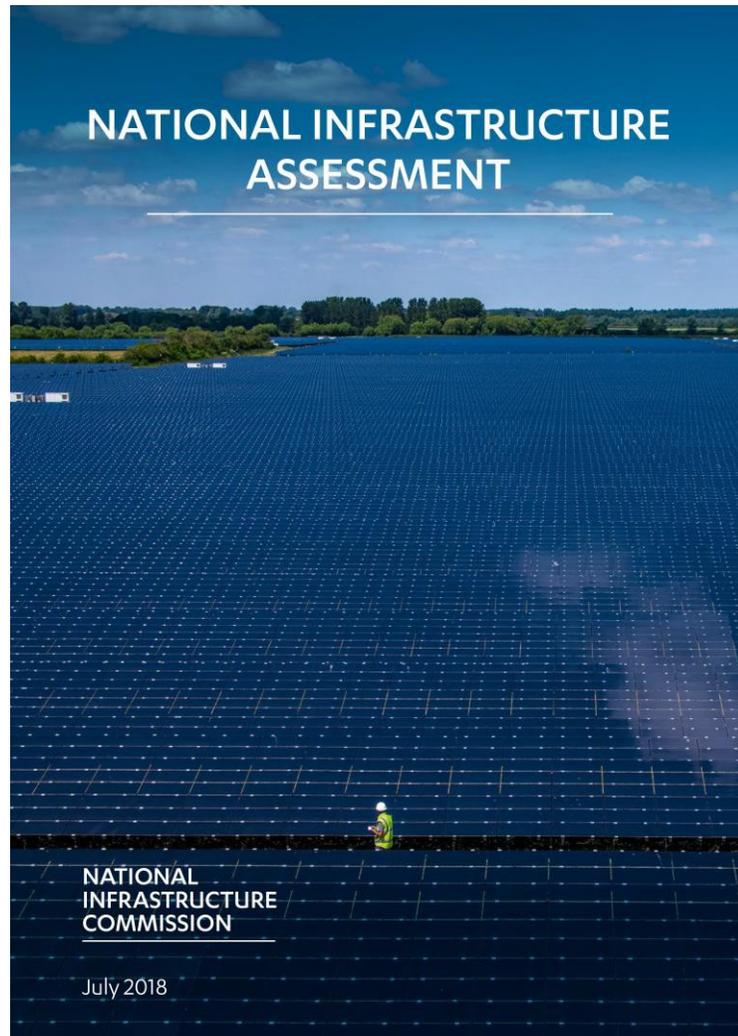


**NATIONAL
INFRASTRUCTURE
COMMISSION**

The UK's National Infrastructure Assessment
September 2018

The National Infrastructure Assessment



“Infrastructure can inspire confidence and growth. But long term projects require a long term vision, lasting plans and stable funding...”

“Now is the time to deliver. This Assessment is the plan of action.”

What does it say?

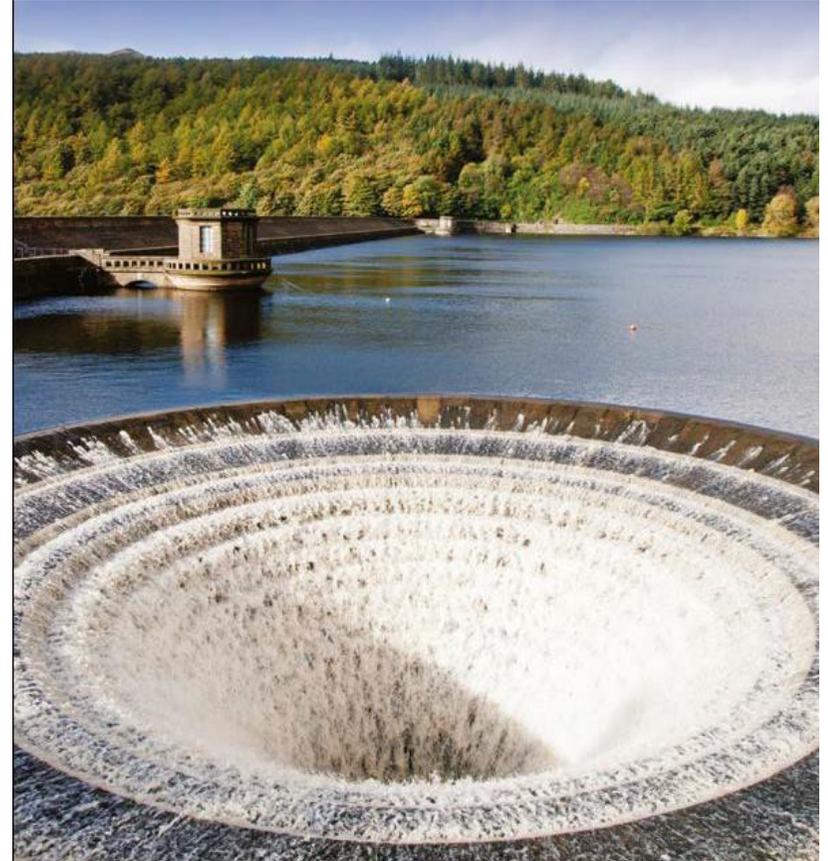
The recommendations include:

- Nationwide full fibre broadband by 2033
- Half of the UK's power provided by renewables by 2030
- Three quarters of plastic packaging recycled by 2030
- £43 billion of stable long term transport funding for regional cities
- Preparing for 100 per cent electric vehicle sales by 2030
- Ensuring resilience to extreme drought
- A national standard of flood resilience by 2050

It's not all about new infrastructure

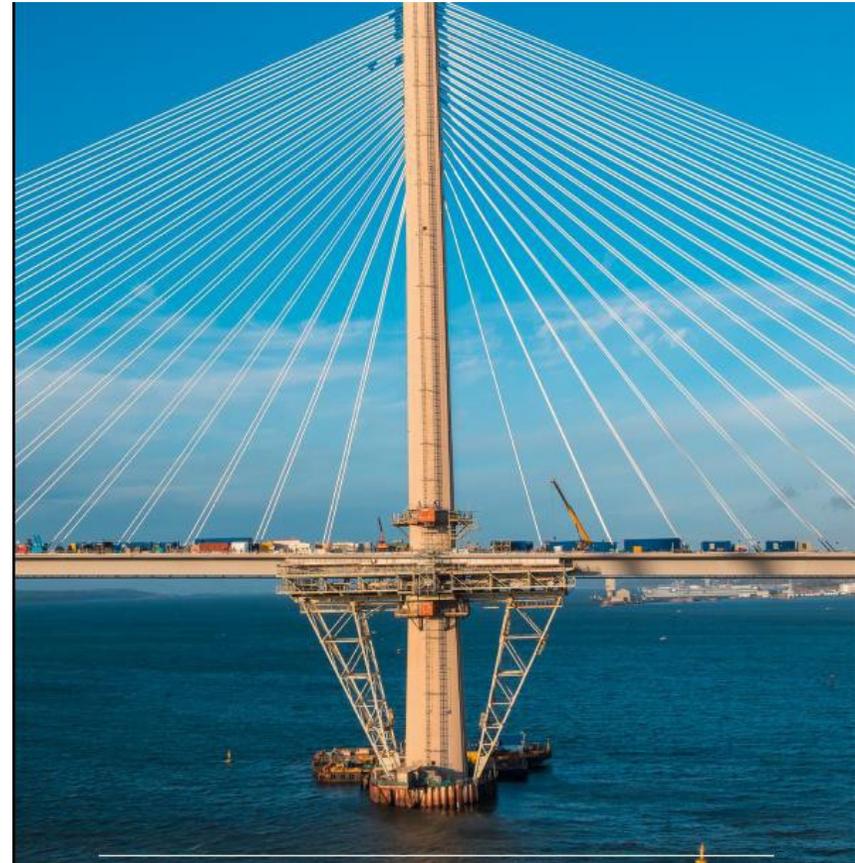
The recommendations include:

- Making better use of existing assets
- Policy changes
- Funding and financing
- In some areas, keeping our options open
- Getting better at choosing and designing infrastructure

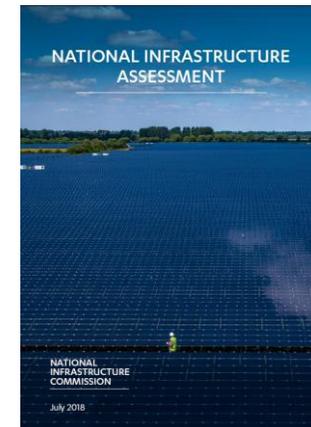
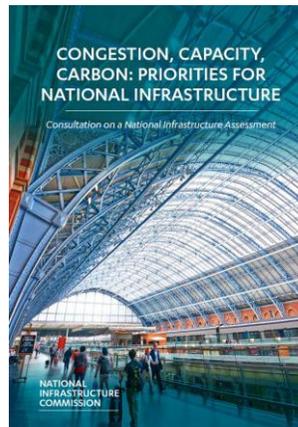
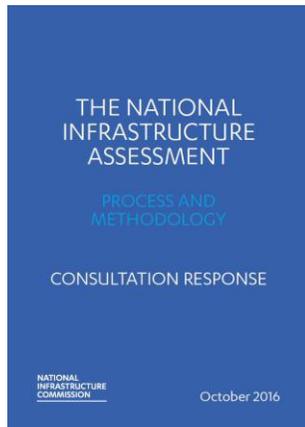


Putting the Assessment together

- There was no blueprint
- The potential scope was vast
- Timelines were relatively short
- Commissioners came from a range of backgrounds
- The Secretariat had to build capacity in parallel
- Stakeholders were incredibly supportive



The three main phases



Establishing our credibility through studies

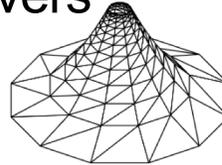


Thinking long term

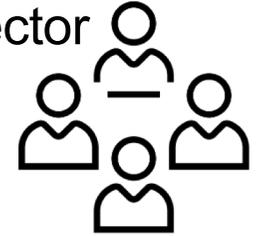


31 specialist reports

Analysing drivers and scenario modelling



Industry/sector events and bilaterals



Social research

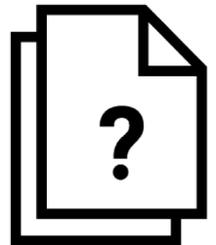
If you surround the problem, it will eventually surrender

Engagement around the country

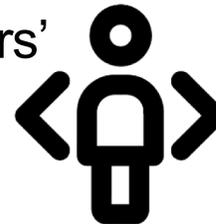


Expert panels and roundtables

Public calls for evidence & consultations



Commissioners' judgements



A fully costed plan, not a wish list

Table 7.1: The fiscal remit

| Average annual expenditure (£ million, 2018/19 prices) | 2020-2025 | 2025-2030 | 2030-2035 | 2035-2040 | 2040- 2045 | 2045-2050 |
|---|---------------|---------------|---------------|---------------|---------------|---------------|
| Transport | | | | | | |
| HS2 | 4,500 | 3,900 | 900 | | | |
| Crossrail 2 | 200 | 2,200 | 2,900 | | | |
| Northern Powerhouse Rail | 200 | 1,100 | 1,700 | 1,800 | | |
| Network Rail | 6,100 | 6,100 | | | | |
| Highways England | 4,300 | 3,200 | | | | |
| Strategic Transport* | | | 10,500 | 11,400 | 11,200 | 11,600 |
| Devolved Cities | 3,300 | 3,600 | 4,600 | 5,400 | 6,100 | 6,800 |
| Transport for London | 2,600 | 2,900 | 2,200 | 2,000 | 2,200 | 2,400 |
| Urban Major Projects | 500 | 400 | 2,400 | 3,100 | 3,500 | 3,900 |
| Non-urban local transport | 2,700 | 2,900 | 3,400 | 3,800 | 4,200 | 4,700 |
| Local Roads Backlog | | 500 | 500 | | | |
| Housing Infrastructure Fund | 500 | 200 | 200 | 200 | 200 | 200 |
| Energy | | | | | | |
| Energy efficiency | 100 | 300 | 300 | 100 | | |
| EV Charging | 2** | | | | | |
| Digital | | | | | | |
| Rural fibre | 400 | 300 | 100 | | | |
| Waste | 600 | 500 | 500 | 500 | 500 | 500 |
| Flood Resilience | 600 | 700 | 900 | 1,300 | 1,300 | 1,300 |
| Studies Contingency | 300 | 400 | 400 | 400 | 400 | 400 |
| Total expenditure on infrastructure | 26,900 | 29,200 | 31,500 | 30,000 | 29,600 | 31,800 |
| As a % of GDP | 1.2% | 1.2% | 1.2% | 1.0% | 0.9% | 0.8% |

*combined allocation for road and rail.

**£10m funding in 2020/21.

The team

- 38 people worked directly on the assessment
- About 20 at any one time
- Mix of civil servants, industry secondees and direct recruits
- Wide range of skills: economics, engineering, finance, transport planning, gas networks...
- Policy, drafting and engagement skills also crucial



Govt committed to respond within 12 months

The work does not stop here

Government, regulators and industry all need to contribute to deliver this

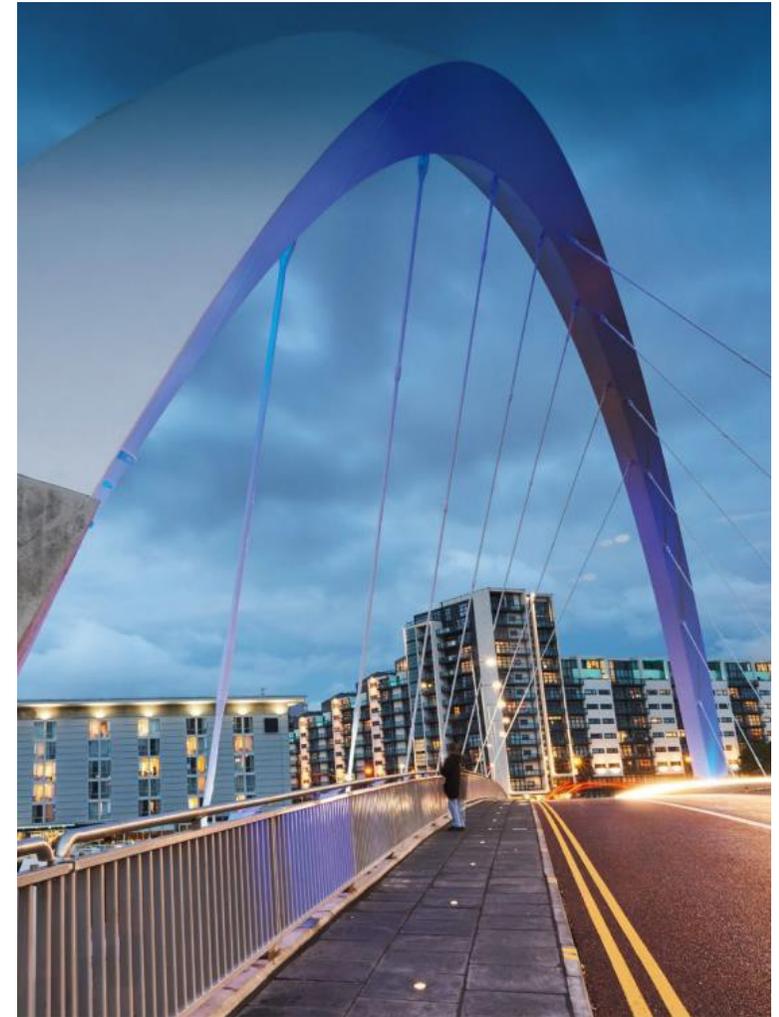
The Commission will:

- Seek consensus
- Work with government to establish recommendations as policy
- Monitor implementation of recommendations
- Carry out further work, including housing, design and regulation
- Begin work on the 2nd Assessment



Lessons learnt

- The power of independence
- Good decisions that last
- Data and methods are imperfect
- Problem definition is key
- Show your working
- Anyone can come up with a wish list: a costed plan is quite different
- It's not all economics & engineering
- Social research
- The usual project lessons
- Proof is in the eating...



NATIONAL INFRASTRUCTURE COMMISSION

Our reports have led to action

- The establishment of proper cross-Government working on housing and transport
- The setup of a new Digital Task Force
- Development funding released for rail schemes and to accelerate delivery of smart motorways
- Government plan for removing barriers to smart technologies across energy system

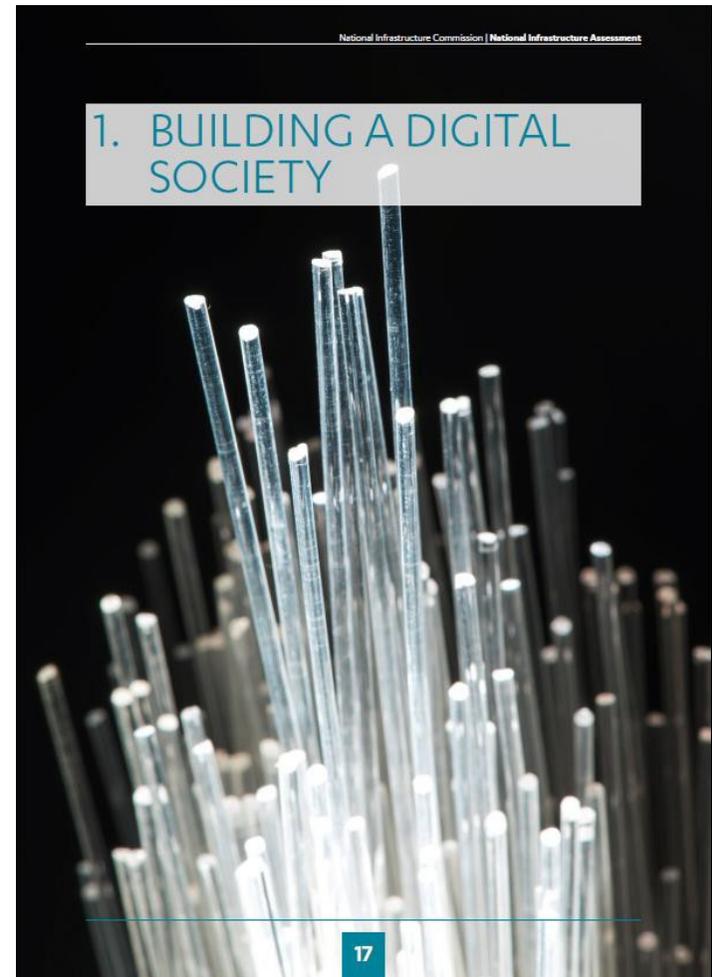
Building a digital society

Full fibre is the next step

- Faster, more reliable, cheaper to run
- Delivery will take 10-20 years

Key recommendations:

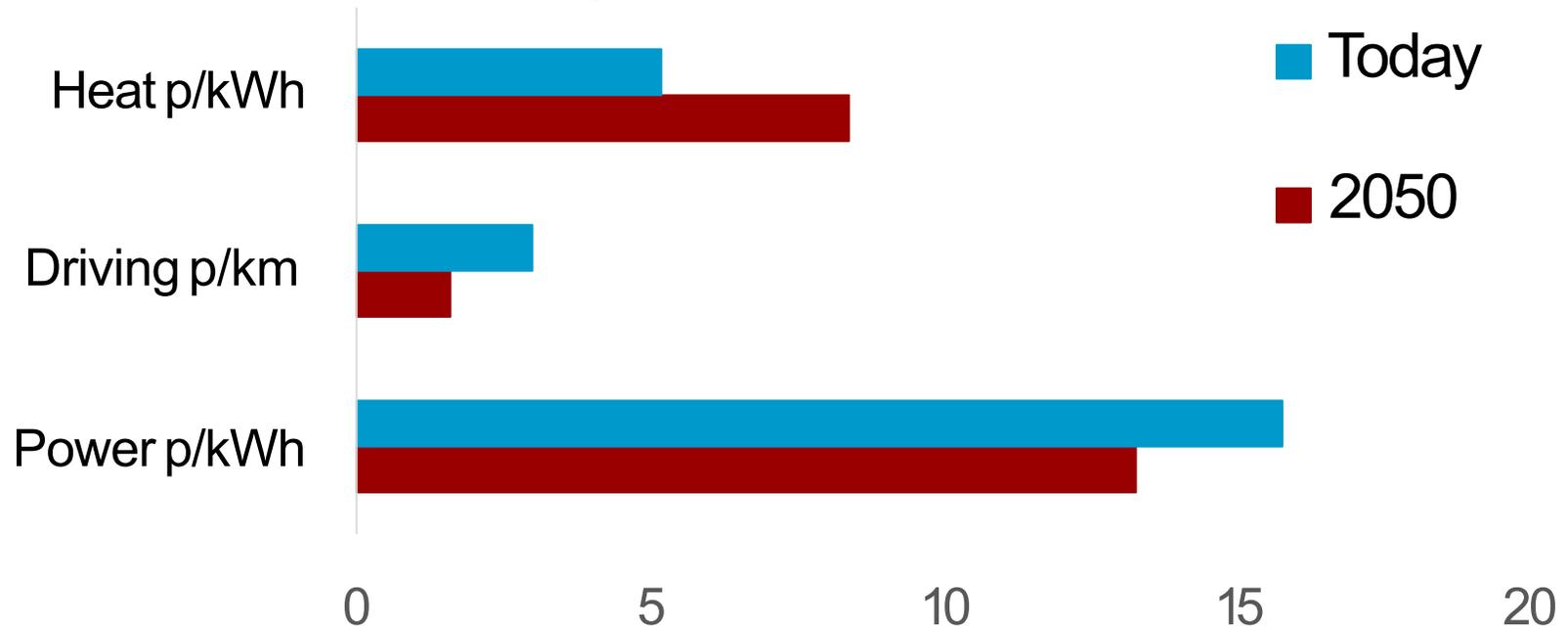
- Govt strategy: nationwide full fibre by 2033
- Ofcom should promote network competition
- Govt support for rural ('outside in')
- Cut costs & allow copper switch-off



Low cost, low carbon

Low carbon energy and fuel at today's overall cost

Unit costs of power, driving and heat:
today and 2050

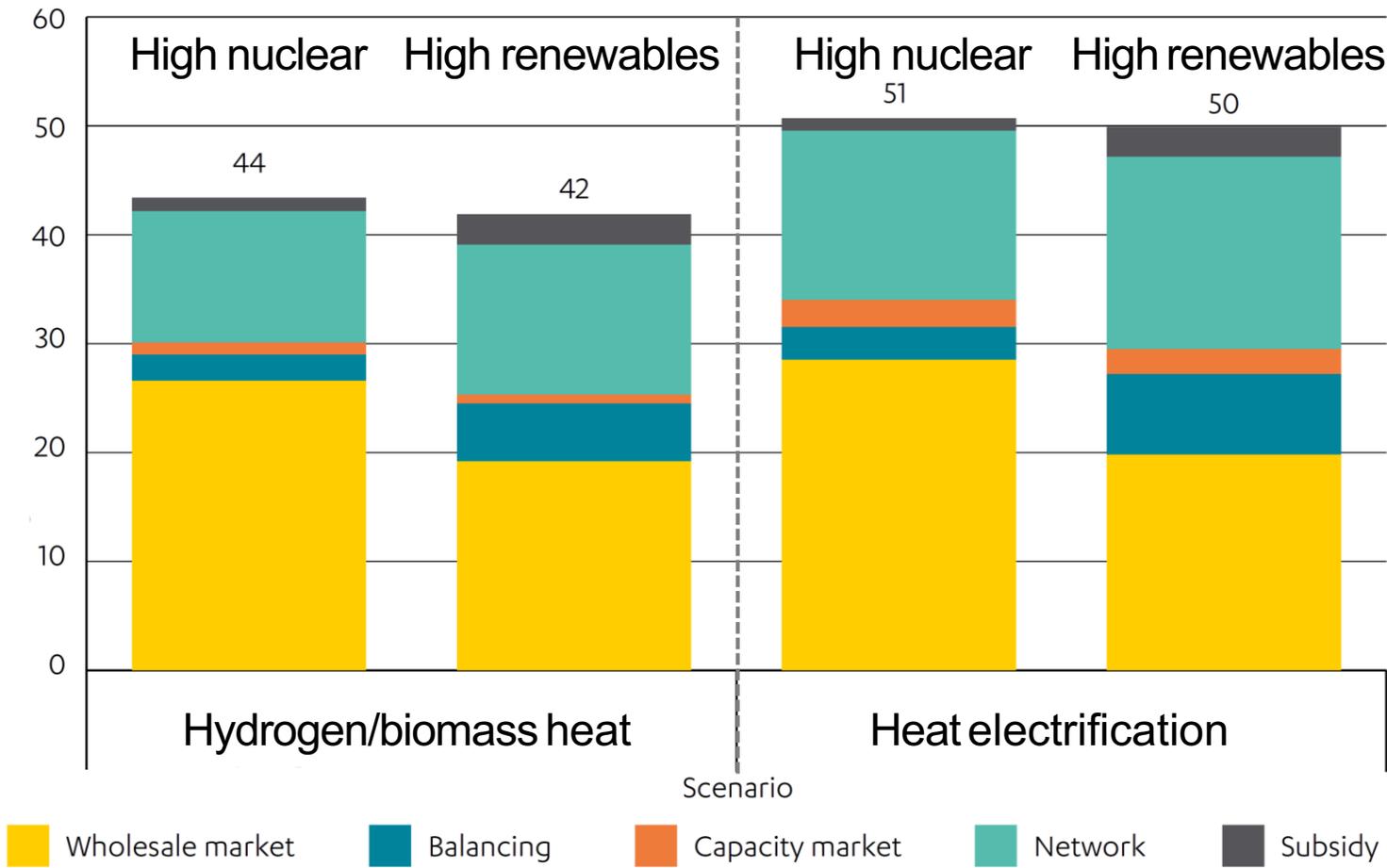


- Requires investment in energy efficiency of homes

A highly renewable system is a low cost option

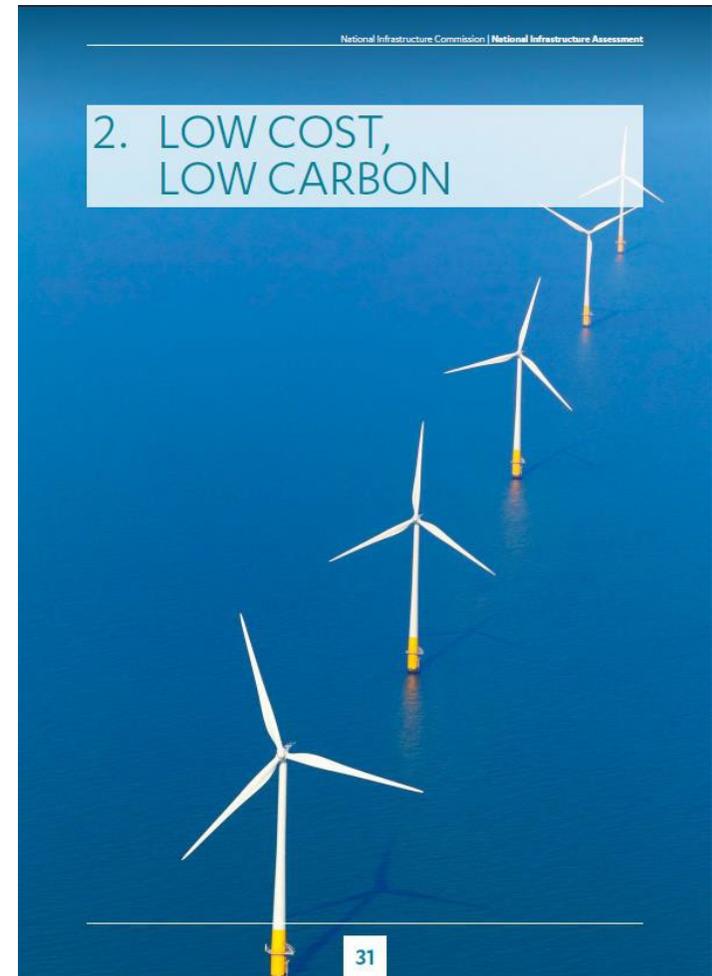
Cost comparable to nuclear and cheaper than CCS

Average whole electricity system costs, 2030-2050, £bn (2016)



Energy recommendations

- At least 50% renewables by 2030
- No more than one more nuclear deal before 2025
- Improvements to CfD auctions
- No special deal for tidal
- Pilots for hydrogen heating, with CCS
- Better data on heat pumps
- Energy efficiency, including £3.8bn for social housing



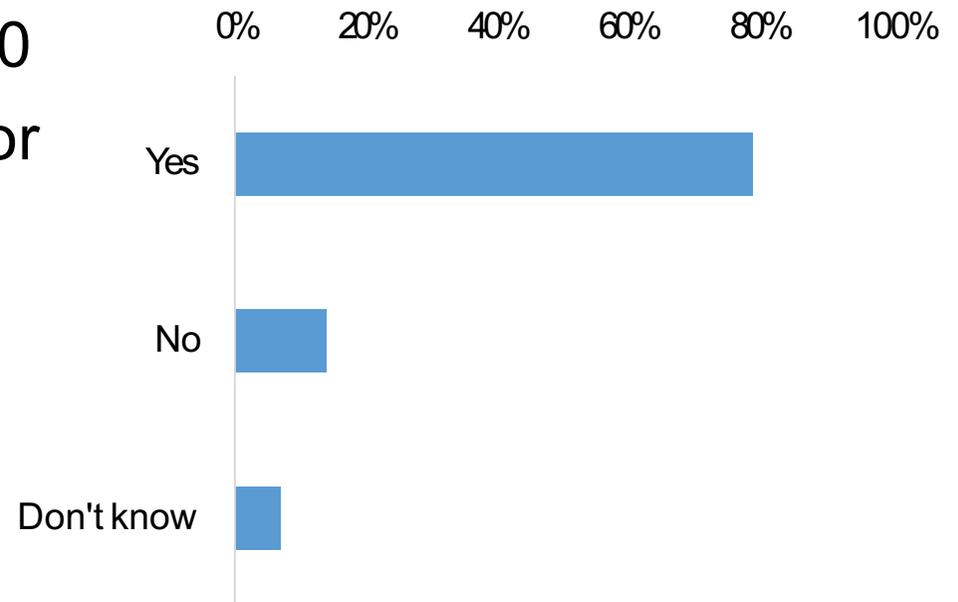
Incinerating less, recycling more

There are more cost effective, lower carbon options for waste

Key recommendations

- 65% recycling target by 2030
- 75% plastic packaging by 2030
- Clearer labelling: recyclable or not
- Restricting hard to recycle plastics, by 2025
- Separate food waste collection, by 2025

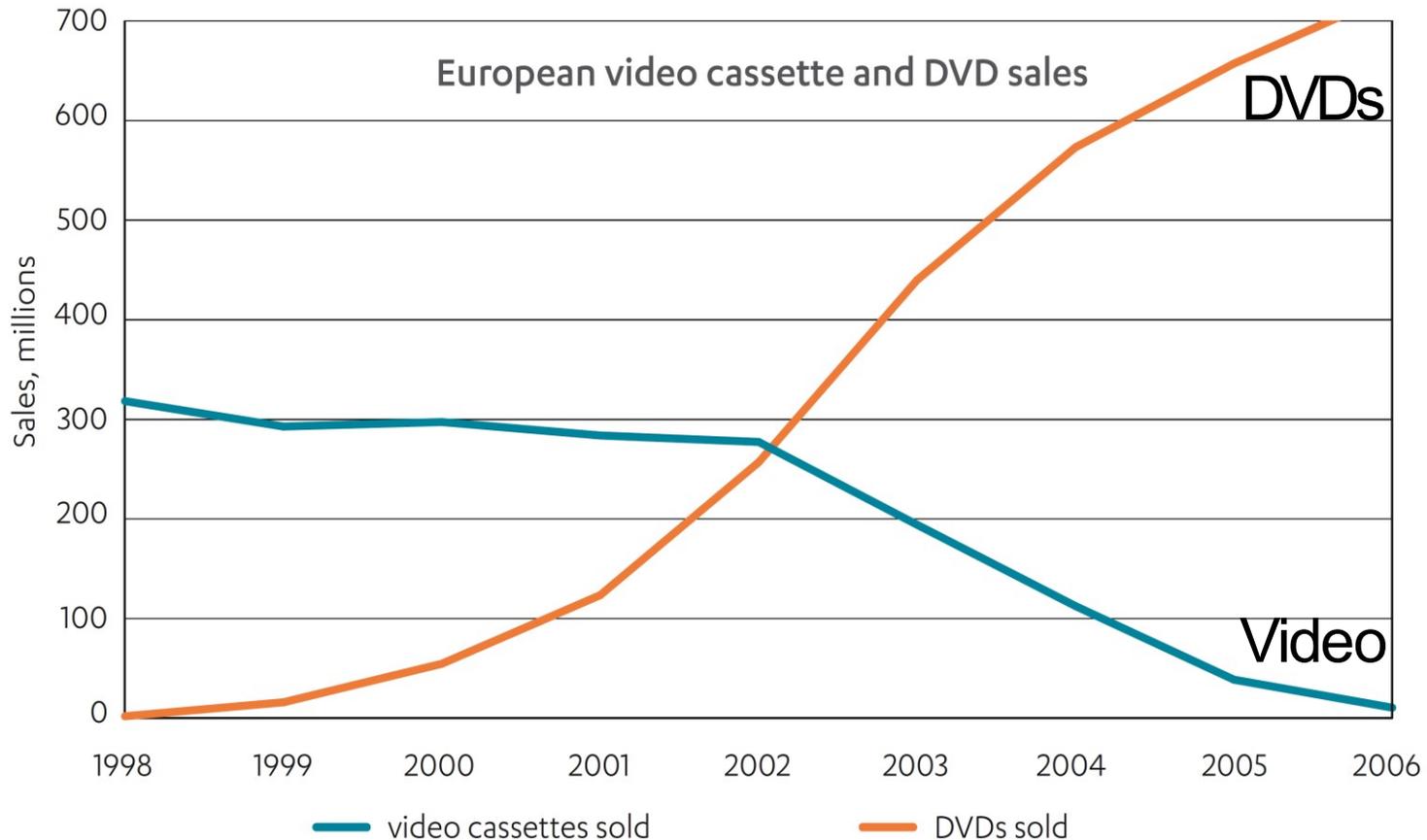
Would you be willing to use a separate food waste bin?



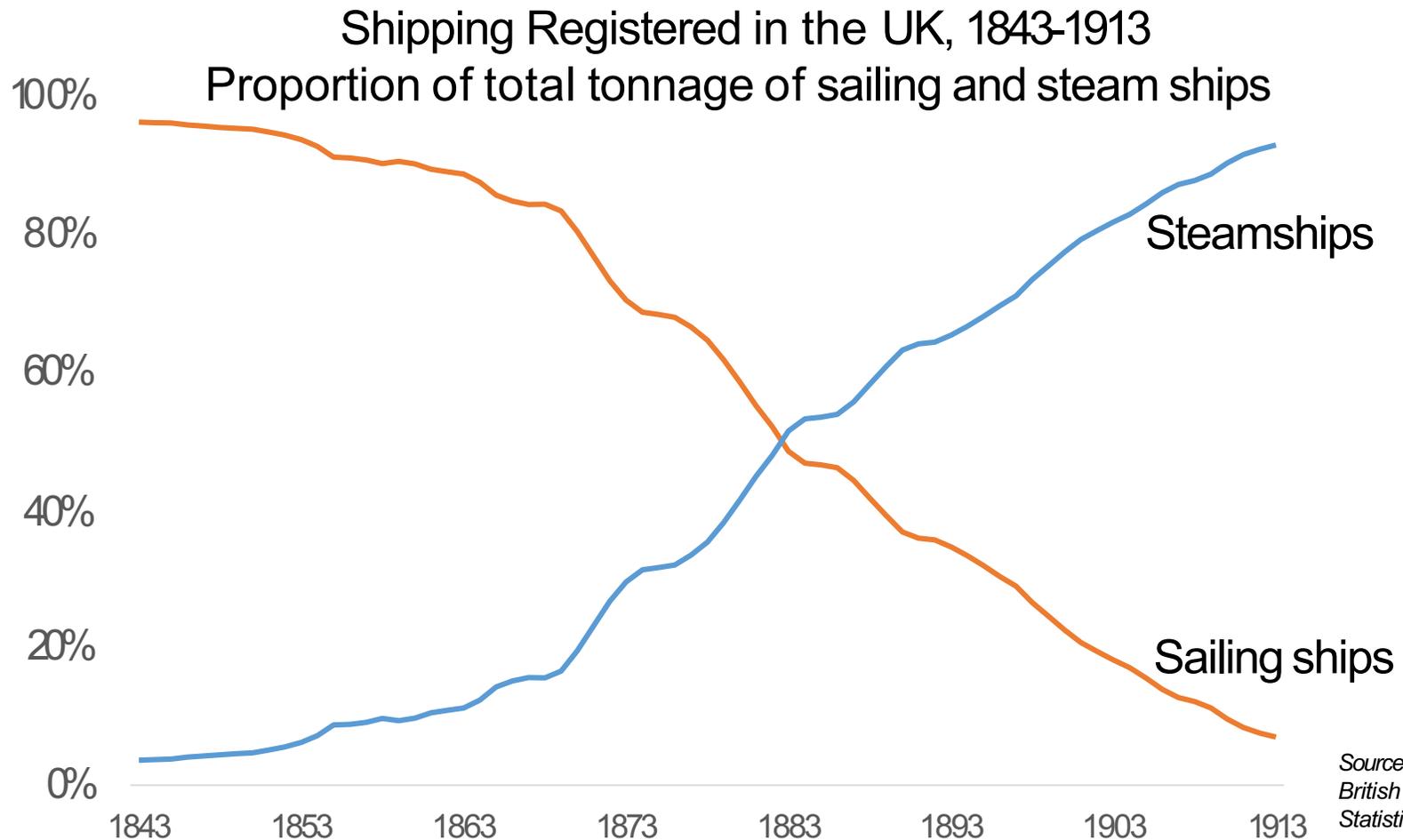
Base: All - 1599 adults from across the UK - those that do not already use a food waste bin (23rd – 26th March 2018)

Revolutionising road transport

Technology transitions follow an 'S' shaped diffusion



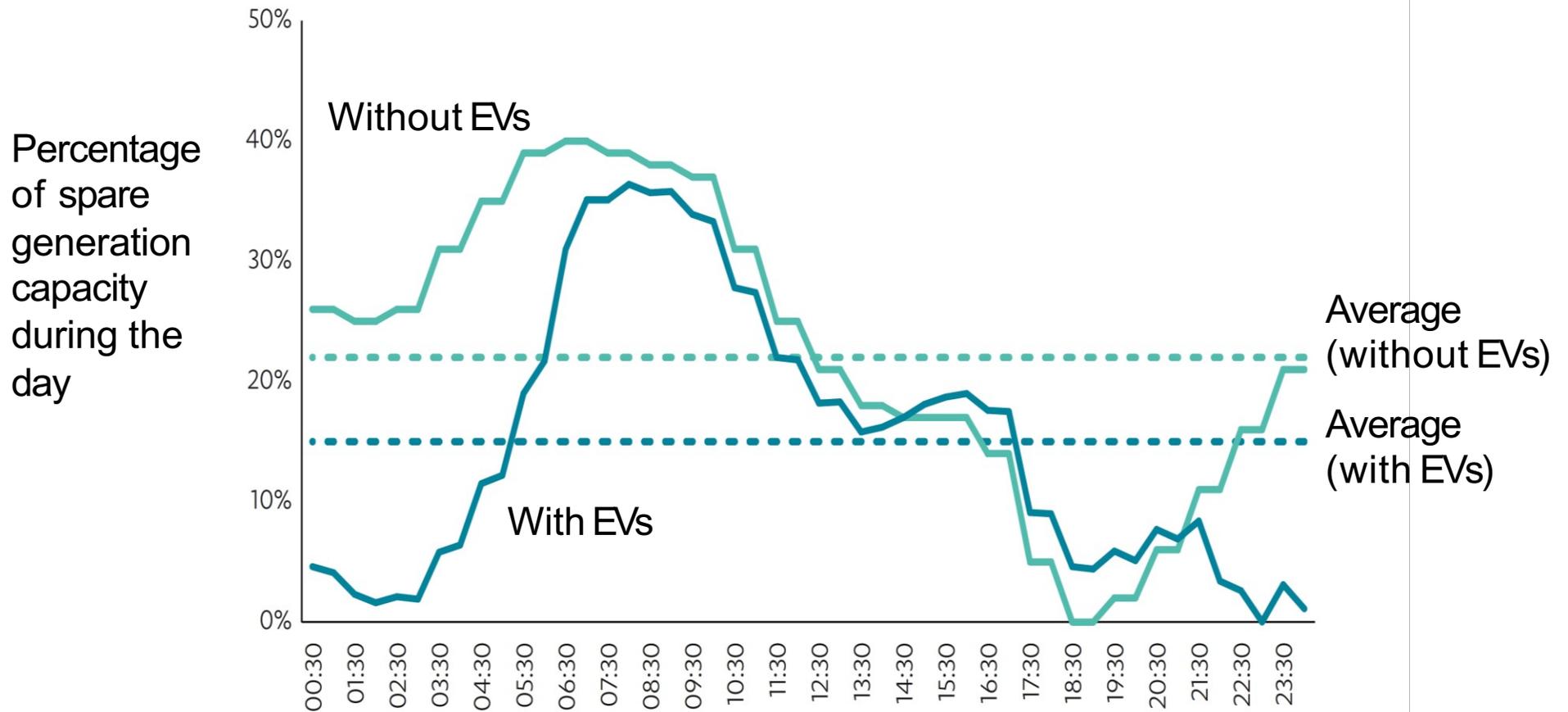
Revolutionising road transport



- Electric vehicles are cheaper to run and maintain, quieter and easier to drive
- Increasing number of models on the market

Power system effects of electric vehicles

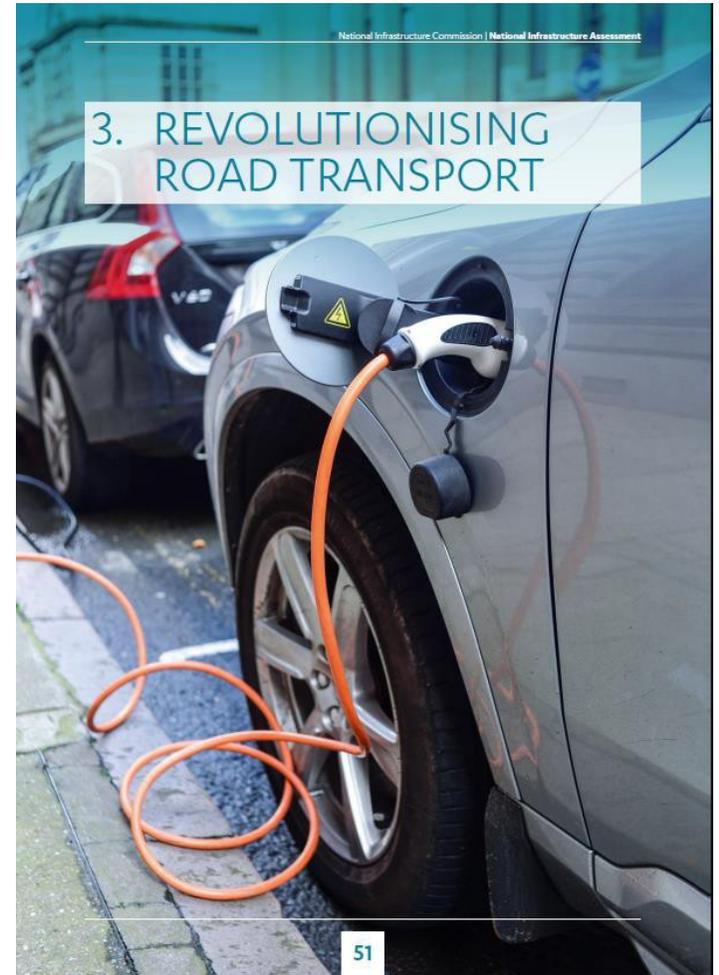
Smart charging delivers flexibility for the power system



Electric, connected vehicle recommendations

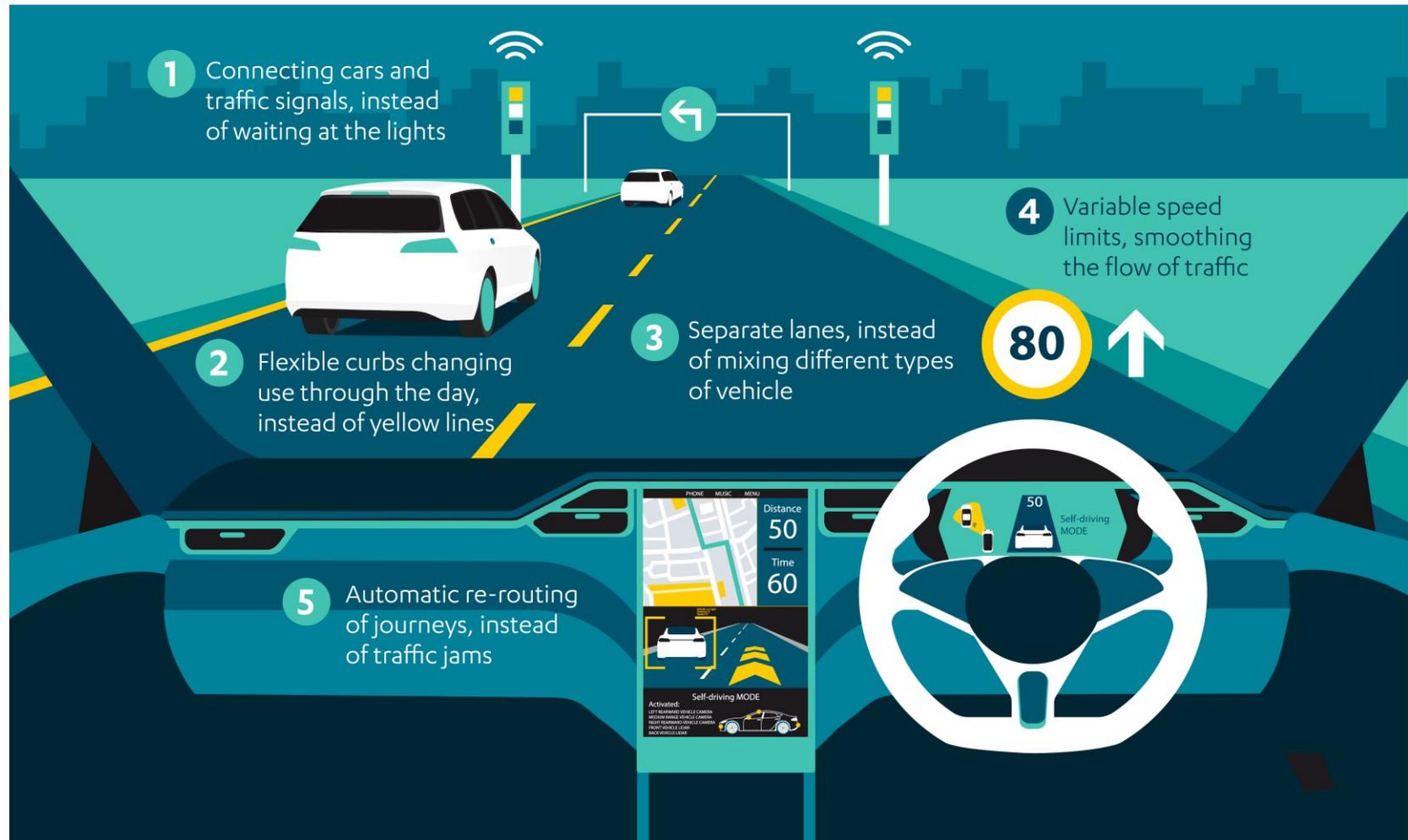
A national network of charge points:

- Minimum standards for smart charge points
- Enabling parking spaces to be converted for charge points
- Investment in the electricity network to enable rapid charging
- Govt support for rural charge points



Connected and autonomous vehicles

Road and rail plans need to prepare for connected autonomous vehicles

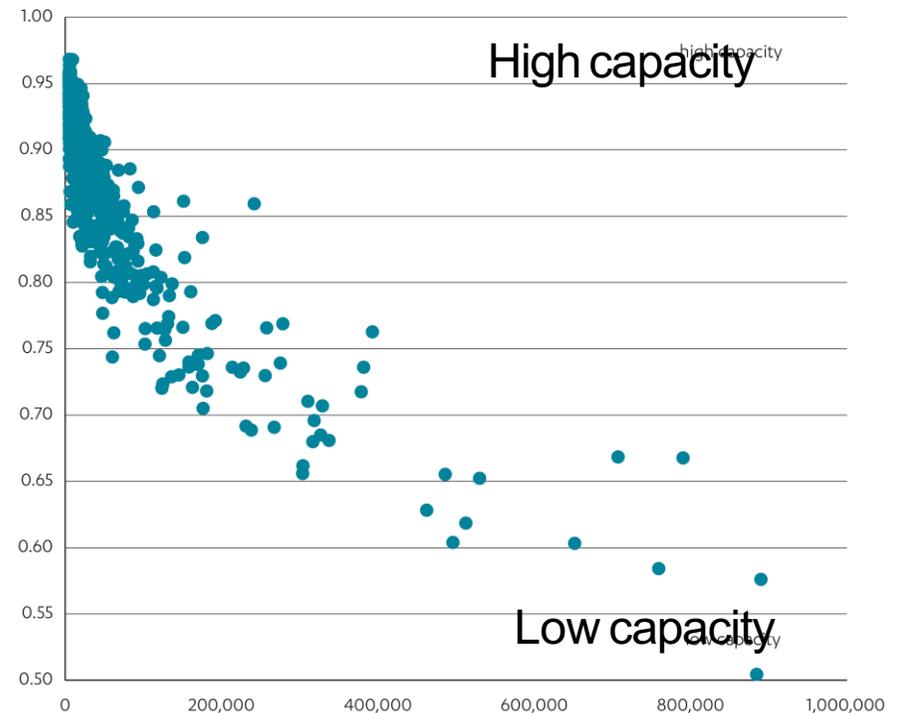


Transport and housing for thriving city-regions

Cities are the next transport investment priority

Key recommendations:

- City-led plans for transport, housing and jobs
- Devolved, long-term funding: certainty for all cities
- Major projects in the fastest growing, congested cities
- £43 billion additional stable, long term funding by 2040

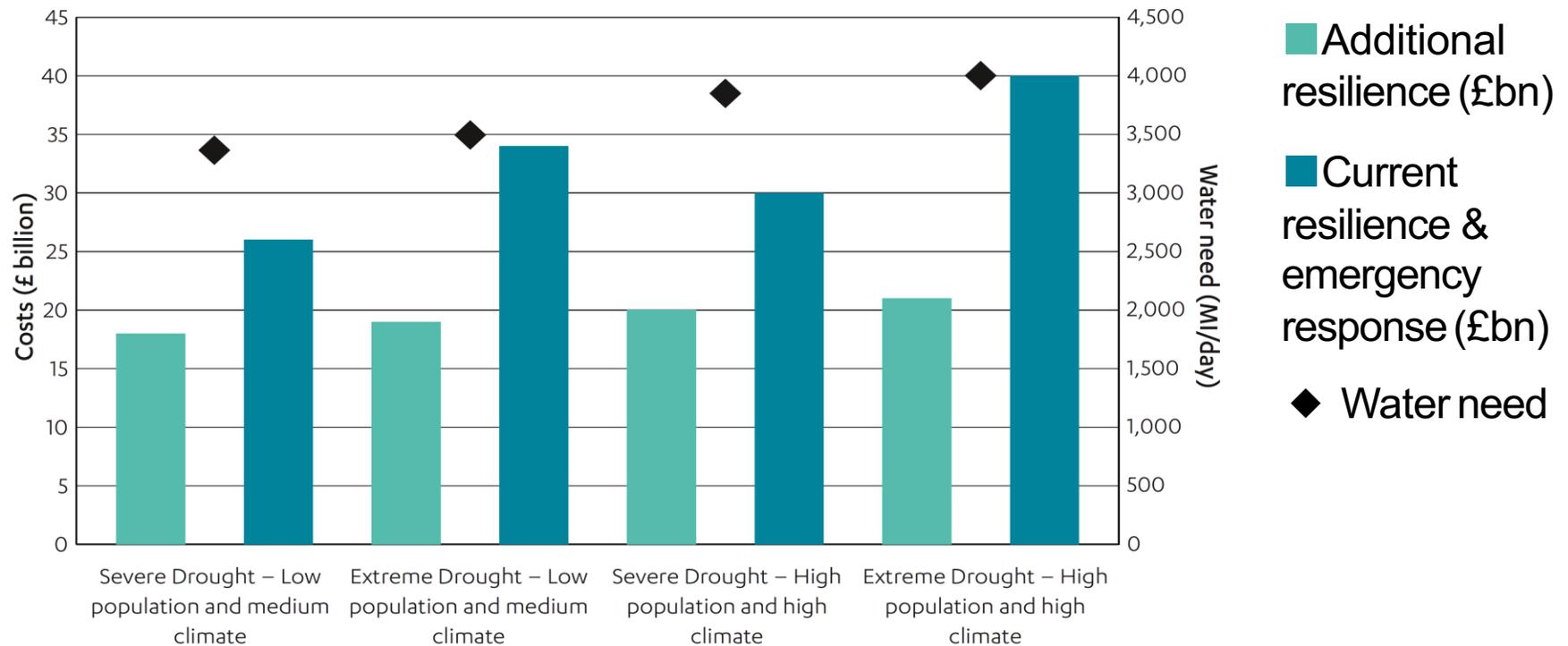


Urban transport capacity constraints in built-up areas, by population

Source: National Infrastructure Commission

Preparing for a drier future

Building resilience is cheaper than relying on emergency measures



Source: National Infrastructure Commission

Recommendations:

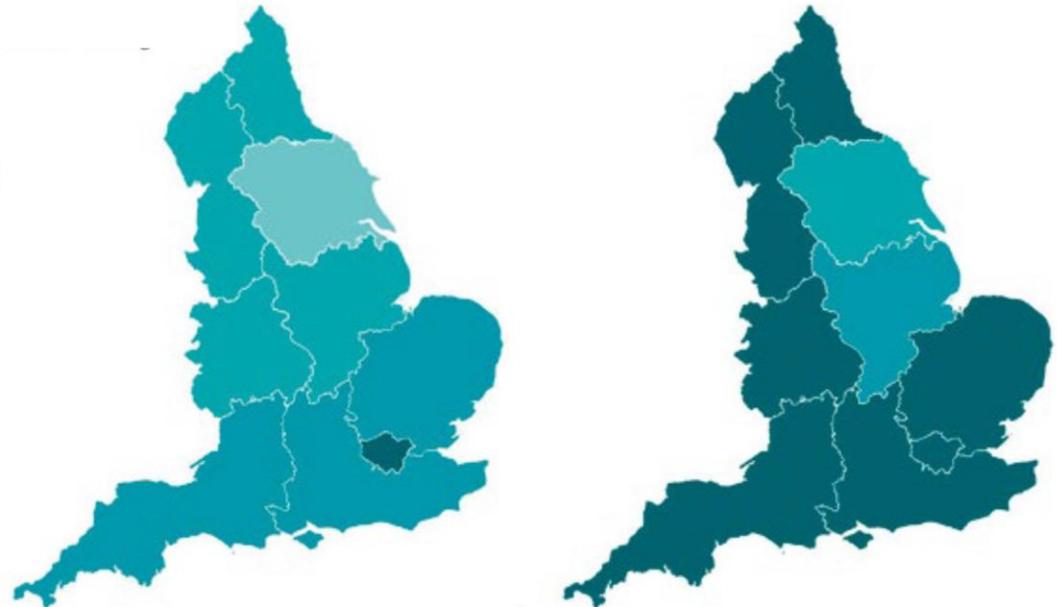
- A national water transfer network and new supply, eg reservoirs
- Halving leakage by 2050 and reducing demand

A national standard of flood resilience

Climate change is increasing the risk of flooding

2° climate, low population growth

4° climate, high population growth



Increase in homes at risk of flooding

| | |
|---|--------|
| ■ | <5% |
| □ | 5-10% |
| □ | 10-20% |
| □ | 20-30% |
| □ | 30-40% |
| □ | 40-50% |

Recommendations:

- A national standard of resilience to flooding: 0.5% by 2050
- Higher standard for densely populated areas: 0.1% by 2050

Source: National Infrastructure Commission

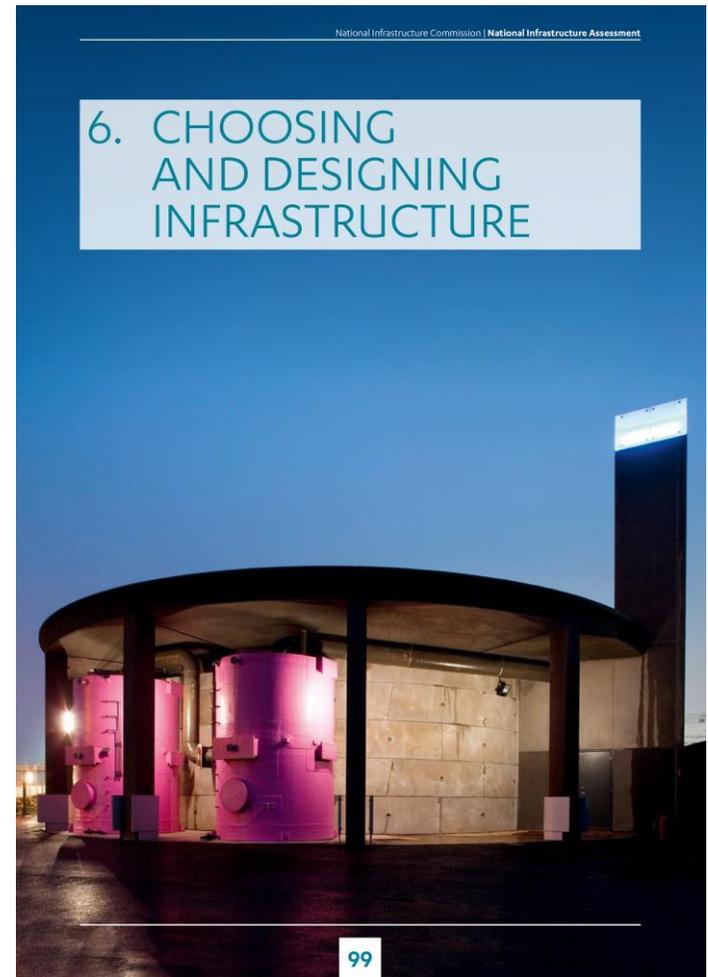
Choosing and designing infrastructure

The UK needs the confidence to invest

Key recommendations:

- Publishing costs and benefits data
- Board level design champions and use of design panels

Delivery also depends on skills, supply base and capabilities. The IPA works on this.



Funding and financing

This is not an unaffordable wish list

Public spending within 12% of GDP

Bills impact < £20 a year on average

Key recommendations:

- Government should adopt the funding profile
- A UK infrastructure finance institution if EIB access is lost
- Local authority powers to capture a fair proportion of land value uplift

“The NIC must be able to demonstrate that its recommendations ... can be accommodated within gross public investment in economic infrastructure of between 1.0% and 12% of GDP”

Remit letter for National Infrastructure Commission

Funding and financing

This is not an unaffordable wish list

The Commission has made judgements on spending within the government’s funding guidelines.

The impact on bills is no more than £20 a year for an average household, with savings in the longer-term.

Getting the best value infrastructure also requires improvements in funding and financing arrangements:

- Improving the analysis of costs and benefits of private financing and traditional procurement
- Engaging the public on paying for road use; the existing approach is unsustainable

Key recommendations:

- Government should deliver long term certainty by adopting the ‘fiscal remit’ funding profile
- A new, operationally independent, UK infrastructure finance institution if EIB access is lost
- local authorities should be given further powers to capture a fair proportion of land value increases.

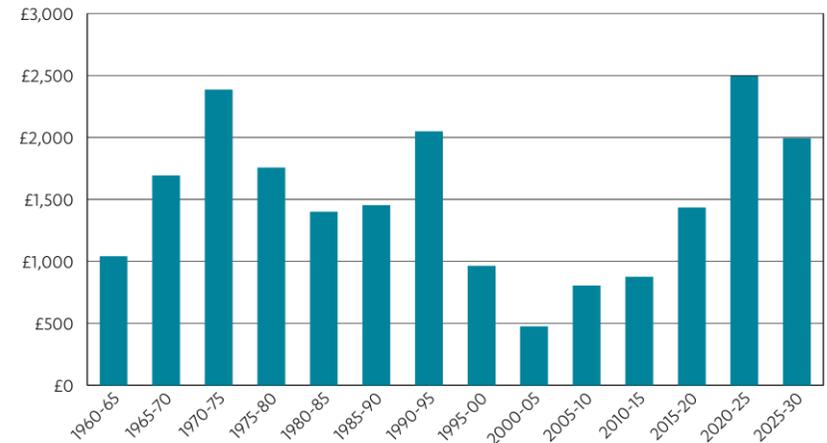


Figure 7.1: Historic and planned enhancement spending on strategic roads⁶

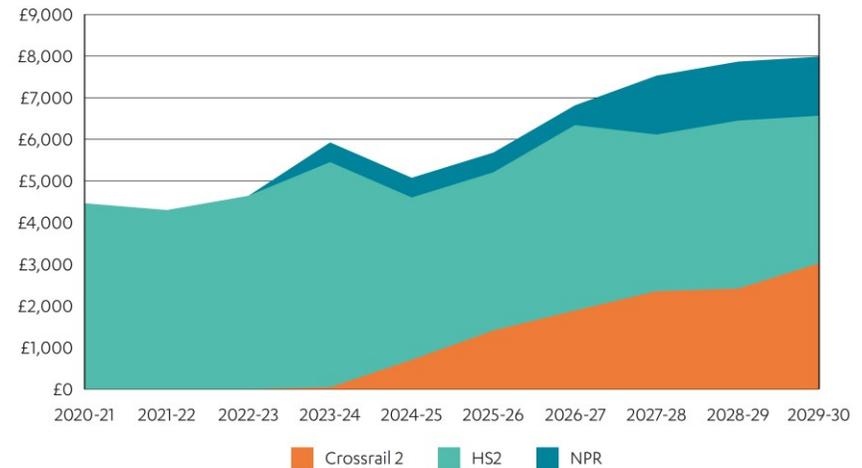


Figure 7.2: Capital Investment in rail ‘mega projects’ (£m, 2018/19 prices)

Energy and fuel bills today and in 2050

| Average annual household bill (£, 2018/19 prices) | Consumption, today | Unit cost, today | Total, today |
|--|--------------------|------------------|--------------|
| Power (domestic appliances and lighting, but excluding electricity for heat and driving) | 3,400 kWh | 15.8 p/kWh | £540 |
| Driving: fuel/electricity costs | 13,900 km | 3.0 p/km | £410 |
| Heat: fuel/electricity costs | 14,300 kWh | 5.2 p/kWh | £750 |

Table 2: Unit costs, consumption and energy bills, today (latest data)

Totals may not sum due to rounding

| Average annual household bill (£, 2018/19 prices) | Consumption, 2050 | Unit cost, 2050 | Total, 2050 |
|--|-------------------|-----------------|-------------|
| Power (domestic appliances and lighting, but excluding electricity for heat and driving) | 3,400 kWh | 13.3 p/kWh | £460 |
| Driving: fuel/electricity costs | 13,900 km | 1.6 p/kWh | £220 |
| Heat: fuel/electricity costs | 7,000 kWh* | 8.4 p/kWh | £590 |

Table 3: Unit costs, consumption and energy bills, 2050 constant consumption comparison

Totals may not sum due to rounding

* 2050 energy consumption required to generate the same level of heat as today is lower due to energy efficiency and greater technological efficiency, especially of heat pumps

Scotland, Wales and Northern Ireland

The Commission's role is to advise the UK government

| Sector covered by the Commission | Devolved administration responsibility | | |
|----------------------------------|--|------------------------------|---|
| | Scotland | Northern Ireland | Wales |
| Transport | Largely devolved | Devolved responsibility | Devolved, aside from rail |
| Energy | Not devolved, aside from energy efficiency | Devolved, aside from nuclear | Not devolved aside from energy efficiency |
| Water and sewerage | Devolved responsibility | Devolved responsibility | Devolved responsibility |
| Flood risk | Devolved responsibility | Devolved responsibility | Devolved responsibility |
| Digital | Not devolved | Not devolved | Not devolved |
| Waste | Devolved responsibility | Devolved responsibility | Devolved responsibility |

Table 1: Devolved administration responsibilities, by infrastructure sector

The impact on bills

Table 7.2: The impact on bills

| Average annual aggregate impact (£ million, 2018/19 prices) | 2020-2025 | 2025-2030 | 2030-2035 | 2035-2040 | 2040- 2045 | 2045-2050 |
|---|-----------|-----------|-----------|-----------|------------|-----------|
| Heat trials and energy efficiency | +110 | +270 | +190 | +180 | +180 | +180 |
| Waste | +140 | +110 | +50 | -10 | -30 | -60 |
| Flood risk – lower insurance costs | -60 | -240 | -420 | -610 | -790 | -980 |
| Water – resilience to drought | +310 | +640 | +280 | +280 | +280 | +280 |
| Total impact on households, businesses and public sector | +510 | +780 | +100 | -150 | -370 | -580 |
| Total impact on households | +440 | +650 | +120 | -60 | -240 | -420 |
| Average impact per household (£/year) | +£20 | +£20 | £0 | £0 | -£10 | -£10 |
| Total impact on businesses | +50 | +90 | -20 | -70 | -100 | -130 |
| Total impact on public sector resource spending | +20 | +40 | 0 | -20 | -30 | -30 |

Impacts are shown relative to a baseline without the recommendation. This is different to the energy bills impacts described in the *Low Cost, Low Carbon* chapter which compare 2050 to today. Negative figures denote savings. Columns may not sum to totals due to rounding