendation on reducing water

consumption through mandatory metering, stating it wanted to explore other options. Instead of enabling compulsory smart metered charging, the government announced alternative measures to reduce consumption, including:

- Designating additional 'areas of serious water stress', where water companies can introduce charging by compulsory metering where this is cost effective and has customer support.[278]
- Acting to introduce a mandatory water efficiency labelling scheme in 2025, with enabling secondary legislation tabled in 2024, to support household demand reduction. This will be followed by a consultation on the introduction of minimum product standards.[279]
- Through a review of the Building Regulations, to be consulted on in Spring 2024, considering mandating a new water efficiency standard for new homes in England of 105 litres per person per day[280] and allowing local planning authorities to introduce standards which are tighter than the 110 litres per person per day in current voluntary guidance.[281]
- Publishing a wider roadmap on water efficiency including working to integrate water efficiency into energy efficiency programmes.[282]

In the second Assessment, the Commission considered that the government has had time to explore alternative options to compulsory metering. Based on the lack of progress on reducing demand, the Commission restated its recommendation that all water companies in England should be enabled to roll out compulsory smart metered charging.[283] Smart meters can help identify customer leaks, and alongside metered charging could deliver an up to 17 per cent reduction in demand, a large portion of the 25 per cent reduction in demand implied by targets in the Environment Act 2021.[284] However, companies and regulators should ensure that smart meters' data recording and data collection is appropriate to secure effective demand reductions.[285] The Commission awaits a government response to its renewed recommendation.

Water companies have a statutory duty to ensure secure sustainable water supplies and plan the balance between action on leakage, demand, and new supply in five yearly Water Resources Management Plans. These plans cover a 25 year time horizon enabling water companies to align five year investment plans with longer term ambitions.

The sector is also working to develop additional supply infrastructure and to increase the use of water transfers. The Regulators Alliance for Progressing Infrastructure Development, established at Price Review 19, has worked through a gated approval process to accelerate the delivery of new strategic supply infrastructure.

The draft Water Resources Management Plans include around 1,500 million litres a day in new supply over the next 25 years, including reservoirs, desalination plants, water recycling plants, and reservoir extensions.[286] For the first time water companies have also produced regional plans covering the whole of England, allowing better coordination between companies in addressing the challenge. This is a step change in planned action compared to the last 30 years, when no new large public water supply reservoirs were built and only one desalination plant, one recycling plant and one reservoir extension were completed.

Delivering this infrastructure will be a challenge. To enable greater competition, Ofwat has stated that at Price Review 24 all new supply schemes costing above £200 million will be open to third party competition rather than being supplied by water companies.[287] The government is further enabling this by consulting on the expansion of the use of one of the two main competition models for major water resource infrastructure projects, the Specified Infrastructure Projects Regulations.[288]

Change in infrastructure over the past year

As the charts below highlight, in the year to March 2023, the last year for which data is available, progress on reducing leakage has reversed. Reduction in demand is also not sufficient to meet the ambitious target set in the Environment Act 2021.

On leakage, prior to 2022-23 companies had achieved an 11 per cent leakage reduction across five years.[289] However, in 2022-23 most companies saw a rise in leakage levels.[290] Some companies have attributed this in part to the very hot summer of 2022 which caused pipe bursting ground movements.[291] While 2022 saw the hottest temperatures ever recorded in England, weather which appears anomalous now is likely not to be so in future. The third Climate Change Risk Assessment highlighted that water pipe bursts in dry soils in summer could be more likely in a hotter and drier climate.[292] UK Water Industry Research is currently investigating this failure mechanism and its potential consequence for future asset management strategies. It may be the case that the most common current methods of driving down leakage will not be sufficient to maintain progress in future. If so, companies may need to replace mains which are vulnerable to climate change.

On demand, although usage has reduced over the last two years, no water company in England is currently meeting its regulatory performance commitment for demand reduction.[293] This is because demand increased during the pandemic and so over a five year period it is broadly static. Without full metered coverage, figures on leakage and demand are estimates, and it can be difficult to distinguish between the two.

On supply, in October 2023 water companies submitted final business plans to Ofwat as part of the Price Review 24 process, covering 2025 to 2030. These included a proposed investment of £5.7 billion in enhancement to the water resource network including developing new supply options, tackling leakage, and initiatives to reduce demand including metering.[294] If all supply options are funded and delivered to their proposed timelines they should meet the Commission's ambition. Ofwat will publish draft determinations on these plans on 12 June as part of the Price Review 24 process.[295]

Given the publication timings, the Commission could not take account of these determinations. However, the Commission is clear that water bills will need to rise to fund drought resilience. Final determinations of allowable expenditure from 2025 to 2030 are due to be made in December 2024. After these decisions have been taken, government will need to monitor progress to ensure structural, regulatory, or other barriers to delivery are removed.

Assessment of progress

High level plans are in place to deliver the reduction in demand and increase in supply that the Commission has recommended. However, they lack detail on how ambitious leakage and demand reduction targets will be met.

Draft final Water Resources Management Plans proposed delivering more than the Commission's target of 1,300 million litres a day of new supply. Price Review 24 will be a critical test of whether water resource investment has remained a priority. Many of the projects to deliver this supply will also be consented under the Nationally Significant Infrastructure Project planning regime. If the government delivers on the Commission's recommendations for infrastructure planning reform, this could speed up delivery. Plans also propose reducing demand to meet the government's Environment Act target and to halve leakage across the sector by 2050. Assumed water savings from demand management rely heavily on savings delivered by government initiatives such as water efficiency labelling. Ofwat's £100 million Water Efficiency Fund announced for Price Review 24 could help achieve this. But funding wider coordinated action on demand will also be important given how much of the early years of company plans rest on delivering demand savings.[296]

- **Long term decisions: Met.** The government's commitment to ensuring resilience against extreme drought by 2050 has driven long term planning by regulators and industry. In line with the Commission's recommendations, the water industry has committed to halving leakage by 2050, and Ofwat and the industry is acting to expand supply. Water Resources Management Plans acknowledge the challenge, and the regional plans are the first step to coordinated long term solutions. In the longer term, as more data emerges, future iterations of these plans will need to consider the impact of a changing technological mix in non-household use of water. The closing of inland thermal electric plants and the opening of potentially water intensive coastal hydrogen production facilities could change the shape and size of the network.
- **Clear goals and effective policies to achieve them: Partly met.** The government has set clear targets on leakage and demand reduction which industry has signed up to. Ofwat has also acted to speed up the development of supply options. However, as performance in 2022-23 highlights, these targets will need to be backed up by detailed delivery plans which are adapted to future climate driven changes in network resilience and consumer behaviour.
- **Firm funding commitment: Partly met.** Evidence of a firm funding commitment will be subject to the funding of new supply schemes and action on reducing both leakage and demand in the Price Review 24 settlement. The regulators have supported the development of new supply options and the UK Infrastructure Bank has invested in Havant Thicket reservoir, the first new supply scheme since 1992, to reduce delays to project construction.[297] Investment in water resource infrastructure will need to increase and this will result in higher water bills. To support this, government should consider how it can mitigate the impact on the poorest households, such as through social tariffs. In return for bill increases there must be a discernible and speedy improvement in performance. It is right for Ofwat to enforce a clear link between dividends and environmental performance, among other goals.

Ofwat has funded the development of new supply infrastructure and the regulators are working to accelerate infrastructure delivery. Additionally, as part of Ofwat's Price Review 24 methodology, it has made £100 million available to support initiatives to drive greater water efficiency in homes and businesses.[298] Ofwat should consider how it can drive a continued reduction in leakage rates. This will partly be achieved by water companies effectively managing their assets, with appropriate funding, and through a rapid and effective smart metering programme which enables a dynamic response to leaks. As the Commission pointed out in its letter to Ofwat in 2023, this means Ofwat and water companies should work together on future focused asset health metrics to better understand what level of base investment will ensure the future efficiency of the network.[299]

- **Removing barriers to delivery on the ground: Partly met.** So far the government has acted to support the rollout of new supply infrastructure. It should continue to do so through amending legislation on water resource scheme procurement routes if needed. Timelines for the delivery of schemes are tight and so government must continue to monitor progress. However, progress on demand and leakage reduction are not currently sufficient. Regulators and water companies may need to consider removing potential barriers to deploying more efficient, and climate resilient, means of delivering leakage reduction such as trenchless mains replacement. Additionally, achieving the government's ambition on demand reduction requires not just company action, but government support. Government has set out plans to introduce mandatory water efficiency labels in 2025, and to consult on minimum product standards after this. To achieve the current target, faster action, including the early rollout of minimum product standards, could be needed. In the energy sector minimum product standards have delivered significant savings for consumers and reduced carbon emissions.[300]

8. The environment: Waste

The waste sector plays an important role in enabling resource efficiency and the move to a more circular economy. Despite clear long term targets, recycling rates have stagnated for over a decade, while a growing reliance on incineration has limited progress on reducing greenhouse gas emissions.

Significant delays to key reforms have created uncertainty and prevented the necessary investment in new and improved recycling capacity. Recent initiatives have provided more clarity, and the government should now sustain this momentum as it moves to implement its collection and packaging reforms. It should also create stronger incentives to invest in recycling infrastructure by sending a clear signal on the future of energy from waste in a circular economy.

Priorities over the next five years

Recycling infrastructure capacity needs to significantly increase to achieve government targets, decarbonise the sector and support the move to a circular economy. To unlock the necessary investment, local authorities and the private sector need clarity on the volume and quality of recyclable waste, and the future of incineration and landfill. This requires that the government:

- without further delay, implements and provides clear guidance on the collection and packaging reforms, covering 'simpler recycling', the packaging extended producer responsibility scheme and the deposit return scheme
- expands bans on single use plastics to cover other hard to recycle plastic items
- supports local authorities to drive up recycling rates by developing targets that are tailored to the local context, with financial support for transitional costs, by 2026
- obtains monitoring information for commercial and industrial waste by introducing a measurement system on composition and treatment destinations by 2025, and where the market is unlikely to deliver solutions, develop policies to increase recycling rates
- bans future energy from waste capacity that does not include carbon capture and storage, and instructs local authorities to not sign or renew long term energy from waste contracts without credible plans for this technology
- instructs local authorities with existing long term contracts to transition away from unabated energy from waste at end of contract, or at break clauses where possible
- delivers on its commitment to bring energy from waste into the Emissions Trading Scheme from 2028
- keeps the landfill tax under review to ensure that landfill remains more expensive than disposal at energy from waste facilities.

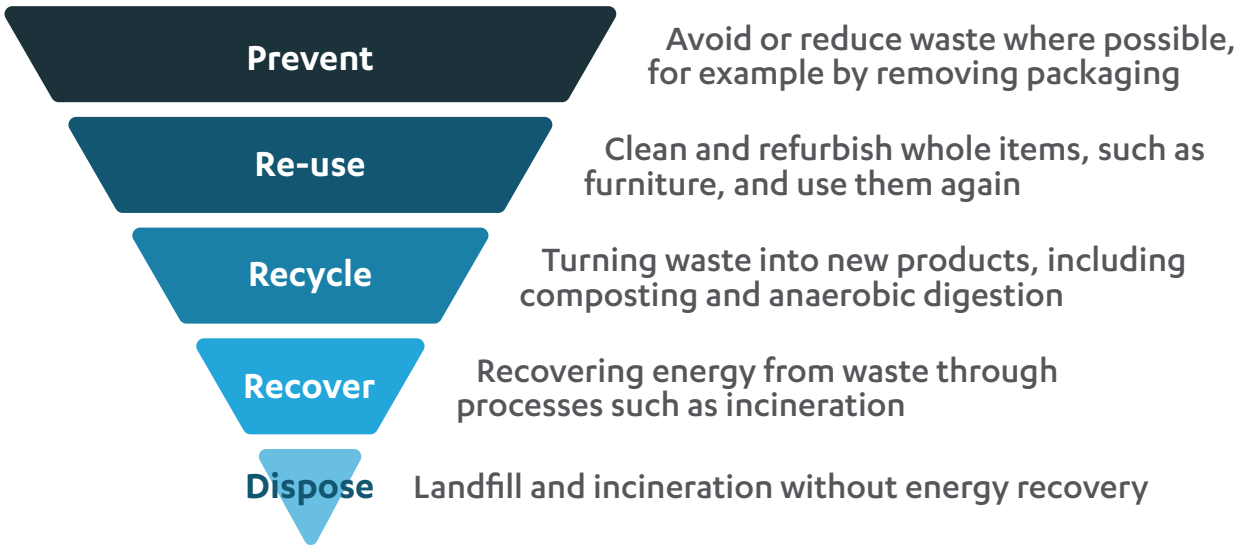
State of the sector

The solid waste sector consists of the infrastructure used to collect, sort, treat and dispose of solid waste. This includes sorting and recycling facilities, incinerators (including those with energy recovery), anaerobic digestion plants, landfill sites, and trucks and bins. The Commission's remit covers household waste, commercial and industrial waste, and construction and demolition waste in England.

The waste hierarchy ranks waste management options by environmental outcome. When waste cannot be prevented, recycling is generally a cheaper and more environmentally friendly treatment method than sending it to be incinerated or to landfill.[301]

Figure 8.1: As much waste should be prevented as possible and waste disposal should be kept to a minimum

Waste management intervention hierarchy



Source: Environment Agency

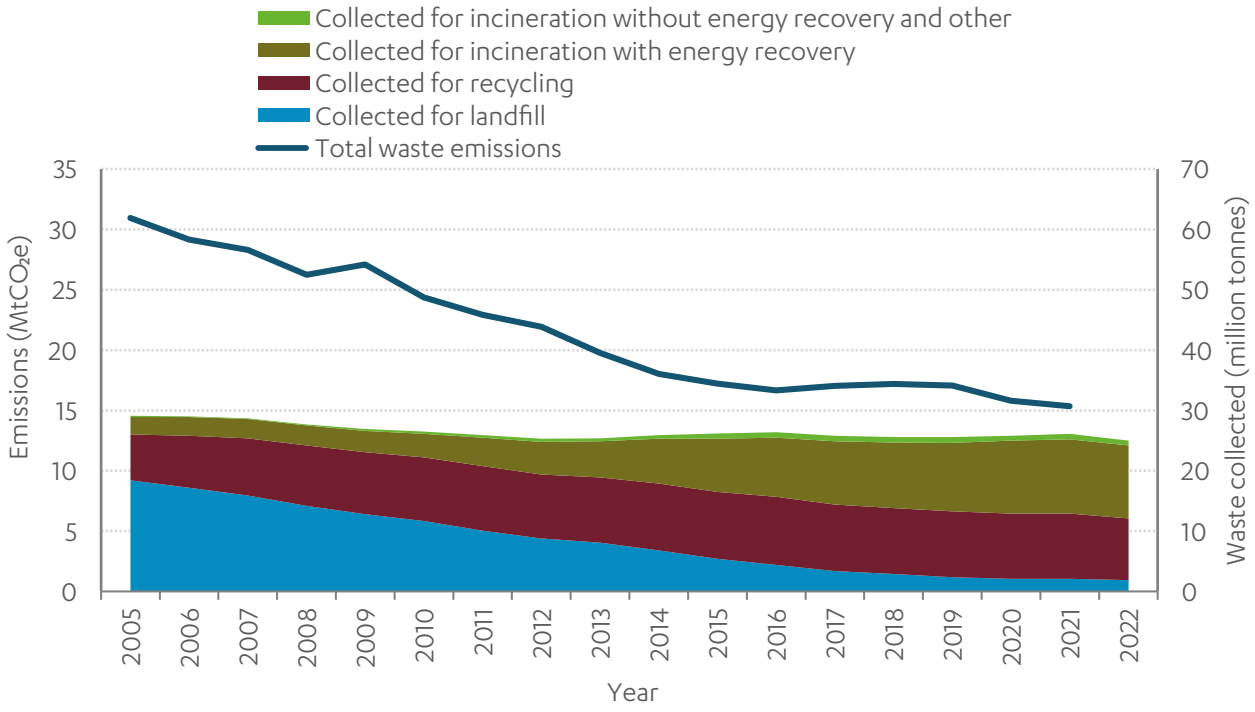
Local authorities have a duty to arrange for the collection and disposal of household waste in their area, and for commercial waste if requested. Most of the waste collected by local authorities comes from households, with the remainder from street cleaning, parks and grounds, businesses and construction.[302]

Countries like Germany and Wales show that high levels of recycling are achievable. However, recycling rates for local authority collected waste in England have remained at just over 40 per cent since 2012.303 Just under half of local authority collected waste is now incinerated with energy recovery.[304]

Greenhouse gas emissions from the sector decreased significantly from the late 1990s due to reductions in the use of landfill.[305] They have fluctuated since 2016 and now represent around five per cent of emissions in England.[306] To achieve net zero and move waste up the hierarchy, the tonnage of waste treated at energy from waste plants without carbon capture and storage will need to reduce by around a quarter by 2035 and by around 80 per cent by 2050.[307]

Figure 8.2: The amount of local authority collected waste sent to landfill has decreased over time while the amount sent to incineration has increased. This has caused emissions from the waste sector to fluctuate since 2016

Management of local authority collected waste by method and overall waste sector emissions in England, 2005 to 2022



Source: Department for Environment, Food & Rural Affairs (2024), Management of Local Authority Collected Waste 2000-01 to 2022-23 and Department for Energy Security and Net Zero (2023), UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2021. Data on waste sector emissions for England is only available from 2005.

Households spent around £167 for local authority collected waste management in 2022-23, an increase of five per cent from the previous year.[308] Measures of customer service satisfaction have been consistently high over the past decade.[309] The Commission's historic data on sector performance is available online.[310]

Progress against the Commission's recommendations

Overview of key government policy

The 2018 *Resources and Waste Strategy* and the 2021 *Waste Management Plan for England* contain the government's key waste policies. These, coupled with the 2021 *Environment Act* and *Net Zero Strategy,* set the following commitments and targets:

- achieving the near elimination of biodegradable municipal waste sent to landfill from 2028
- that plans must be in place to ensure 65 per cent of municipal waste, defined as household waste and household like waste from commercial and industrial sources, is recycled by 2035, with no more than ten per cent going to landfill
- that the total mass of residual waste (excluding major mineral waste) is not to exceed 287 kg per head of population by the end of 2042, with total and material specific interim targets for 2028.[311] Residual waste is waste sent to landfill, incineration or incineration with energy recovery.

To complement these, government has set an ambition to work towards all plastic packaging being reusable and recyclable, or compostable where no other option is available, by 2025.[312] It has also set an ambition to eliminate food waste to landfill by 2030 and to eliminate all avoidable plastic waste by the end of 2042, and committed to double resource productivity and eliminate avoidable waste of all kinds by 2050.[313]

Recycling policy

The 2021 Environment Act introduced powers to increase recycling, focused on municipal waste. These are known as the collection and packaging reforms, which have three main components:

'Simpler recycling' will require all non-household municipal premises, such as businesses, schools and hospitals, to have the same five recyclable waste streams collected for recycling or composting by March 2025. Businesses with fewer than ten employees will have until March 2027. By March 2026, local authorities will be required to collect the same recyclable waste streams from households, plus garden waste where requested (which can be charged for). Local authorities will be required to collect food waste weekly from households, with transitional arrangements for those in long term disposal contracts.[314] The government confirmed these measures in October 2023, and has consulted on further details. These include providing exemptions to allow all dry recyclables to be collected together in one recycling bin, and on the recommended frequency of residual waste collections in statutory guidance.

Packaging extended producer responsibility will require eligible organisations that use or supply packaging to cover the full costs of collecting and sorting household packaging waste and to meet recycling obligations.[315] Organisations will comply by purchasing evidence notes from reprocessing plants or export companies, as they do at present, and by paying modulated fees to a scheme administrator based on the recyclability of the packaging.

The reforms also mandate specific recyclability labelling on consumer facing packaging by March 2026 (except for plastic films and flexibles, where the deadline is the following year), and set new recycling targets for packaging.[316] In July 2023 the government announced that this component will be phased in from 2025, two years later than initially planned.[317]

The **deposit return scheme** will place a redeemable deposit on single use plastic and metal containers up to three litres in volume. In 2023, the government announced an implementation date of October 2025 at the earliest.[318] In April 2024, this date was revised to October 2027.[319]

In 2024 the government plans to lay secondary legislation and publish statutory guidance for each component of the reforms. It also plans to work on the modulated fees framework for packaging extended producer responsibility and to establish the scheme administrator, and to identify potential administrators for the deposit return scheme.

Other policy

In July 2023, the government announced that it intends to expand the Emissions Trading Scheme to cover emissions from energy from waste and waste incineration without energy recovery from 2028.[320] The government is assessing future incineration capacity requirements and has consulted on requiring future plants to demonstrate that they can be retrofitted with carbon capture and storage.[321]

In October 2023, further bans and restrictions on certain single use plastic items from businesses came into force.[322] Government has published draft regulations to ban disposal vapes and has consulted on banning wet wipes containing plastic.[323] Government has also consulted on reforms to the producer responsibility system for waste electrical and electronic equipment.[324] The plastic packaging tax increased by three per cent in April 2024 and the landfill tax will increase by over 20 per cent in 2025-26.[325]

In October 2023, the government announced that it will implement a mandatory digital waste tracking system from April 2025, covering all waste types including commercial and industrial.[326]

Change in infrastructure over the past year

The overall amount of local authority collected waste in England decreased by six per cent to 24.5 million tonnes between 2021-22 and 2022-23. This follows an increase over the previous two years. Over the same period, the recycling rate for local authority collected waste decreased slightly to just under 41 per cent, as shown in figure 2.[327]

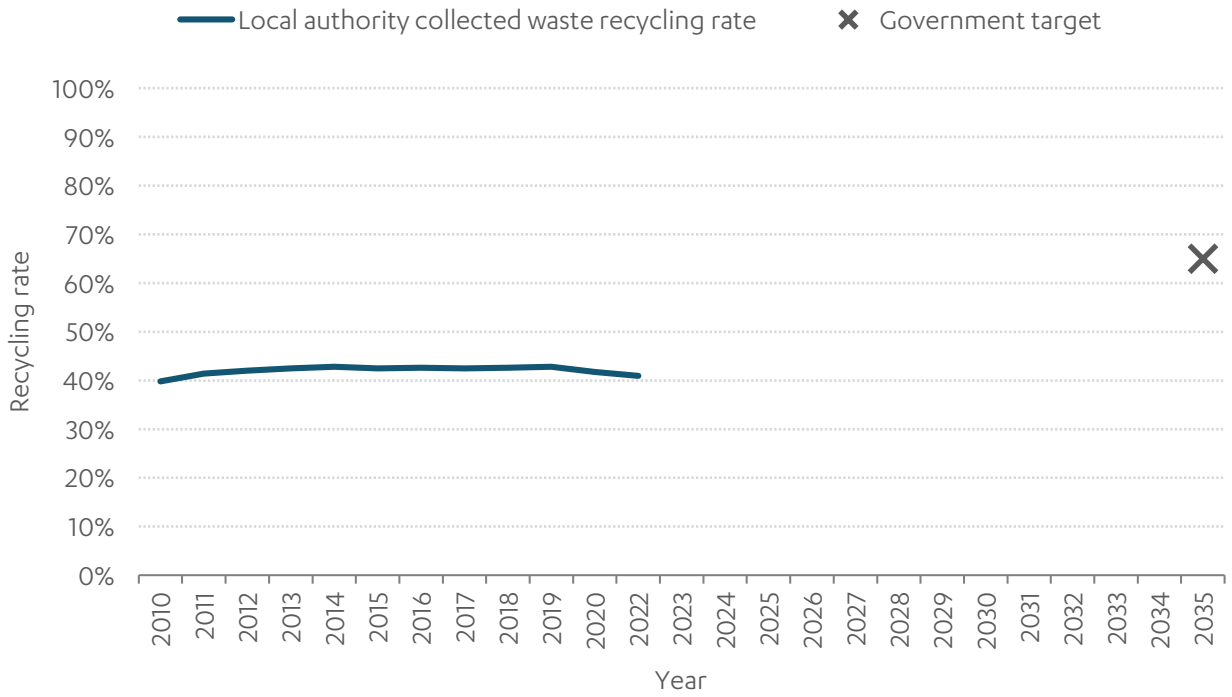
The government estimates that the total mass of residual waste (excluding major mineral waste) per head of population decreased by almost three per cent between 2019 and 2022, to 559 kg.[328] Overall residual waste (excluding major mineral waste) was estimated to have increased between 2015 and 2019, exceeding the rate of population growth.[329]

The amount of local authority collected residual waste – sent to landfill, incineration or incineration with energy recovery – decreased by around five per cent between 2021-22 and 2022-23, to 13.8 million tonnes. Within this, there was a small decrease in the amount sent to energy from waste, and a larger decrease in both amounts sent to landfill and incineration without energy recovery.[330]

Between 2021 and 2022 the recycling rate for dry waste collected from households (such as paper and card, glass, plastic and waste electrical and electronic equipment) decreased by just over seven per cent.[331] Over the same period, the recycling rate for separately collected food waste from households decreased by 2.6 per cent, although the percentage of the population with access to separate food waste collections increased from 28 to 30 per cent (see figure 8.5).[332] The recycling rate for other organic wastes, including garden waste and mixed garden and food waste, decreased by almost 12 per cent.[333] The amount of biodegradable municipal waste sent to landfill increased by eight per cent between 2020 and 2021, following a 52 per cent decrease over the past decade.[334]

Figure 8.3: Recycling rates for local authority collected waste need to increase rapidly

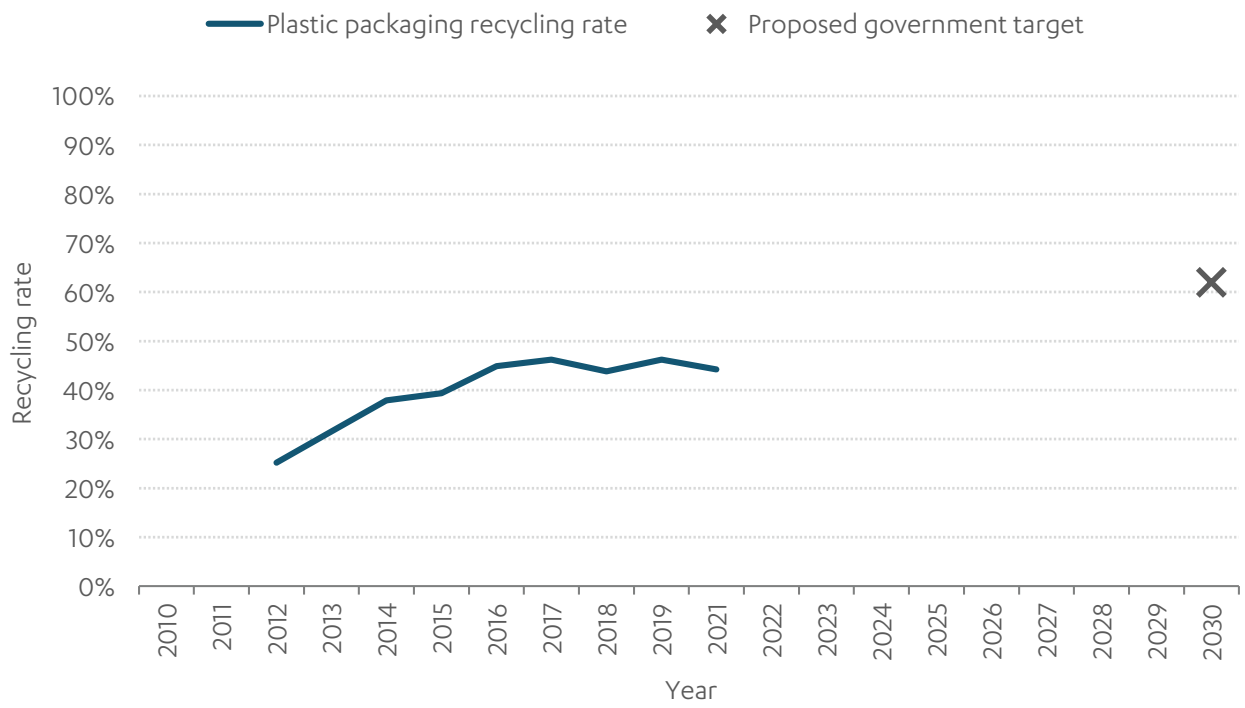
Historic recycling rates and municipal waste recycling target, 2010 to 2035, England



Source: Department for Environment, Food & Rural Affairs (2022), ENV18 Local authority collected waste: annual results tables

Figure 8.4: Progress on recycling plastic packaging has stalled and is now well off target

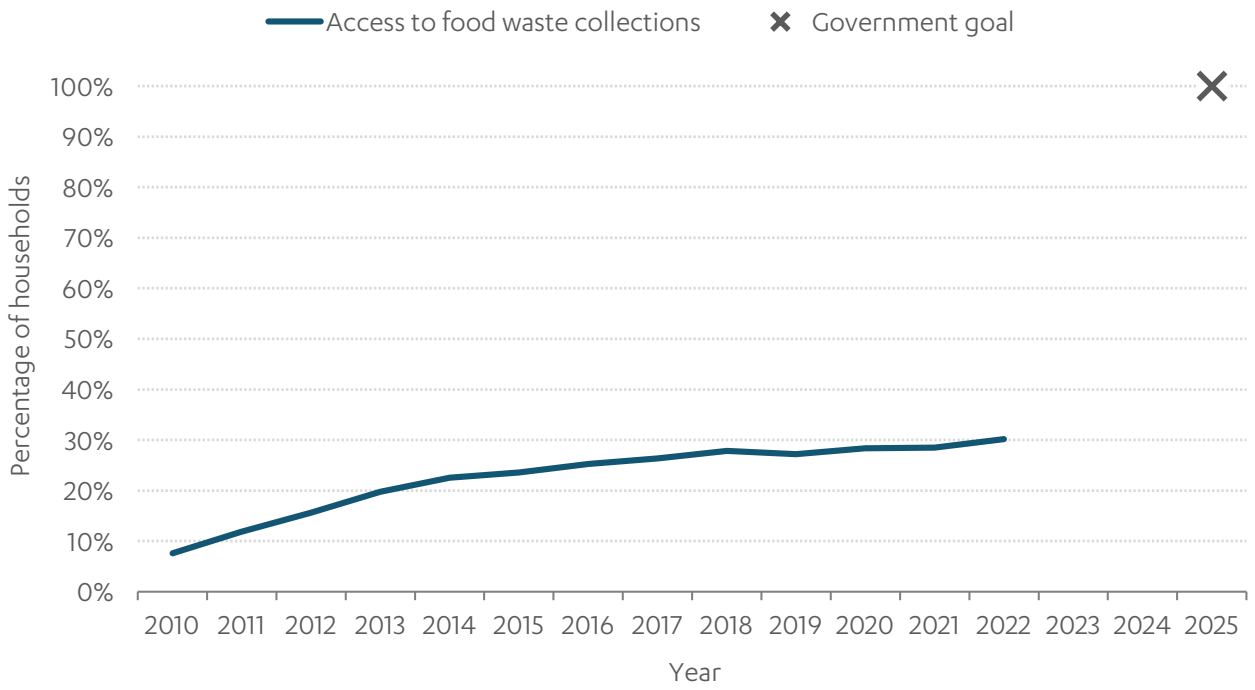
Plastic packaging recycling rate and proposed government target, 2012 to 2030, United Kingdom



Source: Department for Environment, Food & Rural Affairs (2023), UK Statistics on Waste and Department for Environment, Food & Rural Affairs, Department for Agriculture, Environment and Rural Affairs, Scottish Government and Welsh Government (2022), Extended Producer Responsibility for Packaging: Summary of consultation responses and Government response

Figure 8.5: 30 per cent of households have access to separate food waste collection

Percentage of households in local authorities who provide separate food waste collection and government goal, 2010 to 2025, England



Source: Commission calculations, Waste and Resources Action Programme

Assessment of progress

The government has suitable long term waste targets but has not yet implemented the key reforms needed to drive delivery on the ground. Recent progress must be sustained to provide local authorities, packaging producers, infrastructure operators and investors with the confidence to make the necessary changes.

- **Taking long term decisions and demonstrating staying power: Met.** The government has long term statutory targets for municipal recycling and residual waste, and for specific waste streams and materials. The upcoming waste decarbonisation plan needs to build on the Sixth Carbon Budget and Net Zero Strategy to clarify how current targets and policies achieve net zero and interim carbon budgets.[335] This should consider the impact of proposals to support energy from waste with carbon capture and storage, and set out where further action is required.
- **Policy goals must be matched by effective policies/plans to achieve them: Partly met.** After significant delay, the government has now confirmed how each component of the collection and packaging reforms will work. These have been framed within a broader waste prevention programme[336] and accompanied by other measures, including the bans on single use plastics and increases to landfill tax and the plastic packaging tax. However, key details of reforms are still to be finalised. As it moves towards implementation, the government should continue to improve its approach to managing the reforms as an integrated programme, addressing potential conflicts and issues of mismatched timing.

Few measures in the Resources and Waste Strategy extend beyond 2024. The government should set out the additional policies needed to achieve legal targets and enable the move to a more circular economy, and clarify the investment in waste infrastructure capacity needed to meet its ambitions.[337] This needs to be supported by better data, particularly on recycling rates for commercial and industrial waste. This will help the government to understand the impact of the collection and packaging reforms on this waste stream, and where additional policies might be needed. To inform this, the government should deliver on its commitment to mandatory waste tracking by 2025.

- **Firm funding commitments: Partly met.** Local authorities need to receive sufficient revenue and capital funding to deliver the reforms. In March 2024, the government confirmed new capital grant funding to support the introduction of weekly food waste collections targeted at local authorities that do not yet have these services in place.[338] The packaging extended producer responsibility scheme will fund the collection of packaging materials, and government intends to provide local authorities with estimated payment rates in November 2024.[339] The impact on local authority finances from extending the Emissions Trading Scheme remains uncertain.
- **Removing barriers to delivery on the ground: Not met.** Greater clarity on the collection and packaging reforms has not yet translated to delivery on the ground. Local authorities and the private sector have so far been unable to make major changes to waste services or invest in additional capacity while policy and funding remain unclear. The government should urgently confirm the final details of its reforms and provide local authorities with clarity on funding. The timeframes for delivery are now very tight, and more support may be needed to achieve them.

9. Cross cutting

Funding and financing

In the second *National Infrastructure Assessment*, the Commission's analysis suggested that overall investment by the public and private sector in economic infrastructure needs to increase – from an average of £55 billion per year over the last decade to around £70 to £80 billion per year in the 2030s. This is a significant increase and will be challenging to deliver. However, it is required in order to close the UK's infrastructure gap and help to support economic growth, achieve net zero, and improve resilience and the environment.

The majority of the investment needed will come from the private sector. The Commission's analysis suggests this needs to increase from around £30 to £40 billion over the last decade to £40 to £50 billion in the 2030s and 2040s. The main infrastructure sectors that require private sector investment are:

- renewable generation capacity and flexible sources of generation, electricity grids, and hydrogen and carbon capture and storage networks
- infrastructure to increase water supply, reduce demand and tackle pollution
- gigabit capable networks and 5G mobile.

As well as private sector investment, delivering the recommendations from the second Assessment will require gross public capital investment to be at the upper bound of the Commission's remit at 1.3 per cent of GDP from 2025 to 2040. The majority of this investment will be in the maintenance and enhancement of transport infrastructure, covering urban public transport and interurban road and rail. Public investment will also be required to:

- decarbonise public sector buildings by deploying heat pumps, heat networks and energy efficiency measures
- support the rollout of gigabit capable broadband networks to provide coverage in the hardest to reach areas
- protect households and businesses from river, coastal and surface water flooding
- support the safe collection, processing and disposal of municipal waste.

In addition to maintaining these high levels of investment in economic infrastructure, government should support households through the energy transition with funding of around £3 to £12 billion per year to subsidise the cost of purchasing heat pumps or connecting to heat networks.[340]

The executive summary contains charts showing historic public and private investment in economic infrastructure, and the Commission's estimates of what is needed. Further information on investment priorities can be found in the sector chapters and the second Assessment.

Priorities for the next five years

Investment interest in the UK's economic infrastructure, from both national and international markets, suggests there is likely to be private finance available, provided projects are investable and the returns are appropriate. However, there is currently intense global competition for private capital, with incentives available under the US Inflation Reduction Act and the EU Net Zero Industry Act.[341]

Securing private sector investment will require stable and coherent policy and regulation, and government making good decisions, fast. The UK must be able to attract investors based on the strength of its policy and regulatory environment. There needs to be a visible and long term pipeline of investable opportunities, improvements to speed up the planning process, predictable regulatory models that allow rates of return commensurate with the level of risk, and better strategic policy direction from government. Specific priorities for regulation, planning and design are set out later in this chapter.

The government should adopt the funding profile from the second Assessment in future spending reviews. The government should also reform public spending frameworks for infrastructure to provide longer term certainty and enable more effective management. Current funding decisions are too often short term and volatile, leading to stop-start and underinvestment in infrastructure maintenance and renewal. To ensure funding commitments get spent effectively, the government should, by 2025:

- set fixed budgets for capital infrastructure for at least five years
- move away from annual controls for major capital projects and instead give major projects a fixed budget, with the ability to move money forward and backward across years within that budget
- account for maintenance and renewal spend separately from capital or resource spend, with these budgets set for at least five years, and with departments identifying an indicative longer term pipeline that highlights any particularly large upcoming spend
- give infrastructure megaprojects their own 'project expenditure limit' including explicit contingency budgets, separate to the department which runs them.

The cost of building economic infrastructure in the UK is perceived to be high by international standards, and recent years have seen even more acute pressures from high levels of construction inflation.[342] To deliver the Commission's recommendations in an affordable way, the UK must get better at controlling the costs of major infrastructure projects. While a number of initiatives are focused on this issue, outcomes have been mixed. The Commission is currently investigating the drivers of infrastructure cost, including benchmarking against international peers and conducting a system level analysis of the main influencing factors. Initial findings will be published later in 2024.

The Commission has not made specific recommendations on skills and supply chain requirements for different infrastructure sectors. However, there is clear risk that these factors become binding constraints on the pace of infrastructure improvements and there will need to be active intervention to deliver the proposals set out in the second Assessment.

Having visible and long term pipelines of investable opportunities will be necessary for the market to invest in the skills and supply chains essential to deliver the required infrastructure on time and to budget.[343]

Government should deepen and widen the devolution of powers and resources in relation to many areas of infrastructure. Decisions made at the local level are better able to reflect local preferences, circumstances and information. Implementation is often most effective when undertaken at the local level. As such, when done well, devolution is associated with productivity benefits and reduced regional differences.[344] Historically, the UK has struck the wrong balance between risk sharing nationally, and local autonomy. The sector chapters describe where the government should go further on devolution to achieve its objectives.

Assessment of progress

Over the last decade, public investment in economic infrastructure averaged around £20 billion per year. At the latest spending review in 2021, the government committed to increase this to around £30 billion per year between 2022-23 and 2024-25.[345]

Government should ensure that increased capital budgets get spent.

Beyond 2024-25, the government's stated plan would also freeze overall capital spending in cash terms.[346] If this was applied to infrastructure spending, it would not be consistent with the funding profile the Commission has set out to deliver the recommendations in the second Assessment, which would see capital spending on infrastructure rise in line with inflation.

Key enablers to attract private investment in a competitive market are policy stability, regulation and planning reform. The Commission's assessment on these can be found in the sector chapters and the sections below.

Regulation

The UK's system of independent economic regulation has attracted significant investment and improved some outcomes for the public. However, it was designed over 30 years ago when the focus was on making marginal efficiency improvements and addressing issues with major and unavoidable monopoly power. Overall investment plateaued in the 2010s and significant problems have since emerged including unacceptable levels of water pollution and slow electricity grid connections. Regulation has become more complex, with regulators required to balance a longer list of duties and priorities in a more complex environment.[347]

The system now requires urgent reform to keep pace with the rapid and transformational investment needed in many infrastructure sectors.

Priorities for the next five years

Regulators need to be empowered by government to approve long term, high quality, strategic investments, with decisions made about how these costs are passed on to consumers and/or taxpayers. To achieve this, the government should set out a long term strategic vision for

each of the regulated sectors, through strategic policy statements which are updated each Parliament. It should also give a coherent set of duties for each regulator, covering price, quality, resilience and net zero, with guidance on how to manage trade-offs between them.

Although competition is not appropriate in all circumstances, its use for strategic enhancements in the energy and water sectors could boost innovation and give investors the confidence to deliver long term projects, while maintaining a stable regulatory environment. The government should require regulators to enhance the role of competition by introducing legislation to remove any barriers to its use. 'Standard' periodic price controls should be focused on the maintenance of existing networks, with tendering processes used for strategic enhancements. A clear, public justification should be required where tendering is not used.

Regulators must also ensure that regulated companies are financially sustainable. This should include stress testing of financial capability, considering appropriate ratios related to gearing and performance related risk adjusted returns. The UK Regulators Network should have a stronger role in facilitating collaboration between regulators.

Government policy

In 2023 the government launched its smarter regulation programme, led by the Department for Business and Trade. This aims to reduce burdens on businesses and promote innovation and growth.[348] As part of this, the government consulted in November 2023 on proposals to strengthen the economic regulation of the energy, telecoms and water sectors. These included an assessment of infrastructure investment needs in energy networks and the water sector, measures to enhance the use of competition, and a requirement for government departments to review regulatory duties. The latter is part of a move towards a simpler framework with new outcome based duties. The consultation also proposed that regulators have regard to analysis from the Commission and other public bodies, as the Commission has previously recommended.[349]

In November, following consultation, the government announced that they will extend the growth duty, which already applies to other regulators, to cover Ofcom, Ofgem and Ofwat. This will require them to have regard to the desirability of promoting economic growth. The government intends to legislate for this change and enable the duty to commence in the 2024-25 financial year, accompanied by updated statutory guidance.[350]

In 2023, the UK Regulators Network published guidance on the methodology for setting the cost of capital through different price controls.[351]

Digital

The government published its Statement of Strategic Priorities to Ofcom in 2019. This helped secure alignment between the government and the regulator on the goal of nationwide gigabit capable broadband networks, and the network competition model and investment incentives to achieve it.[352] This stability, alongside Ofcom's long term regulatory settlement that allows

pricing flexibility for fibre services while protecting consumers, has helped create market confidence and contributed to the significant increases in private sector investment and rapid delivery.[353] The digital chapter contains further details.

Energy

In 2023 the Energy Act came into force which updated Ofgem's existing duties to include net zero targets and five year carbon budgets.[354] In May 2024, the government's new Strategy and Policy Statement for Ofgem and the new National Energy System Operator came into force.[355]

While both of these developments deliver on Commission recommendations, the Strategy and Policy Statement does not provide Ofgem and the wider sector with direction on key decisions, such as the future role of hydrogen in the energy system. More positively, regulatory reform was a key part of the government's response to the Electricity Networks Commissioner's report on accelerating electricity transmission network build.[356]

The government has also enabled greater competition in the building, ownership and operation of onshore electricity networks, building on the existing regime for offshore transmission.[357] To improve oversight of financial sustainability, Ofgem is incorporating the concept of 'investability' into its approach to assessing how companies finance their activities.[358]

Water

The government updated its strategic policy statement for Ofwat in February 2022.[359] Ofwat has enabled greater competition through its Direct Procurement for Customers model, where water and wastewater companies competitively tender for services in relation to the delivery of certain large infrastructure projects. The government is now consulting on the wider use of the Specified Infrastructure Project Regulations model. Under this approach, which was used for the Thames Tideway Tunnel, projects are delivered by independent contractors and operated under their own licence, independent of the local water company. Competition, through either of these models, will be the default approach at price review 24 for all new supply schemes with a whole life expenditure above £200 million.[360]

Ofwat reviewed other ways to increase competition in 2022.[361] It has also continued to monitor financial resilience in 2022-23, including regulatory gearing.[362]

Assessment of progress

- **Taking long term decisions and demonstrating staying power: Partly met.** The government has shown that it understands the challenges facing the regulatory system and the need for change. Both Ofwat and Ofcom have benefitted from strategic policy stability. The recent publication of the Strategy and Policy Statement for Ofgem and National Energy System Operator is welcome, although the Commission is concerned

that it does not provide a strategic steer on key policy decisions and how to balance different duties and priorities.

While Ofgem has now been given a net zero duty, the government has been slow in responding to the Commission's recommendation from 2019 to give all regulators a consistent set of duties. The government should urgently progress with its review of duties to better enable investment to meet long term aims. As part of this, it should give Ofgem and Ofcom appropriate duties on resilience to long term factors such as climate change. The review should also make sure that regulators' duties are coherent and that they have sufficient guidance on how to balance them effectively to deliver strategic priorities.

The government has made progress on enabling greater competition in the energy and water sectors, with further action planned. It is too early to assess the impact of these changes.

- **Policy goals must be matched by effective policies to achieve them: Not met.** While there has been progress in setting out a vision for the future of regulation and consultations on some proposals, most of these still need significant further development. In some areas there are no specific plans from government, including on how to provide a consistent set of duties for regulators.
- **Firm funding commitments: Not assessed.** The Commission has not made recommendations on the funding of regulators.
- **Removing barriers to delivery on the ground: Not assessed.** While regulation facilitates investment in infrastructure it does not, by itself, lead to change on the ground. Regulation can be an enabler for change, such as the financing of new or complex technologies through incentive structures.

Planning

A sizeable proportion of the investment needed in economic infrastructure over the coming decades will be consented through the planning system for Nationally Significant Infrastructure Projects (NSIPs). This could equate to up to £30 billion of investment per year in the late 2020s and 2030s.

This separate planning system was introduced in 2008 and initially worked well. However, its effectiveness has declined in recent years, with consenting times increasing by 65 per cent between 2012 and 2023.[363] Delays increase the costs of infrastructure, which are ultimately passed on to taxpayers for public infrastructure and bill payers for private infrastructure.

An effective planning system should embed the principles of pace, certainty, flexibility and quality decisions. This is essential to rapidly deliver the infrastructure needed to tackle climate change, boost growth and increase climate resilience. Government has set clear goals for improving the system and started making reforms, but further action is needed.

Priorities for the next five years

To ensure that National Policy Statements remain up to date and provide an effective steer on the need for infrastructure, the government should make five-yearly reviews of statements a legal requirement. Future iterations should include clear tests, refer to spatial plans and set out clear timelines and standards for pre-application consultation. The government should also introduce a system of modular updates to National Policy Statements to make the system more flexible and bring onshore wind into the system for Nationally Significant Infrastructure Projects.

To improve the approach to managing impacts on the historic and natural environment, the government should create a platform for sharing environmental data with clear data standards. Statutory consultees should develop a library of mitigations for different kinds of infrastructure and be resourced to agree strategic mitigations for the most urgently needed infrastructure.

To ensure local communities receive consistent, tangible and fair benefits from hosting network infrastructure, the government should develop a framework of compulsory direct benefits for local communities and individuals hosting projects which deliver few local benefits.

To improve accountability, the government should create a central coordination and oversight mechanism which reports to the Prime Minister or the Chancellor, with measurable targets for reducing consenting times. Performance indicators for statutory consultees operating under a cost recovery model should form part of compulsory service level agreements with developers, with budget implications for failure to meet agreed service levels.

Government policy

National Policy Statements and operational reforms

The government set out a programme of short term reforms to the planning system in an action plan published in February 2023.[364] This committed to review key National Policy Statements. The government has since revised its statements for water resources, energy and national networks, with the latter covering road, rail and strategic rail freight interchange projects.[365] The government has consulted on the siting of nuclear power sites from 2025, which will inform the development of a draft new statement for nuclear power generation during 2024.[366] It has committed to a review of the statement for ports with a consultation on a revised draft expected this year.[367]

The action plan was followed by a consultation on operational reforms to improve the consenting process. This set an ambition for all projects entering the pre-application stage from spring 2024 to go through the process within the overall statutory timeframes. In March, the government confirmed changes to support this.

They include a fast track consenting route for certain projects, improved pre-application services and advice from the Planning Inspectorate, changes to the examination process and the development of a statutory timeframe for decisions on post-consent changes.[368] In April, the government published new and updated guidance on each stage of the consenting process.[369] An independent review on the causes of legal challenges and options to improve existing processes will report in May 2024.[370]

The 2023 Levelling up and Regeneration Act enabled fuller cost recovery for the Planning Inspectorate and statutory consultees. The government intends to introduce secondary legislation to enable this during spring 2024, and to update the fees which the Planning Inspectorate can charge.[371] It has provided grant funding to support local authority engagement with major infrastructure projects and will publish guidance to support the use of planning performance agreements. A skills strategy for infrastructure planning is due later in the year.[372]

The 2023 action plan committed the government to update planning guidance to clarify the process for determining when and how to carry out reviews of National Policy Statements. Revised guidance is expected during 2024, along with new and updated guidance on other aspects of the planning system. To support more frequent reviews and explore options for changing the National Policy Statement framework, the government has also committed to examine the process for reviewing and designating statements. Here, the government has stated that modular approaches may form part of the solution.[373] The government is also reviewing the thresholds for highways and rail projects set out in the 2008 Planning Act.[374]

Longer term reforms were set out in a policy paper in November 2023. These included establishing a taskforce to consider the potential for a more spatial approach in the transport, water, waste and wastewater sectors, building upon the approach in the energy sector. Work is underway, and the taskforce will report later in the year.[375] Work is also continuing on the Marine Spatial Prioritisation Programme, a cross-government review of how marine plans and the wider planning regime can balance development and environmental objectives.[376]

Environmental data, assessment and mitigation

The government is improving the quality of environmental data through its Natural Capital and Ecosystem Assessment Programme. This maps the extent and condition of England's ecosystems and natural capital assets, and changes over time.[377]

The 2023 Levelling up and Regeneration Act provided the government with powers to implement a new system of environmental impact assessment, called Environmental Outcome Reports. These are intended to streamline the current approach and focus more clearly on outcomes. Changes include moving from a document-based system to interactive information, underpinned by planning data standards. Government consulted on these changes in 2023.[378]

The government has also committed to explore how its approach to delivering strategic compensatory measures for offshore wind could be applied elsewhere and intends to apply mitigation libraries within Environmental Outcome Reports.[379]

Community benefits and accountability

The government published guidance on community benefits for onshore wind in 2021.[380] It set out proposals on community benefits for transmission infrastructure in 2023, which would be recognised in regulatory settlements. Voluntary guidance is expected in 2024.381 It intends to set out approaches for other sectors in due course.[382]

In November 2023 the government announced that it would establish a centralised, ministerially led forum with strategic oversight of major infrastructure projects, including Nationally Significant Infrastructure Projects, and covering both consenting and delivery. This forum will report to the Prime Minister or the Chancellor.[383]

Assessment of progress

- **Taking long term decisions and demonstrating staying power: Partly met.** The government has committed to progressing the Commission's recommendations and set an ambition to return consenting times to the two and a half year average achieved in 2012.[384] It has set out a range of short and long term reforms and made progress on revising National Policy Statements for water, energy and national networks. However, timescales that were set out in the action plan for designating these revised statements were missed.[385]

  The commitment to examine the approach to reviewing and designating National Policy Statements is welcome, along with the recognition of the benefits from a modular approach. However, the government should legislate for five-yearly reviews of key National Policy Statements to ensure that these important documents do not again become outdated over time.

- **Policy goals must be matched by effective policies to achieve them: Partly met.** The government has taken steps towards implementing many of the Commission's recommendations. There has been welcome progress on the development of spatial plans for energy infrastructure and a commitment to examine a more spatial approach in other sectors. It should support this by publishing its land use framework, which was due in 2023, and providing clarity on timeframes for the Marine Spatial Prioritisation Programme and revisions to the 2011 Marine Policy Statement.

  The government has recognised the value in a more strategic approach to community benefits. It should build on its approach for transmission infrastructure by committing to develop a national framework for other types of infrastructure which deliver few local benefits.

  More detail is needed on the government's central coordination and oversight mechanism, including its remit, expertise and skills. It should have measurable targets to help assess progress.

The government should provide more clarity on how Environmental Outcome Reports will work and the timeframes for implementation. There is a lack of ambition to improve the approaches to environmental management in the meantime, for example by enabling data sharing, introducing mitigation libraries and resourcing statutory consultees to develop strategic mitigations for the most urgently needed infrastructure. This limits opportunities to further reduce consenting times and improve outcomes for communities and the environment.

The government has not yet addressed the Commission's concerns about project thresholds in the energy and water sectors, and the reluctance to bring onshore wind into the regime is creating barriers to deployment at scale.

- **Firm funding commitments: Partly met.** The Commission welcomes the government's commitment to move to fuller cost recovery for the Planning Inspectorate and key statutory consultees, and to publish guidance on the use of planning performance agreements for local authorities. Once the changes are implemented, it will take time for these bodies to develop a workforce with sufficient skills to allow for more timely and strategic engagement with the consenting process. While the commitment for statutory consultees to use key performance indicators is welcome, there should be budget implications for failing to meet them.
- **Removing barriers to delivery on the ground: Not assessed**.

Design

Good infrastructure design provides value for people, places and the environment, while also helping projects finish on time and at lower cost. Embedding the design process from the outset of a project can improve aesthetics, support community engagement, maximise benefits and reduce overall costs.[386] Given the scale and urgency of the required changes to infrastructure, it is essential that projects use design solutions that deliver clear objectives for a price that can be afforded and to a schedule that is acceptable. The Commission's Design Group is developing new guidance to support this.

Government policy

In the first Assessment, the Commission recommended that all Nationally Significant Infrastructure Projects appoint design champions to their boards and called for the use of the Commission's design principles.[387] These recommendations were accepted by the government, with the 2020 National Infrastructure Strategy committing to embed good design in all infrastructure projects. It required all projects to have board level design champions in place by the end of 2021, supported by design panels where appropriate.[388] It also embedded the Commission's design principles and recommendations on design champions in the delivery support and assurance regime overseen by the Infrastructure and Projects Authority.[389]

Priorities for the next five years

There is emerging evidence that on some infrastructure projects, design principles have been used effectively.[390] But there needs to be a step change to deliver the appointment of board level design champions, coupled with action to embed wider design leadership on all Nationally Significant Infrastructure Projects. The Commission's Design Group has worked with the Infrastructure and Projects Authority to encourage appointment of design champions in line with the government's commitment. The Institute of Civil Engineers is working to define and develop the scope of the role and the experience and qualifications required.[391]

Getting design champions appointed at board level will be a positive step, as they can set the right brief, support the development of a vision and bespoke design principles for each project and ensure that these inform board level decision making. But given the scale of transformation required across economic infrastructure, sectors will need creative, collaborative leaders at all levels. The Commission's Design Group is developing further guidance to explain how infrastructure project directors, using an effective, structured process, should develop and embed project specific design principles. This guidance will outline how a structured approach to good design is not about adding cost and complexity to projects, but rather about developing cost effective ways to meet agreed outcomes and reduce the risk of delays. Once completed in May 2024, the Commission recommends that the Infrastructure and Projects Authority incorporate this guidance within its assurance review regime, and expect all Nationally Significant Infrastructure Projects to follow it.

Natural capital

UK and global trends show that many aspects of natural capital have declined in recent decades. The latest UK biodiversity indicators show declines in the status of threatened habitats and species, as well as increased pressure from invasive species.[392]

Infrastructure is not the primary cause of biodiversity decline, however, if assets are badly designed and operated, they can exacerbate this problem by fragmenting habitats and polluting the environment.[393] But if done well, infrastructure can and should contribute to the goals of the government's 25 year environment plan.[394] Examples include using infrastructure investment to create, improve and connect habitats, using nature based solutions to increase infrastructure resilience, and investing in infrastructure that helps to improve air and water quality. Properly considering environment can also speed up infrastructure delivery by getting communities on board and reducing the risk of judicial review.

Government policy

To improve air quality, the government has legal targets which set limits for concentrations of fine particulate matter 2.5 across England by 2040 and to reduce population exposure. Targets also exist to limit emissions of other key air pollutants by 2030.[395] The 2019 Clean Air Strategy contains policies to help achieve these targets. Other policies that will improve air quality are described in the transport and energy chapters.[396]

To support its objectives on habitats and biodiversity, the 2021 Environment Act provided the government with the power to make biodiversity net gain a condition of planning permission. In February 2024 this became mandatory for infrastructure projects consented under the Town and Country Planning Act, which are required to achieve a minimum ten per cent net gain. A similar approach will apply to Nationally Significant Infrastructure Projects from November 2025.[397] A separate approach is being developed for marine infrastructure development.[398]

The Environment Act also provided the government with powers to require local government to produce local nature recovery strategies. They are intended to agree priorities for nature recovery, propose locations to create or improve habitat and support developers in delivering biodiversity net gain. The government produced statutory guidance for these strategies in March 2023.[399]

To improve water quality, the government has legal targets to reduce nitrogen, phosphorus and sediment pollution from agriculture, and phosphorus loadings from treated wastewater by 2038.[400] Targets to reduce leakage and water use, and other policies relevant to the water sector, are described in the water chapter.

Government policy on environmental data and assessment is described in the planning section.

Priorities for the next five years

In the second National Infrastructure Assessment, the Commission considered how its recommendations, coupled with the trajectory of future government policy, would impact air quality, biodiversity and water quality. This showed that changes to transport could improve air quality, and that changes to energy and wastewater could improve both air and water quality. However, changes to transport and flood risk management infrastructure could have negative impacts for biodiversity and water quality.[401]

Any potential negative impacts need to be mitigated. For new infrastructure, this can be achieved through the adoption of the Commission's recommendations for planning and design, coupled with the extension of the statutory requirement for biodiversity net gain to Nationally Significant Infrastructure Projects. However, given the pressures on the natural environment, the government must also maximise opportunities to enhance environmental outcomes through the operation, maintenance and renewal of existing assets in sectors with the biggest potential to drive improvements.

To achieve this, the government should require that network and asset plans in the flood management, transport and water sectors maximise opportunities to improve natural capital by taking an integrated and strategic approach to maintenance and renewals. Infrastructure operators in these sectors should:

- publish regular reports on the state of environmental water quality and biodiversity on their estates or areas affected by their assets

- develop and fund maintenance and renewal strategies that deliver a net improvement in environmental water quality and biodiversity by altering operating and maintenance regimes and materials, incorporating new design features reflective of nature based solutions, and in some cases moving spend from the development of new to existing assets.

Guidance and objectives should be delivered by:

- the Department for Transport to inform National Highways' Road Investment Strategies and Network Rail's Control Period 8
- the Environment Agency as part of its enabling and supporting programmes included in the next Flood and Coastal Erosion Investment plan, due to start in 2027
- Ofwat working with the environmental regulators, to inform operation, maintenance and renewals activities in 2030-35.

The Commission will report on progress against these recommendations in the 2025 Infrastructure Progress Review.

Resilience

Resilient infrastructure can continue to provide the services that businesses and communities rely on when there are short term shocks. It can also adapt to deal with longer term chronic stresses, risks and opportunities. The Commission has identified six key aspects of resilience: anticipate, adapt, resist, absorb, recover and transform. Resilience should be specified through a set of outcome based standards that are regularly reviewed. These should be published so that the public understand the costs and benefits of different levels of resilience and, crucially, know what level of service to expect.

To determine these standards, the government will need to consider the right balance between the costs of resilience, impacts of disruption and consumer expectations. This will inform a level of service to aim for across infrastructure sectors and includes striking a balance between under and over investing in resilience. Where more resilient infrastructure can anticipate and resist or absorb shocks, it can prevent economic damage by improving the reliability and predictability of services. Where it cannot, a focus on fast recovery can improve quality of life and reduce disruption costs.

The first step in ensuring service resilience is understanding the existing infrastructure asset base. Many existing infrastructure assets have long lives and need to provide a resilient service into the future, when risks from climate change and other factors will be different.[402]

Priorities over next five years

There is significant variation in how the government currently provides resilience standards for infrastructure. To inform the next round of regulatory and spending cycles, it should publish a full set of outcome based resilience standards by 2025 for digital, energy, transport services and

water infrastructure. Operators of digital, energy, road and rail and water infrastructure should then develop and maintain strategies to ensure that services can continue to meet resilience standards, including through regular stress testing.

The government should require regulators to ensure determinations in future regulatory settlements are consistent with meeting these standards in short, medium or long term. It should also establish a system of cross sector stress testing to address the risks of cascading failures.

Asset and system resilience will be tested in a changing climate. In time to inform the next round of regulatory and spending cycles, the government should also ask operators to estimate the cost of maintaining resilience standards to the impacts of projected climate change to 2050. To enable this, the Met Office, infrastructure operators and appropriate regulators should work together to develop an accessible interface for asset owners to use relevant climate data by the end of 2025. By the end of 2026, the government should have worked with relevant bodies to identify and update core technical engineering standards to factor in future climate change.

Government policy

The UK Government Resilience Framework was published in 2022. This sets out the government's overarching approach to resilience, both in infrastructure and more broadly, based around three principles. These are: developing a better and shared understanding of risks, emphasising preparation and prevention wherever possible, and the need to take a 'whole of society' approach.[403]

In December 2023 the government published an update on progress. Actions included changes to the National Security Risk Assessment to make assessments more frequent and improve access to information, new processes for assessing chronic risks, clarification of risk ownership across government departments, and the confirmation of pilot projects to strengthen Local Resilience Forums.[404]

The government's third National Adaptation Programme was published July 2023. It sets out a five year programme of work across government to build resilience to climate change. This includes a commitment to establish a new cross-departmental Climate Resilience Board to oversee strategic, cross cutting adaptation and resilience issues and to shift to a systems based approach to climate change risk assessment.[405]

The framework also committed the government to take forward the Commission's recommendation on outcome based resilience standards, but with an implementation date of 2030. These are intended to build on the patchwork of service standards that already exist in some sectors, like digital and telecoms, energy and water. To support this, the government has improved how it works with departments to analyse baseline security and resilience and developed new approaches to examine interdependencies between infrastructure systems.[406] It also announced that it will set targets for cyber resilience for all critical national infrastructure sectors to meet by 2025.[407]

Assessment of progress

- **Taking long term decisions and demonstrating staying power: Partly met.** The government is strengthening its approach to understanding and managing risks, including those which cross government departments, through improved arrangements in the Cabinet Office.[408] On climate change, as the Climate Change Committee highlight, the government's 2023 National Adaptation Plan lacks the pace and ambition to address growing risks, and lacks a measurable vision.[409] However, the proposals for a cross departmental board and systems based approach to future risk assessments should enable a more strategic approach.[410]

  While the 2022 framework sets out sensible principles for resilience, the government does not yet have a consistent set of outcome based standards for different infrastructure sectors to achieve a desired level of resilience. Without these, as the National Audit Office highlight, government cannot make informed decisions about priorities for investment and funding, make decisions about trade-offs, monitor progress and take an adaptive approach.[411]

- **Policy goals must be matched by effective policies to achieve them: Not met.** There continue to be positive examples of resilience planning in specific infrastructure sectors. The water sector has adopted the Commission's recommendation to make supply resilient to a drought with an annual probability of 0.2 per cent, and in the energy sector, distribution companies have 12 hours to restore electricity supply if it fails in normal weather conditions.[412] In the telecoms sector, Ofcom has recently consulted on resilience guidance for communications providers including on levels of resilience expected for certain types of infrastructure in the event of power outages.[413] In the transport sector, Network Rail is planning to invest £1 billion in adaptation between 2024 and 2029 and to develop a costed climate investment programme based on adaptation pathways.[414] The Department for Transport is also developing a new adaptation strategy to address climate risks.[415]

  However, gaps remain. For example, in the transport sector, while Network Rail has resilience standards for adverse and extreme weather, it has not published expected service standards in normal weather. Similarly, in a number of sectors there are no clear expectations on what service standards are expected in the event of a failure in another sector.

  The absence of clear resilience standards makes it difficult to assess the adequacy of plans and investments. If the government only sets outcome based standards by 2030 then both public and private sectors are unlikely to adequately plan for resilience in the meantime. This means that around £400 billion of future investment in infrastructure may not be fully optimised for resilience.[416]

  While it takes time to develop standards, the process of adapting infrastructure to known risks also takes time and delay will increase costs. Only by setting standards and embedding them in regulatory frameworks can progress be made on ensuring they are being met. In many cases standards already exist, or the government has the information needed to set them. The Commission is now working with regulators and departments to demonstrate how resilience standards can be developed at pace and key gaps filled.

There has been some progress in analysing baseline security and resilience, and the government is reviewing whether to make reporting on climate risks, impacts and adaptation plans mandatory for infrastructure operators.[417] Doing so could encourage more organisations to start responding ahead of time and provide valuable information to government.

- **Firm funding commitments: Not met.** As above, there are some positive examples in specific sectors. Resilience features in the 2022 Strategic Policy Statement for Ofwat, and reservoirs and other water resource options are being progressed by the Regulators Alliance for the Progression of Infrastructure Development which will improve drought resilience.[418] In the transport sector, the first round of city region sustainable transport settlements provided mayoral authorities with stable funding to cover maintenance.[419] Network Rail is also planning to invest in climate adaptation, as described above. And in the energy sector, reopeners were included in the latest electricity distribution price control to enable a response to Storm Arwen.[420]

  But beyond these examples, it is unclear where government thinks new investment is needed. The third National Adaptation Programme contained no significant additional funding for adaptation activities, despite an estimate from the Climate Change Committee that £10 billion of extra funding may be needed each year to improve preparedness for climate change.[421] And as described above, the lack of clear outcome based standards creates the risk of underinvestment in resilience.

- **Removing barriers to delivery on the ground: Not assessed.** Isolating resilience investments is difficult. These investments often deliver other benefits, such as improved capacity, or form part of business as usual actions, such as maintenance activity. Changes to infrastructure would be expected to follow changes in standards and improved stress testing, but this will depend on how government decides to set them. Changes will also require better data with which to assess the costs and benefits of adaptation.

References

Executive summary

1 Office for Budget Responsibility (2022), **The Implications of the Government's Departmental Spending Plans**

2 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

3 The chart includes the government's commitment to spend £100 billion on infrastructure between 2022/23 and 2024/25. Infrastructure spending in 2022/23 was below the level anticipated by the Commission and, in order for the government to still meet its commitment, it will need to increase its spending on infrastructure between 2024 and 2025 compared to previous years.

4 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

5 HM Government (2021), **Net Zero Strategy: Build back greener**

6 Department for Energy Security & Net Zero (2023), **Contracts for Difference Allocation Round 5 Results**

7 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

8 HM Government (2023), **Families, business and industry to get energy efficiency support**

9 Department for Energy Security & Net Zero (2024), **Clean heat market mechanism: proposal to change the scheme start date to 1 April 2025**

10 Department for Energy Security & Net Zero (2024), **Hydrogen Heating: Overview**

11 Department for Energy Security & Net Zero (2023), **Carbon Capture, Usage and Storage: a vision to establish a competitive market**

12 Department for Transport (2023), **City Region Sustainable Transport Settlements 2**

13 House of Commons Library (2023), **Trailblazer Devolution Deals**

14 Department for Levelling Up, Housing & Communities (2024), **Update on Level 4 Devolution: Confirmation of Eligibility for West Yorkshire, South Yorkshire, Liverpool City Region and West Midlands**

15 Department for Environment, Food & Rural Affairs (2023), **UK Statistics on Waste**

16 Environment Agency (2023), **Water and Sewerage Companies in England: Environmental Performance Report 2022** and (2023), **State of the Water Environment Indicator B3: Supporting Evidence**

17 Sky News (6 November 2023), **Schools close as thousands still without water in Surrey**

18 National Infrastructure Commission (2021), **The Second National Infrastructure Assessment: Baseline Report**

19 Environment Agency (2023), **Flood and Coastal Erosion Risk Management Report: 1 April 2022 to 31 March 2023**

20 Department for Environment, Food & Rural Affairs (2024), **Government Response to the National Infrastructure Commission's Study: Reducing the Risk of Surface Water Flooding**

21 Department for Environment, Food & Rural Affairs (2024), **Understanding biodiversity net gain**

22 Joint Nature Conservation Committee (2023), **Overview of Assessment of Change for all Indicators**

23 National Infrastructure Commission (2021), **Natural Capital and Environmental Net Gain: a discussion paper**

24 Department for Levelling Up, Housing & Communities (2023), **Government Response to the National Infrastructure Commission's Report on Delivering Net Zero, Climate Resilience and Growth: Improving nationally significant Infrastructure planning**

Energy and net zero

25 Commission calculations based on Ofgem (2022), **Decision on Accelerating Onshore Electricity Transmission Investment**

26 National Grid ESO (2022), **Modelled Constraint Costs, NOA 2021/22 Refresh**

27 Department for Energy Security & Net Zero (2024), **Sub-national estimates of properties not connected to the gas network**

28 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

29 Ofgem (2022), **Default Tariff Cap update from 1 January 2023**

30 Ofgem (2024), **Energy price cap (default tariff) update from 1 April 2024**

31 National Infrastructure Commission (2024), **Infrastructure performance data**

32 Department for Business, Energy and Industrial Strategy/10 Downing Street (2022), **British Energy Security Strategy**

33 Department for Energy Security & Net Zero (2023), **Contracts for Difference (CfD) Allocation Round 6: core parameters**

34 Department for Levelling Up, Housing & Communities (2023), **National Planning Policy Framework**

35 Department for Energy Security & Net Zero (2024), **Review of electricity market arrangements (REMA): second consultation**

36 Department for Business, Energy and Industrial Strategy/Ofgem (2021), **Transitioning to a net zero energy system: smart systems and flexibility plan 2021**

37 Department for Energy Security & Net Zero (2024), **Long duration electricity storage: proposals to enable investment**

38 Department for Energy Security & Net Zero (2023), **Energy Security Bill factsheet: Ofgem net zero duty**

39 Department for Energy Security & Net Zero (2023), **Energy Security Bill factsheet: Future System Operator**

40 National Grid ESO (2024), **ESO announces the name of the forthcoming Future System Operator**

41 Ofgem (2023), **Decision on future of local energy institutions and governance**

42 Department for Energy Security & Net Zero (2023), **Electricity networks: transmission acceleration action plan**

43 Department for Energy Security & Net Zero/Ofgem (2023), **Electricity networks: connections action plan**

44 Department for Energy Security & Net Zero (2024), **Civil nuclear: roadmap to 2050**

45 Department for Energy Security and Net Zero (2024), **Further steps to prepare Sizewell C for construction**

46 Department for Energy Security & Net Zero (2023), **Six companies through to next stage of nuclear technology competition**

47 Department for Energy Security & Net Zero (2023), **Contracts for Difference (CfD) Allocation Round 5: results**

48 Department for Energy Security & Net Zero (2023), **Contracts for Difference: Methodology used to set Administrative Strike Prices for CfD Allocation Round 6**

49 Energy UK (2024), **Energy UK explains: Allocation Round 6 and the UK's energy security goals**

50 Department for Energy Security & Net Zero (2024), **Energy Trends: March 2024**

51 Commission analysis of Department for Energy Security & Net Zero (2024), **Renewable Energy Planning Database**

52 This refers to recommendation 6 in the second National Infrastructure Assessment, which recommends the creation of a reserve of stored energy that can be used to generate 25TWh of electricity in 2040. It does not refer to the option for a strategic reserve that was discounted in the second Review of Electricity Market Arrangements consultation. House of Lords Science and Technology Committee (2024), **Long-duration energy storage: get on with it**

53 Department for Business, Energy and Industrial Strategy/10 Downing Street (2020), **The Ten Point Plan for a Green Industrial Revolution**

54 Department for Levelling Up, Housing & Communities (2023), **The Future Homes and Buildings Standards: 2023 consultation**

55 Department for Energy Security & Net Zero (2023), **Heat pump grants increased by 50 per cent**

56 Department for Energy Security & Net Zero (2023), **Families, business and industry to get energy efficiency support**

57 Department for Levelling Up, Housing & Communities (2024), **Changes to various permitted development rights: consultation**

58 10 Downing Street (2023), **PM recommits UK to Net Zero by 2050 and pledges a "fairer" path to achieving target to ease the financial burden on British families**

59 Department for Energy Security & Net Zero (2024), **Clean heat market mechanism: proposal to change the scheme start date to 1 April 2025**

60 National Audit Office (2024), **Decarbonising home heating**

61 Cadent Gas (2023), **Hydrogen Village Statement**; Department for Energy Security & Net Zero (2023), **Major boost for hydrogen as UK unlocks new investment and jobs**

62 HM Treasury (2022), **Autumn Statement 2022**

63 Department for Energy Security & Net Zero (2023), **Families to save hundreds through £1 billion insulation scheme**

64 10 Downing Street (2023), **PM recommits UK to Net Zero by 2050 and pledges a "fairer" path to achieving target to ease the financial burden on British families**

65 Department for Business, Energy and Industrial Strategy (2020), **Improving the energy performance of privately rented homes**

66 Climate Change Committee (2023), **Progress in reducing emissions – 2023 Report to Parliament – Supplementary Indicator Data**

67 Department for Energy Security & Net Zero (2024), **Boiler Upgrade Scheme Statistics: December 2023**

68 Department for Energy Security & Net Zero (2023), **Digest of UK Energy Statistics, Table 1.1**

69 Department for Levelling Up, Housing & Communities (2023), **English Housing Survey 2022 to 2023: headline report**

70 National Audit Office (2024), **Decarbonising home heating**

71 HM Government (2021), **Net Zero Strategy: Build Back Greener**

72 Department for Energy Security & Net Zero (2023), **Engineered Greenhouse Gas Removals: government response to the consultation on a GGR Business Model**

73 Department for Energy Security & Net Zero (2023), **Power bioenergy carbon capture and storage consultation: government response**

74 Department for Energy Security & Net Zero (2023), **Carbon capture, usage and storage: a vision to establish a competitive market**

75 Department for Energy Security & Net Zero (2023), **Carbon capture, usage and storage (CCUS): business models**

76 Department for Energy Security & Net Zero (2023), **Cluster sequencing Phase-2: Track-1 project negotiation list, March 2023**

77 Department for Energy Security & Net Zero (2024), **Transitional support mechanism for large-scale biomass electricity generators**

78 Department for Energy Security & Net Zero (2023), **Hydrogen strategy delivery update**

79 Department for Energy Security & Net Zero (2023), **Hydrogen Production Business Model / Net Zero Hydrogen Fund: HAR1 successful projects**

80 Department for Energy Security & Net Zero (2023), **Hydrogen transport and storage networks pathway**

81 National Infrastructure Commission (2024), **Letter to government on business models for net zero technologies**

Growth across all regions: Digital

82 Ofcom (2023), **Communications Market Report 2023: Interactive data** – figures are £57.52 (2013) vs £37.31 (2022) for mobile, and £42.19 (2013) vs £42.42 (2022) for fixed voice and data. All figures are CPI adjusted.

83 Ofcom announced in February 2023 that it would review inflation-linked telecoms price rises, and has consulted on changing the way in which price rises are communicated to consumers, so they are set-out upfront at the start of contracts, and in pounds and pence, rather than linked to inflation statistics. Ofcom (2023), **Prohibiting inflation-linked price rises: proposals for new rules and guidance**

84 Department for Digital, Culture, Media & Sport (2018), **Future Telecoms Infrastructure Review**

85 Figures are from ThinkBroadband, **Local Broadband Information** (accessed on 4 April 2024)

86 Ofcom (2023), **Connected Nations 2023**. Data collected between September 2022 and August 2023. Both the figures for fixed and mobile incidents were broadly in-line with last year's figures. However, whilst there were fewer incidents attributable to storms, there was a seasonal uplift during the summer months, which may indicate that widespread heatwaves may be having an impact on infrastructure resilience.

87 Ofcom (2023), **Communications Market Report 2023: Interactive data**

88 National Infrastructure Commission (2024), **Infrastructure performance data**

89 HM Treasury (2020), **National Infrastructure Strategy**

90 HM Government (2022), **Levelling Up the United Kingdom**

91 Department for Digital, Culture, Media & Sport (2021), **Government launches new £5bn 'Project Gigabit'**

92 HM Treasury (2020), **Spending Review 2020**

93 Department for Science, Innovation & Technology (2024), **Over £1 billion awarded to roll out lightning-fast broadband in hard to reach towns and villages**

94 Department for Digital, Culture, Media & Sport (2021), **Government launches new £5bn 'Project Gigabit'**

95 Building Digital UK (2023), **Policy paper: Project Gigabit progress update, December 2023** and Building Digital UK (2023), **Policy paper: Project Gigabit progress update, April 2024**

96 Ofcom (2021), **Statement: Promoting investment and competition in fibre networks – Wholesale Fixed Telecoms Market Review 2021-26**

97 Ofcom (2024), **Telecoms Access Review 2026**

98 HM Government, **Product Security and Telecommunications Infrastructure Act 2022**

99 Department for Science, Innovation & Technology (2023), **New measures to better protect vulnerable customers agreed with Telecoms firms**

100 Department for Digital, Culture, Media & Sport (2018), **Future Telecoms Infrastructure Review**; HM Treasury (2020), **Response to the National Infrastructure Assessment**

101 Figures are from ThinkBroadband, **Local Broadband Information** (accessed on 4 April 2024) and Ofcom (2022), **Connected Nations 2022**

102 Ofcom (2024), **Connected Nations 2024**. For England, 84 per cent of urban areas had access to a gigabit-capable connection in 2024, against 47 per cent in rural areas. In Scotland, the figures were 82 per cent and 36 per cent respectively; in Wales they were 74 per cent and 43 per cent respectively.

103 Openreach (2023), **Openreach hits halfway point in UK broadband upgrade plan**

104 ISP Review (2024), **Openreach Set to Top 14 Million UK Premises with FTTP Broadband**. Openreach (2023), **Celebrating getting next generation Ultrafast Full Fibre Broadband to 12.5 million homes and businesses**

105 ISP Review (2023), **Virgin Media O2 and Nexfibre Build FTTP to 300,000 Extra UK Premises UPDATE**

106 ThinkBroadband, **Local Broadband Information**, accessed on 1 April 2024

107 Ofcom (2023), **Connected Nations 2023**

108 Ofcom (2023), **Connected Nations 2023**

109 Department for Digital, Culture, Media & Sport (2022), **Call for evidence: Improving broadband for Very Hard to Reach Premises, Government response**

110 Department for Digital, Culture, Media & Sport (2020), **Shared Rural Network**

111 Department for Science, Innovation & Technology (2023), **UK Wireless Infrastructure Strategy**

112 Department for Digital, Culture, Media & Sport (2021), **Telecoms Diversification Taskforce: Findings and Report**

113 Department for Digital, Culture, Media & Sport (2021), **A joint statement on the sunsetting of 2G and 3G networks and public ambition for Open RAN rollout as part of the Telecoms Supply Chain Diversification Strategy**

114 National Infrastructure Commission (2023), **Second National Infrastructure Assessment**

115 National Infrastructure Commission (2023), **Second National Infrastructure Assessment**

116 National Infrastructure Commission (2016), **Connected Future**

117 Ofcom (2024), **Connected Nations update: Spring 2024**, Ofcom (2023), **Connected Nations 2023** and (2022), **Connected Nations 2022**

118 Ofcom (2023), **Connected Nations 2023**

119 Ofcom (2023), **Connected Nations 2023**

120 Figures for 2022 were 73 to 79 per cent for B roads (Ofcom (2022), **Connected Nations 2022**), whereas for 2023 they were 74 to 80 per cent for B roads (Ofcom (2023), **Connected Nations 2023**)

121 Department for Science, Innovation & Technology (2023), **UK Wireless Infrastructure Strategy**

122 Ofcom (2024), **Connected Nations update: Spring 2024** and Ofcom (2023), **Connected Nations 2023**

123 Ofcom (2023), **Connected Nations 2023**

124 Ofcom (2023), **Connected Nations 2023**

125 A non-standalone 5G network is one in which the 5G Radio Access Network is connected to a 4G core network

126 Ofcom (2023), **Connected Nations 2023**. A standalone 5G network, where the 5G Radio Access Network is connected to a 5G core, and can deliver the full functionality of 5G. In contrast, a non-standalone network, where the 5G Radio Access Network is connected to a 4G core, is not able to support the full range of 5G capabilities including, for instance, ultra-low latency.

127 Ofcom (2023), **Connected Nations 2023**

128 Ofcom, **Spectrum information portal**. Accessed 1 May 2024.

129 Ofcom (2023), **Connected Nations 2023**

Growth across all regions: Long term plan for rail

130 HM Treasury (2021), **Remit letter to the National Infrastructure Commission**

131 Department for Transport (2019), **Rail Network Enhancements Pipeline: Autumn 2019 update**

132 Resolution Foundation & Centre for Economic Performance, LSE (2023), **Ending Stagnation: A New Economic Strategy for Britain**

133 Centre for Cities (2024), **Cities Outlook 2024**

134 OECD (2020), **Enhancing Productivity in UK Core Cities**, *Connecting Local and Regional Growth*

135 Office for National Statistics (2024), **Nomis: Population estimates – small area based by single year of age – England and Wales**

136 Venables, A, Laird, J, and Overman, H (2014), **Transport investment and economic performance: Implications for project appraisal**

137 Venables, A, Laird, J, and Overman, H (2014), **Transport investment and economic performance: Implications for project appraisal**

138 Only 17 per cent of vehicle kilometres travelled on the rail network were freight. Office of Rail and Road (2023), **Table 1343: Freight vehicle kilometres by operator, Great Britain, April 2010 to December 2023** and **Table 1253: Passenger vehicle kilometres by operator, Great Britain, April 2020 to December 2023**

139 Department for Transport (2023), **Policy paper: Rail freight growth target**

140 Department for Transport (2022), **TAG UNIT A4.3 Place-Based Analysis**

141 Department for Levelling Up, Housing & Communities (2023), **Greater Manchester Combined Authority Trailblazer deeper devolution deal**

142 Department for Levelling Up, Housing & Communities (2023), **West Midlands Combined Authority Trailblazer deeper devolution deal**

143 Department for Levelling Up, Housing & Communities (2024), **North East deeper devolution deal**

144 Department for Transport (2020), **TAG UNIT M2.1: Variable Demand Modelling**; Wardman, M. and Batley, R. (2014), **Travel time reliability: a review of late time valuations, elasticities and demand impacts in the passenger rail market in Great Britain**; McNulty, R. (2011), **Realising the potential of rail in Great Britain: final independent report of the rail value for money study – detailed report**

145 European Commission (2021), **7th monitoring report on the development of the rail market under Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council**

146 Office of Rail and Road (2024), **Table 3124 – Trains planned and cancellations by operator and cause (periodic)**

147 Office of Rail and Road (2024), **Table 3114 – Public Performance Measure by operator and sector (periodic). Using moving annual average measures**

148 Office of Rail and Road (2024), **Passenger rail performance: 1 October to 31 December 2023**

149 Department for Transport and Williams Rail Review (2021), **Great British Railways: The Williams-Shapps Plan for Rail**

150 The Commission's analysis using data from Network Rail. 14 locations experienced more than 800 delay minutes per week on average between 2021 and 2023, of which seven were in the North and Midlands.

151 Rodrigues, G and Breach, A (2021), **Measuring up: Comparing public transport in the UK and Europe's biggest cities**, *Centre for Cities*

152 Resolution Foundation & Centre for Economic Performance, LSE (2023), **Ending Stagnation: A New Economic Strategy for Britain**

153 Puga, D (2009), **The magnitude and causes of agglomeration economies**

154 Office of Rail and Road (2024), **Passenger rail usage**. 90 per cent include those on the Elizabeth Line. If this is excluded the proportion of 2019 levels would be 80 per cent. From May 2022 journeys on the central section of the Elizabeth line started being recorded in these statistics, some of these journeys replace those that would have been made by other modes (ie on other TfL services) and are therefore not recorded within the statistics in 2019.

155 Steer for the Railway Industry Association (2024), **Research on Long-Term Passenger Demand Growth**

156 Department for Transport (2023), **Rail passenger numbers and crowding on weekdays**

157 Department for Transport (2023), **Rail passenger numbers and crowding on weekdays**; Office of Rail and Road (2023), **Passenger rail usage**; Steer for the Railway Industry Association (2024), **Research on Long-Term Passenger Demand Growth**

158 Frontier Economics (2017), **Exploring the economic benefits of strategic roads**. Report produced for Department for Transport; Laird, J and Johnson, D (2021), **The GDP Effects of Transport Investments: The Macroeconomic Approach**. There is a wide ranging literature on the topic of transport and economic performance. For example, the Frontier Economics report sets out the theoretical mechanisms on how transport investment improves economic performance, including trade and how benefits to key users (freight and business travellers) also affect economic performance. The Laird and Johnson report explains that the key mechanism for interurban (long distance trips that tend to be between cities or regions) is around trade, particularly the location of firms that depend on market access and transport costs between regions.

159 National Infrastructure Commission (2020), **Rail Needs Assessment for the Midlands and the North**

160 National Rail (2024) **National Rail Journey Planner**; Rail Data Marketplace: Office of Rail and Road (2024), **Origin and destination matrix (ODM) 2019-20**

161 Midlands Connect, **Midlands Rail Hub**

162 Department for Transport (2024), **Government sets out next steps on Northern Powerhouse Rail between Liverpool and Manchester**

163 Network Rail, **The Hope Valley Railway Upgrade**

164 Department for Transport (2015), **Technical Annex: Demand and Capacity Pressures on the West Coast Main Line**

165 Department for Transport (2017), **High Speed Two Phase Two Strategic Case**

166 Atkins for the Department for Transport (2015), **Rail Alternative to HS2 Phase 2a**; Atkins for the Department for Transport (2016), **Strategic Alternatives to HS2 Phase 2b**

167 Department for Transport (2015), **Supplement to the October 2013 Strategic Case for HS2 Technical Annex: Demand and Capacity Pressures on the West Coast Main Line**

168 Department for Transport (2023), **Network North**

169 House of Commons Committee of Public Accounts (2024), **HS2 and Euston, Tenth Report of Session 2023-24**

170 Centre for Cities (2020), **Why big cities are crucial to 'levelling up'**

171 Rodrigues, G and Breach, A (2021), **Measuring up: Comparing public transport in the UK and Europe's biggest cities**, *Centre for Cities*

172 Department for Transport (2023), **Passenger transport by mode from 1952**; Department for Transport (2023), **Road traffic estimates in Great Britain: 2022**; Department for Transport (2023), **Road Traffic Estimates in Great Britain, 2022: Traffic in Great Britain by Vehicle Type**

173 Department for Transport (2023), **Passenger transport by mode from 1952**

174 Department for Transport (2024), **Domestic Transport Usage by Mode**

175 Office of Rail and Road (2024), **Passenger rail usage: October to December 2023**

176 Department for Transport (2023), **Provisional road traffic estimates, Great Britain: October 2022 to September 2023**

177 Steer (2022), **Continuing COVID Funding Support for Urban Public Transport**; Department for Transport (2023), **Annual bus statistics: year ending March 2022 (revised)**

178 Urban Transport Group (2023), **A Smoother Ride**; West Yorkshire Combined Authority (2023), **Advancing Bus Provision**

179 Department for Energy Security & Net Zero (2024), **2023 UK greenhouse gas emissions: provisional figures - statistical release**

180 Department for Energy Security & Net Zero (2024), **2023 UK greenhouse gas emissions: provisional figures - statistical release**

181 Department for Energy Security & Net Zero (2024), **2023 UK greenhouse gas emissions: provisional figures - statistical release**

182 National Infrastructure Commission (2024), **Infrastructure performance data**

183 Department for Transport (2023), **Network North CRSTS2 indicative allocations, 4 October 2023**

184 Institute for Government (2023), **Trailblazer devolution deals**

185 HM Treasury (2024), **Spring Budget 2024**

186 HM Treasury (2024), **Spring Budget 2024**

187 Department for Levelling Up, Housing & Communities (2024), **Update on Level 4 devolution: Confirmation of eligibility for West Yorkshire, South Yorkshire, Liverpool City Region and the West Midlands**

188 HM Government (2022), **Levelling Up the United Kingdom**

189 Department for Transport (2024), **Local Transport Fund allocations 2025 to 2032**

190 Department for Transport (2021), **Decarbonising transport: a better, greener Britain**

191 Department for Transport (2023), **Infrastructure for zero emission heavy goods vehicles and coaches**

192 Department for Transport (2023), **Infrastructure for zero emission heavy goods vehicles and coaches**

193 Department for Transport (2023), **Government invests £200 million to drive innovation and get more zero emission trucks on our roads**

194 National Audit Office (2022), **Road enhancements: progress with the second road investment strategy (2020 to 2025)**

195 Department for Transport (2023), **Transport Update**

196 Department for Transport (2023), **Network North: highways maintenance funding increase**

197 Ofgem (2018), **Implications of the transition to electric vehicles**; Department for Transport (2021), **Decarbonising transport: a better, greener Britain**; Local Government Association (2023), **The case for electric vehicles**; House of Commons Library (2023), **Electric vehicles and infrastructure**; European Environment Agency (2018), **Electric vehicles from life cycle and circular economy perspectives**

198 Climate Change Committee (2023), **2023 Progress Report to Parliament**; Zapmap (2023), **Zapmap Price Index**; Commission analysis of Department for Transport (2022), **Transport Analysis Guidance**

199 Department for Transport (2024), **Monthly total number of electric vehicle public charging devices available in the UK, 1 April 2024**

200 Department for Transport (2024), **Monthly total number of electric vehicle public charging devices available in the UK, 1 April 2024**

201 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

202 Department for Transport (2023), **Zero emission vehicle (ZEV) mandate consultation: summary of responses and joint government response**

203 Department for Transport (2023), **Consultation on a zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK**

204 Zapmap (2024), **EV market stats 2024**; SMMT (2024), **Car Registrations**

205 Zapmap (2024), **EV market stats 2024**; SMMT (2024), **Car Registrations**

206 Asphalt Industry Alliance (2024), **Annual Local Authority Road Maintenance: Survey**

207 Department for Transport (2024), **Boost for drivers as millions delivered for EV chargepoints across the country**

The environment: Flood resilience

208 Carbon Brief (2024), **Met Office: A review of the UK's climate in 2023**

209 Met Office (2023), **Storm Babet, 18-21 October 2023**

210 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

211 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

212 The Commission's solutions hierarchy for managing surface water flooding starts with optimising existing drainage, through better maintenance and optimisation. After this, above ground interventions, including nature based solutions, should be considered. Below ground options, such as additional pipers and sewers, should be a last resort. See National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

213 Department for Environment, Food & Rural Affairs (2024), **Government response to the National Infrastructure Commission's study: Reducing the risk of surface water flooding**

214 Environment Agency (2023), **Flood and coastal erosion risk management report: 1 April 2022 to 31 March 2023**

215 Environment Agency (2023), **Flood and coastal erosion risk management report: 1 April 2021 to 31 March 2022**

216 Environment Agency (2023), **Flood and coastal erosion risk management report: 1 April 2022 to 31 March 2023**

217 National Infrastructure Commission (2024), **Infrastructure performance data**

218 National Audit Office (2023), **Report: Resilience to flooding**

219 National Audit Office (2023), **Report: Resilience to flooding**

220 See recommendation 35 in the second National Infrastructure Assessment. National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

221 National Infrastructure Commission (2022), **Reducing the risk of surface water flooding**; BMG Research (2022), **Surface water flooding social research**

222 National Audit Office (2023), **Government resilience: Extreme weather**

223 BMG Research (2022), **Surface water flooding social research**

224 House of Commons Committee of Public Accounts (2024), **Resilience to flooding**

225 House of Commons Committee of Public Accounts (2024), **Resilience to flooding**

226 See recommendation 33 in the second National Infrastructure Assessment. National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

227 Environment Agency (2023), **Flood and coastal erosion risk management report: 1 April 2022 to 31 March 2023**

228 All references to the government response to the Commission's study on surface water flooding can be found in Department for Environment, Food & Rural Affairs (2024), **Government response to the National Infrastructure Commission's study: Reducing the risk of surface water flooding**

229 Department for Environment, Food & Rural Affairs (2023), **New approach to sustainable drainage set to reduce flood risk and clean up rivers**

230 Environment Agency (2020), **National flood and coastal erosion risk management strategy for England**

231 HM Treasury (2024), **Treasury minutes: March**

232 HM Government (2020), **Flood and coastal erosion risk management: Policy statement**

233 House of Commons Committee of Public Accounts (2024), **Resilience to flooding**

234 HM Government (2022), **Guidance: Flood risk and coastal change**

235 See recommendation 33 in the second National Infrastructure Assessment. National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

236 HM Government (2022), **Guidance: Flood risk and coastal change**

237 Environment Agency (2023), **Flood and coastal erosion risk management report: 1 April 2022 to 31 March 2023**

238 Environment Agency (2023), **Flood and coastal erosion risk management report: 1 April 2022 to 31 March 2023**

239 HM Government (2023), **Guidance: Natural flood management programme**

240 Environment Agency (2023), **Improving the way we deliver Property Flood Resilience**

241 Environment Agency (2024), **Bold leadership for surface water flooding**

242 Ofwat (2024), **Price reviews**

243 Modelling carried out on behalf of the Commission for its study on surface water flooding indicated that investing about £12 billion over 30 years is needed, with approximately 60 per cent of this coming from private sector investment. National Infrastructure Commission (2022), **Reducing the risk of surface water flooding**

244 HM Government (2023), **Frequently flooded allowance: Funding for repeatedly flooded communities**

245 Department for Environment, Food & Rural Affairs (2024), **Government response to the National Infrastructure Commission's study: Reducing the risk of surface water flooding**

246 National Audit Office (2023), **Report: Resilience to flooding**

247 Department for Environment, Food & Rural Affairs (2023), **The review for implementation of Schedule 3 to the Flood and Water Management Act 2010**

248 National Audit Office (2023), **Report: Resilience to flooding**

249 HM Government (2020), **Guidance: Flood and coastal innovation programmes**

250 Department for Environment, Food & Rural Affairs (2024), **The floods investment programme: Investment in deprived areas**

251 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment: Appendix A**

252 See recommendation 46 in the second National Infrastructure Assessment. National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

253 National Infrastructure Commission (2022), **Reducing the risk of surface water flooding**. The Public Accounts Committee also reported that flood resilience schemes were disproportionately time consuming to set up – while most of the schemes in the Environment Agency's capital programme are small (80 per cent will cost less than £3 million), they have to go through the same, complex approval process as larger schemes. See House of Commons Committee of Public Accounts (2024), **Resilience to flooding**.

254 Department for Environment, Food & Rural Affairs (2024), **Government response to the National Infrastructure Commission's study: Reducing the risk of surface water flooding**

255 Environment Agency (2023), **Annual report and accounts for the financial year 2022 to 2023**

256 Environment Agency (2023), **Annual report and accounts for the financial year 2022 to 2023**

257 HM Treasury (2024), **Treasury minutes: March**

258 National Audit Office (2023), **Report: Resilience to flooding**

259 National Infrastructure Commission (2022), **Reducing the risk of surface water flooding**

260 Department for Environment, Food & Rural Affairs (2024), **Government response to the National Infrastructure Commission's study: Reducing the risk of surface water flooding**

The environment: Water

261 Commission calculation using the CIPH inflation measure for November 2023, consistent with Ofwat methodology; see Ofwat (2024), **Average Bills Press Statement 2024/25**

262 Commission calculation

263 Discover Water (2023), **Loss of Supply**

264 Drinking Water Inspectorate (2023), **Drinking Water 2022**

265 Environment Agency and Natural England (2023), **State of the Water Environment Indicator B3: Supporting Evidence**

266 Environment Agency (2023), **Water and Sewerage Companies in England: environmental performance report 2022**

267 Environment Agency (2024), **Environment Agency Publishes Storm Overflow Spill Data for 2023**

268 Department for Environment, Food & Rural Affairs (2022), **Storm Overflows Discharge Reduction Plan**

269 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

270 Environment Agency (2023), **A summary of England's revised draft regional and water resources management plans**

271 National Infrastructure Commission (2024), **Infrastructure performance data**

272 HM Treasury (2020), **National Infrastructure Strategy**

273 Department for Environment, Food & Rural Affairs (2022), **Government's Strategic Priorities for Ofwat**

274 Ofwat (2019), **PR19 Final Determinations: Overview of companies' final determinations**

275 Water UK (2018), **Letter to the Secretary of State**

276 Water UK (2022), **A Leakage Routemap to 2050**

277 Department for Environment Food & Rural Affairs (2022), **Consultation on Environmental Targets**

278 Environment Agency (2021), **Updating the Determination of Water Stressed Areas in England**

279 Department for Environment, Food & Rural Affairs (2023), **Consultation Outcome: Summary of Responses and Government Response**

280 Department for Environment, Food & Rural Affairs (2023), **Plan for Water: Our Integrated Plan for Delivering Clean and Plentiful Water**

281 Department for Levelling Up, Housing & Communities (2023), **The Next Stage in Our Long Term Plan for Housing Update**

282 Department for Environment, Food & Rural Affairs (2023), **Plan for Water: Our integrated plan for delivering clean and plentiful water**

283 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

284 Frontier Economics (2021), The Benefits of Smart Metering in the Water Sector

285 Artesia and Frontier Economics (2024), **Smart Metering: Making the Right Decisions**

286 Environment Agency (2023), **A Summary of England's Revised Draft Regional and Water Resources Management Plans**

287 Ofwat (2022), **Creating Tomorrow, Together: Our final methodology for PR24**

288 Department for Business & Trade (2023), **Smarter Regulation: Strengthening the Economic Regulation of the Energy, Water and Telecoms Sectors**

289 National Infrastructure Commission (2023), **Infrastructure Progress Review 2023**

290 Ofwat (2023), **Water Company Performance Report 2022-23**

291 Thames Water (2023), **Annual Performance Report 2022-23**; Anglian Water (2023), **Annual Performance Report 2023**

292 Jaroszweski D, Wood R, and Chapman L (2021), **Infrastructure**, in: *The Third UK Climate Change Risk Assessment Technical Report* [Betts RA, Haward AB, Peearson KV (eds)] prepared for the Climate Change Committee, London

293 Ofwat (2023), **Water Company Performance Report 2022-23**

294 Commission analysis using published PR24 company data tables. Figures are pre-frontier shift.

295 Ofwat (2024), **2024 Price Review**

296 Ofwat (2023), **Scoping the Water Efficiency Fund: High level consultation**

297 UK Infrastructure Bank (2023), **Havant Thicket deal: Factsheet**

298 Ofwat (2022), **Creating Tomorrow Together: our final methodology for PR24**

299 National Infrastructure Commission (2023), **Letter to Ofwat on Asset Management**

300 Department for Business, Energy & Industrial Strategy (2021), **Energy-Related Products Policy Framework**

The environment: waste

301 WRAP (2023), **Comparing the costs of alternative waste treatment options**

302 Department for Environment, Food & Rural Affairs (2023), **Local Authority Waste statistics – Recycling measures** and (2024), **Statistics on waste managed by local authorities in England, Figure 7**

303 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment** and Commission analysis of Department for Environment, Food & Rural Affairs (2024), **Local authority collected waste management – annual results 2022/23**

304 Department for Environment, Food & Rural Affairs (2024), **Local authority collected waste management – annual results 2022/23**

305 Committee on Climate Change (2020), **The Sixth Carbon Budget: Waste**

306 Department for Energy Security & Net Zero (2023), **UK local authority and regional greenhouse gas emissions national statistics 2005 - 2021;** Commission analysis

307 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

308 Commission analysis of Department for Levelling Up, Housing & Communities (2023), **Local authority revenue expenditure and financing England: Revenue outturn cultural, environmental, regulatory and planning services (RO5) 2022 to 2023**

309 Local Government Association (2023), **Polling on resident satisfaction with councils: Round 35**

310 National Infrastructure Commission (2024), **Infrastructure performance data**

311 HM Government (2018), **Our Waste, Our Resources: A Strategy for England**; Department for Environment, Food & Rural Affairs (2021), **Waste Management Plan for England**; HM Government (2021), **Net Zero Strategy: Build Back Greener**; HM Government (2023), **The Environmental Targets (Residual Waste) (England) Regulations 2023**

312 Department for Environment, Food & Rural Affairs (2021), **EFRA Inquiry: Plastic Waste - Written evidence submitted by Defra (PW0061)**

313 HM Government (2018), **A Green Future: Our 25 Year Plan to Improve the Environment** and (2018), **Our Waste, Our Resources: A Strategy for England**

314 Department for Environment, Food & Rural Affairs (2023), **Consistency in household and business recycling in England: Government response**

315 House of Commons Committee of Public Accounts (2023), **Government's programme of waste reforms**

316 Department for Environment, Food & Rural Affairs, Department for Agriculture, Environment and Rural Affairs, Scottish Government and Welsh Government (2022), **Extended Producer Responsibility for Packaging: Summary of consultation responses and Government response**

317 Department for Environment, Food & Rural Affairs and Environment Agency (2024), **Extended producer responsibility for packaging: who is affected and what to do**; House of Commons Committee of Public Accounts (2023), **Government's programme of waste reforms**

318 Department for Environment, Food & Rural Affairs, Department for Agriculture, Environment and Rural Affairs and Welsh Government (2023), **Introducing a Deposit Return Scheme for drinks containers in England, Wales and Northern Ireland**

319 Department for Environment, Food & Rural Affairs (2024), **Update: Deposit Return Scheme for Drinks Containers**

320 UK Government, Scottish Government, Welsh Government, Department of Agriculture, Environment and Rural Affairs for Northern Ireland (2023), **Developing the UK Emissions Trading Scheme: Main Response**

321 HM Government (2023), **Responding to the Climate Change Committee's (CCC) 2023 Annual Progress Report to Parliament**; Department for Energy Security & Net Zero (2023), **Decarbonisation Readiness**

322 Department for Environment, Food & Rural Affairs (2023), **New bans and restrictions on polluting single-use plastics come into force**

323 Department for Environment, Food & Rural Affairs (2024), **The Environmental Protection (Single-use Vapes) (England) Regulations 2024 draft SI**; (2023), **Consultation on the proposed ban of the manufacture supply and sale of wet wipes containing plastic**

324 Department for Environment, Food & Rural Affairs, Department for Agriculture, Environment and Rural Affairs, Scottish Government and Welsh Government (2023), **Consultation on reforming the producer responsibility system for waste electrical and electronic equipment**

325 HM Revenues and Customs (2023), **Increase to Plastic Packaging Tax rates from 1 April 2024** and HM Treasury (2024), **Spring Budget 2024**

326 Department for Environment, Food & Rural Affairs (2023), **Mandatory digital waste tracking**

327 Department for Environment, Food & Rural Affairs (2024), **Local authority collected waste management – annual results 2022/23**

328 Department for Environment, Food & Rural Affairs (2024), **Estimates of Residual Waste (excluding Major Mineral Wastes) and Municipal Residual Waste in England**

329 Commission analysis of Department for Environment, Food & Rural Affairs (2023), **J4: Residual waste arising by type and sector** and Office for National Statistics (2020), **Population estimates for the UK and constituent countries by sex and age; historical time series: Table 11**

330 Commission analysis of Department for Environment, Food & Rural Affairs (2024), **Local authority collected waste management – annual results 2022/23**

331 Department for Environment, Food & Rural Affairs (2024), **Local authority collected waste management – annual results 2022/23**

332 Commission analysis of Department for Environment, Food & Rural Affairs (2024), **WasteDataFlow - Local Authority waste management**

333 Department for Environment, Food & Rural Affairs (2024), **Local authority collected waste management – annual results 2022/23**

334 Department for Environment, Food & Rural Affairs (2023), **UK statistics on waste**

335 The waste decarbonisation plan was confirmed in National Audit Office (2023), **The government's resources and waste reforms for England**

336 Department for Environment, Food & Rural Affairs (2023), **The waste prevention programme for England: Maximising Resources, Minimising Waste**

337 Office for Environmental Protection (2022), **Advice on environmental targets**; (2024), **Progress in improving the natural environment in England 2022/23**; House of Commons Committee of Public Accounts (2023), **Government's programme of waste reforms**

338 Department for Environment, Food & Rural Affairs (2024), **New £295m for councils to introduce weekly food waste collections**; Department for Environment, Food & Rural Affairs (2024), **Food waste collection grant determination (2024): No 31/7069**

339 Department for Environment, Food & Rural Affairs (2023), **Consistency in household and business recycling in England: Government response**; **HM Treasury (2024), Treasury Minutes: Government Response to the Committee of Public Accounts on the Eightieth report from Session 2022-23 and the First to the Sixth reports from Session 2023-24**

Cross cutting

340 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

341 The White House (2023), **Inflation Reduction Act Guidebook**; European Commission (2023), **The Net-Zero Industry Act: Accelerating the transition to climate neutrality**

342 HM Treasury (2010), **Infrastructure Cost Review: Main Report**; Office for National Statistics (2023), **Construction output price indices**

343 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

344 Jong, Tsvetkova, Lembcke and Ahrend (2021), **A comprehensive approach to understanding urban productivity effects of local governments: Local autonomy, government quality and fragmentation, OECD Regional Development Papers**

345 HM Treasury (2021), **Autumn Budget and Spending Review 2021**; Commission analysis

346 Office for Budget Responsibility (2022), **The Implications of the Government's Departmental Spending Plans**

347 National Infrastructure Commission (2019), **Strategic Investment and Public Confidence**

348 Department for Business and Trade (2023), **Smarter regulation to grow the economy**

349 Department for Business and Trade (2023), **Smarter Regulation: Strengthening the economic regulation of the energy, water and telecoms sectors**

350 Department for Business and Trade (2023), **Government Response to Smarter Regulation: Consultation on extending the Growth Duty to the economic regulators Ofgem, Ofwat and Ofcom**

351 UK Regulators Network (2023), **UKRN guidance for regulators on the methodology for setting the cost of capital**

352 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

353 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

354 Department for Energy Security & Net Zero (2023), **Energy Security Bill Factsheet: Ofgem net zero duty**

355 Department for Energy Security & Net Zero (2024), **Strategy and Policy Statement for Energy Policy in Great Britain**

356 Department for Energy Security & Net Zero (2023), **Transmission Acceleration Action Plan**

357 Department for Business and Trade (2023), **Smarter Regulation: Strengthening the economic regulation of the energy, water and telecoms sectors**

358 Ofgem (2023), **RIIO-3 Sector Specific Methodology Consultation – Overview Document**

359 Department for Environment, Food & Rural Affairs (2022), **The government's strategic priorities for Ofwat**

360 Department for Business and Trade (2023), **Smarter Regulation: Strengthening the economic regulation of the energy, water and telecoms sectors**; Ofwat (2022), **Creating tomorrow, together: Our final methodology for PR24. Appendix 5: Direct procurement for customers**

361 Ofwat (2022), **Competition in strategic investment: a high-level stocktake**

362 Ofwat (2023), **Monitoring Financial Resilience Report**

363 National Infrastructure Commission (2023), **Delivering net zero, climate resilience and growth: Improving nationally significant infrastructure planning**

364 Department for Levelling Up, Housing & Communities (2023), **Nationally Significant Infrastructure: action plan for reforms to the planning process**

365 Department for Environment, Food & Rural Affairs (2023), National Policy Statement for Water Resources Infrastructure, Department for Energy Security & Net Zero (2024), **National Policy Statements for energy infrastructure**; Department for Transport (2024), **National Networks National Policy Statement**

366 Department for Energy Security & Net Zero (2024), **A National Policy Statement for new nuclear power generation: Consultation on the new approach to siting beyond 2025**

367 Department for Transport (2023), Review of the national policy statement for ports

368 Department for Levelling Up, Housing & Communities (2024), **Operational reforms to the Nationally Significant Infrastructure Projects consenting process: government response**

369 Department for Levelling Up, Housing & Communities (2024), **National Infrastructure Planning Guidance Portal**

370 Department for Levelling Up, Housing & Communities (2024), **Review on the causes of legal challenges brought against the NSIP regime and the scope and options for improving existing processes**

371 Department for Levelling Up, Housing & Communities (2024), **Operational reforms to the Nationally Significant Infrastructure Projects consenting process: government response**

372 Department for Levelling Up, Housing & Communities (2024), **Operational reforms to the Nationally Significant Infrastructure Projects consenting process: government response**

373 Department for Levelling Up, Housing & Communities and HM Treasury (2023), **Government response to the National Infrastructure Commission's report on Delivering net zero, climate resilience and growth: improving nationally significant infrastructure planning** and (2024), **Operational reforms to the Nationally Significant Infrastructure Projects consenting process: government response**

374 Department for Transport (2024), **Review of transport infrastructure legislation: definitions for highway and railway Nationally Significant Infrastructure Projects in the Planning Act 2008**

375 Department for Levelling Up, Housing & Communities (2023), **Getting Great Britain building again: Speeding up infrastructure delivery**

376 Department for Levelling Up, Housing & Communities and HM Treasury (2023), **Government response to the National Infrastructure Commission's report on Delivering net zero, climate resilience and growth: improving nationally significant infrastructure planning**

377 Department for Environment, Food & Rural Affairs (2022), **Natural Capital and Ecosystem Assessment Programme**

378 Department for Levelling Up, Housing & Communities (2023), **Environmental Outcomes Report: a new approach to environmental assessment**

379 Department for Levelling Up, Housing & Communities and HM Treasury (2023), **Government response to the National Infrastructure Commission's report on Delivering net zero, climate resilience and growth: improving nationally significant infrastructure planning**

380 Department for Business, Energy & Industrial Strategy (2021), **Community Engagement and Benefits from Onshore Wind Developments: Good Practice Guidance for England**

381 Department for Energy Security & Net Zero (2023), **Transmission Acceleration Action Plan**

382 Department for Levelling Up, Housing & Communities and HM Treasury (2023), **Government response to the National Infrastructure Commission's report on Delivering net zero, climate resilience and growth: improving nationally significant infrastructure planning**

383 Department for Levelling Up, Housing & Communities (2023), **Getting Great Britain building again: Speeding up infrastructure delivery**

384 HM Treasury (2023), **Autumn Statement 2023**

385 Department for Levelling Up, Housing & Communities (2023), Nationally Significant Infrastructure: action plan for reforms to the planning process

386 National Infrastructure Commission (2018), **The Value of Design in Infrastructure Delivery**

387 National Infrastructure Commission (2020), **Design principles for national infrastructure**

388 HM Treasury (2020), **National Infrastructure Strategy**

389 Infrastructure and Projects Authority (2021), **Transforming Infrastructure Performance: Roadmap to 2030** and (2021), **Gate Review Process - Gate 1 Review: Business Justification**

390 Institution of Civil Engineers (2022), **Defining and developing the design champion role**

391 Institution of Civil Engineers (2022), **Defining and developing the design champion role** and (2023), **Defining and developing the Design Champion Role: research report**

392 Dasgupta (2021), **The Economics of Biodiversity: The Dasgupta Review**; Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019), **Summary for policymakers of the global assessment report on biodiversity and ecosystem services**; Joint Nature Conservation Committee (2023), **Overview of Assessment of Change for all Indicators**

393 National Infrastructure Commission (2021), **Natural capital and environmental net gain: A discussion paper**

394 HM Government (2018), **A Green Future: Our 25 Year Plan to Improve the Environment**

395 HM Government (2023), **Environmental Improvement Plan 2023**

396 Department for Environment, Food & Rural Affairs (2019), **Clean Air Strategy 2019**

397 Department for Environment, Food & Rural Affairs (2024), **Understanding biodiversity net gain**

398 Department for Environment, Food & Rural Affairs (2023), **Consultation on the principles of marine net gain: Government response**

399 Department for Environment, Food & Rural Affairs (2023), **Local nature recovery strategy guidance**

400 HM Government (2023), **Environmental Improvement Plan 2023**

401 National Infrastructure Commission (2023), The Second National Infrastructure Assessment and (2023), **The Second National Infrastructure Assessment: Impact and Costings for Recommendations**

402 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

403 HM Government (2022), **The UK Government Resilience Framework**

404 Cabinet Office (2023), **The UK Government Resilience Framework: 2023 Implementation Update**

405 HM Government (2023), **The Third National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting**

406 HM Government (2022), **The UK Government Resilience Framework**; Cabinet Office (2023), **The UK Government Resilience Framework: 2023 Implementation Update**

407 Cabinet Office (2023), **CyberUK speech**

408 Cabinet Office (2023), **The UK Government Resilience Framework: 2023 Implementation Update**

409 Climate Change Committee (2024), **Independent Assessment of the Third National Adaptation Programme (NAP3)**

410 HM Government (2023), **The Third National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting**

411 National Audit Office (2023), **Government resilience: extreme weather**

412 Environment Agency (2020), **Meeting our future water needs: a national framework for water resources**; Ofgem (2016), **Know Your Rights: Power cuts**

413 Ofcom (2023), **Resilience Guidance Consultation and Call for Input on Mobile RAN Power Back Up**

414 Network Rail (2023), **England and Wales Strategic Business Plan Control Period 7** and (2021), Network Rail **Third Adaptation Report**

415 HM Government (2023), **The Third National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting**

416 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

417 HM Government (2023), **The Third National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting**

418 Ofwat (2023), **The RAPID gated process and the proposed water resource solutions**

419 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

420 National Infrastructure Commission (2023), **The Second National Infrastructure Assessment**

421 Climate Change Committee (2023), **Investment for a well-adapted UK**.

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