National Audit Office

REPORT

Innovation in transport

Department for Transport

SESSION 2026-27
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HC 20

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National Audit Office

Innovation in transport

Department for Transport

Report by the Comptroller and Auditor General

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Gareth Davies
Comptroller and Auditor General
National Audit Office

5 May 2026

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Key facts

£1.1bn

Department for Transport's (DfT's) approximate planned spend on innovation, 2022-23 to 2029-30 (average annual spend of £140 million)

27

number of innovation programmes this £1.1 billion is distributed across

72%

approximate proportion of DfT's planned innovation funding (2022-23 to 2029-30) that aims to decarbonise transport

72%	approximate proportion of DfT's innovation funding that it plans to spend through two delivery partners, Innovate UK and Connected Places Catapult, 2022-23 to 2029-30
Approximately £81 million	combined average annual spend on innovation by Network Rail, National Highways and High Speed 2 Ltd, 2022-23 to 2024-25
£5 million	new dedicated funding from April 2026 to address shared challenges across transport modes

Summary

1 The transport sector has a long history of introducing new and improved ways of helping move people and goods. The government has often supported this activity. There are currently a wide range of opportunities and challenges across the transport sector. Successful innovation will be needed to make the most of emerging technologies and address the challenges of decarbonisation, and in a way that achieves reliable services for people and cost-effective solutions for the taxpayer.

2 The Department for Transport (DfT) has identified innovation as a key enabler to achieving its priority outcomes of growth; greener, safer and healthier transport; and improving transport for people. DfT supports innovation in a range of ways, such as providing funding to businesses and researchers developing and testing ideas, and creating the right regulatory environment for innovative ideas to succeed.

3 We estimate that DfT plans to spend approximately £1.1 billion on activities to support innovation between 2022-23 and 2029-30 (an average annual spend of £140 million) spread across various activities and transport modes. Policy teams initiate and oversee the majority of DfT's innovation programmes. Most of these programmes are then delivered through its two main delivery partners, Innovate UK and Connected Places Catapult. In addition, DfT also provides funding to arm's-length bodies to undertake research and development to help achieve their outcomes. Network Rail, National Highways and High Speed 2 Ltd (HS2 Ltd) have a combined spend of around £81 million a year on research and development.

Scope of this report

4 This report examines whether DfT's support for innovation in transport is delivering value for money. The report looks at whether DfT:

- has set out a clear approach to supporting innovation; and
- is managing its activity to support innovation effectively.

5 Our scope includes innovation spending by DfT's three highest-spending arm's-length bodies: Network Rail, National Highways and HS2 Ltd. For the purposes of this study, we have defined innovation as the creation and application of new scientific or technological knowledge to improve transport. We do not examine DfT's innovation activity relating to improving its internal processes and efficiency. We completed fieldwork between October 2025 and February 2026.

Key findings

DfT's approach to supporting innovation

6 DfT has increased its focus on innovation but could improve how it prioritises its funding to achieve the outcomes it wants. In 2023-24, DfT recognised innovation as one of its key strategic enablers to achieving the department's outcomes and in 2024-25 it revised how it defined that enabler to give innovation greater prominence. We estimate that DfT plans to spend approximately £1.1 billion on activities to support innovation between 2022-23 and 2029-30, across 27 innovation programmes. In its 2025 Science, Innovation and Technology Plan, DfT set out its expectation that its programme of work would reflect the department's three priority outcomes. These outcomes are as follows: growth; greener, safer and healthier transport; and improving transport for people. However, DfT does not have a strong process for prioritising its activity as a whole across different outcomes. As a result, DfT's innovation portfolio has emerged over time. By analysing DfT's management information, we estimate that 72% of DfT's actual and planned spending on innovation between 2022-23 and 2029-30 relates primarily to decarbonising transport. We would not expect DfT's innovation spending to be equally distributed across its three departmental outcomes. However, we have not seen evidence that this distribution results from a deliberate decision by DfT on the balance of funding (paragraphs 1.4 to 1.7 and Figures 1, 2 and 7).

7 DfT aims to use a range of interventions to support innovation but could make better use of regulation and its commercial influence. DfT has identified the key types of interventions that it expects its staff to consider when developing or delivering activity that can support innovation. These include funding, regulation, partnership working and using public procurement to support uptake of innovation. DfT uses these interventions to influence innovation activity, sometimes in combination. For example, DfT's Sustainable Aviation Fuel programme has involved grant funding and specialist advice to encourage production, alongside new regulation and legislation to support its uptake. DfT recognises that it could use its commercial and regulatory policy interventions more systematically across the department, alongside funding (paragraphs 1.8 and 1.9, and Figures 3, 4 and 5).

8 DfT has identified and is addressing barriers to innovation in its approach. In 2022, DfT consulted internally to identify barriers to it successfully supporting innovation, and what it needed to do to address these. The barriers DfT identified included the following: a risk-averse culture; a lack of clear messaging from leadership; staff lacking knowledge and understanding; and business processes that were not supportive of innovation. DfT has worked to address these barriers, for example through a central team dedicated to supporting innovation across DfT, knowledge-sharing groups, engagement events and tailored support. It has also provided guidance to help its investment boards, whose knowledge and experience of assessing innovation programmes may be limited. DfT still has more to do to embed a culture of innovation across the organisation (paragraphs 1.10 to 1.12).

DfT's management of its activity to support innovation

9 DfT's governance of its innovation activity provides limited strategic oversight. DfT intends its Research and Development Board to provide direction for DfT's investments in transport innovation. However, in practice, this board has a limited role in decision-making on investments, with its activity focused on monitoring spending and redistributing underspends between research and development programmes. This monitoring activity does not cover all innovation activity across the department, excluding, for example, a £198 million programme to fund innovative aviation fuels. DfT does not coordinate its innovation activities in a way that would allow it to monitor risk appetite, cross-cutting risks, outcomes or value for money beyond individual projects. This leads to potential missed opportunities for coordinating activity across different modes of transport (paragraphs 2.3 to 2.5, 2.7 and 2.10, and Figures 6 and 7).

10 DfT has not clearly set out its risk appetite for innovation to guide its investment decisions. Innovation requires actively seeking well-managed risk taking, as the path to outcomes is not necessarily clear or known. Some level of failure is inevitable and is an indication that an organisation is taking well-managed risks in pursuit of the outcomes it wants to achieve. Setting out its risk appetite for innovation would help DfT decide what level and type of risks to take in its projects to achieve the intended outcomes, and to monitor and manage higher-risk activity. We have seen that, in the absence of any guidance to decision-makers, there is a tendency towards lower-risk activity, which may limit its impact. DfT was, for example, only able to provide us with one example of a higher-risk investment that it stopped. Currently, DfT does not have an overview of how much risk it is taking across its innovation activity, limiting its ability to balance risk across different areas of activity (paragraphs 2.6 to 2.7 and Figure 8).

11 DfT commissions its main delivery partners, Innovate UK and Connected Places Catapult, to monitor progress and outcomes, but this does not cover all the innovation activity that DfT funds. We estimate that, between 2022-23 and 2029-30, Innovate UK and Connected Places Catapult will deliver about 72% of DfT's total innovation spend. Both Innovate UK and Connected Places Catapult have appropriate monitoring arrangements and report regularly to DfT about the achieved outputs and outcomes of the innovation activities they deliver. This allows DfT to monitor progress and outcomes across themes, beyond individual programmes. We have seen examples of good monitoring and evaluation of DfT's individual programmes. However, outside the programmes delivered by Innovate UK and Connected Places Catapult, we have not seen DfT adopting a similar thematic approach. To maximise the impact of its innovation work, DfT will not only need to assess the effectiveness of its funding. It will also need to assess how it uses regulation, partnership working and commercial influence in support of transport outcomes (paragraphs 2.8 to 2.10 and Figure 9).

12 DfT's three highest-spending arm's-length bodies are more actively prioritising and managing their innovation portfolios. Arm's-length bodies are often the potential buyer and user of the innovations that they are supporting. They also have specific remits, which DfT funds them to deliver against, sometimes with fixed-year funding cycles. These factors support more active management of their portfolios of innovation activity. However, we found that the arm's-length bodies we reviewed also have clearer processes, compared with DfT's, for assessing potential activity. These include setting prioritisation criteria and the desired mix of risk profiles or stages of technology readiness in their portfolios of innovation projects (paragraphs 2.11 to 2.13 and Figures 10 and 11).

13 DfT has facilitated learning within the transport sector but has identified that it needs to improve the coordination of innovation activity with its arm's-length bodies and key stakeholders. In 2017, DfT established the Transport Research and Innovation Board to bring together representatives from key organisations and government departments with an interest in transport research and innovation in the UK. The three arm's-length bodies we spoke to were positive about this board and how they had learned about shared challenges. However, DfT's coordination of innovation activity with and between its arm's-length bodies has been limited. DfT identified that this results in duplication of activity and failure to prioritise cross-sector interventions. In April 2026, DfT launched a £5 million Delivering Efficiency through Technology Adoption fund to address this. DfT has used this fund to establish seven programmes to support the development and adoption of new technology that can be applied across the transport sector (paragraphs 2.14 to 2.16 and Figure 12).

14 Industry representatives we spoke to identified several areas where DfT can improve how it supports innovation. They highlighted a range of areas for improvement, with the most important themes being as follows: a culture of risk aversion; contractual and procurement processes that work against experimentation; concerns about intellectual property rights; and the need for better support to move trials to commercial end products. They also told us that procurement practices place disproportionate burdens on smaller companies. These areas are not unique to DfT. DfT is considering what it needs to do to better support innovative ideas through to commercial deployment from the outset of innovation programmes. International data show that the UK was in the top 10 global locations for transport patents relating to sustainability and digital technologies between 2000 and 2023. However, between 2018 and 2023, the rate of growth has slowed and is falling faster than all the other top locations except Russia (paragraphs 2.17 to 2.19 and Figures 13 to 15).

Conclusion

15 The successful support and adoption of new ways of doing things is key to addressing the opportunities and challenges facing the transport sector. In recent years, DfT has improved its approach to supporting innovation, taking steps to raise its profile within the department and to widen the type of interventions it makes. To continue this positive trajectory there are several areas where DfT can improve what it does to ensure it achieves good value for money. In particular, DfT could better define how its innovation activity can support the full range of outcomes the department wants to achieve. In doing so, it must be clearer on how much risk it is willing to take, collect the data and information it needs to manage and assess its activity, and help progress activity from early stages through to commercial readiness.

Recommendations

a To improve its management of activities to support innovation, DfT should:

- strengthen its process for prioritising its funding across the different outcomes it is seeking from its innovation activity, including being clear how those outcomes will enable it to achieve its departmental objectives, and then monitor alignment against this;
- define, embed and use its risk appetite for innovation activity, to guide investment decisions and actively manage and balance the risk profile across its innovation activity;
- decide how it can more actively manage its innovation activities within the department – whether through a managed innovation portfolio or other appropriate governance mechanisms; and
- ensure that its approach to monitoring and managing its innovation activity is fully supported by appropriate management information.

b To assess the effectiveness of its support to the innovation system across its wider policy instruments such as regulation, procurement, commercial influence, and partnership at a transport mode level, DfT should:

- support more thematic monitoring and evaluation frameworks to capture evidence of impact beyond individual projects; and
- decide how it will assess the impact of its innovation activities towards its departmental objectives of growth and improving transport for users.

c To ensure optimal collaboration and avoid duplication, DfT should build on the success of the Transport Research and Innovation Board to put in place effective coordination of innovation activity across DfT and its arm's-length bodies.

d To maximise the impact of its innovation activity, DfT, and its arm's-length bodies, should identify ways to address any barriers to the adoption of the innovations they fund, including:

- better supporting progression from trials through to final products; and
- ensuring that contractual and procurement processes encourage rather than deter suppliers of innovation, particularly smaller companies.

Part One

The Department for Transport's approach to supporting innovation

1.1 The transport sector has a long history of introducing new and improved ways of helping move people and goods. The government has often supported this activity. There are currently a wide range of opportunities and challenges across the transport sector, where successful innovation will be needed. These include making the most of emerging technologies and addressing the challenges of decarbonisation, and doing so in a way that achieves reliable services for people and cost-effective solutions for the taxpayer.

1.2 This part of the report examines the Department for Transport's (DfT's) approach to supporting innovation. It examines:

- how DfT has prioritised its spending on innovation;
- how DfT uses all the methods at its disposal to support innovation; and
- how DfT is addressing barriers to successful innovation in its approach.

1.3 DfT works with its agencies and other bodies to support the transport network that helps people and goods get to where they need to go. In the context of supporting innovation in transport, key roles and responsibilities include the following.

- **DfT:** Provides funding for programmes of work that support innovation. DfT is also responsible for policies and regulations to enable innovation. DfT leads on working with national and international partners. The arm's-length bodies that DfT funds also oversee innovation activity, including funding trials and setting standards.
- **Innovate UK and Connected Places Catapult:** The main bodies used by DfT to deliver its programmes of work relating to innovation. Innovate UK is the UK's national innovation agency, supporting business-led innovation in all sectors, technologies and UK regions. Connected Places Catapult is an innovation agency for transport, construction and data infrastructure.

DfT's spend on innovation

1.4 DfT has identified that encouraging innovation in the transport sector is an important part of its role. In 2023-24, DfT recognised innovation as one of its key strategic enablers to achieving the department's outcomes and in 2024-25 DfT revised how it defined that enabler to give innovation greater prominence. The priority outcomes that DfT wants its work to support are as follows.

- **Growth:** Boosting economic growth through a transport network and improved infrastructure that, together with areas such as innovation, help raise living standards and productivity.
- **Greener, safer and healthier transport:** Meeting environmental targets, adapting to climate change and improving safety and public health.
- **Improving transport for people:** Improving the transport system to focus on what people need.

1.5 In its 2025 Science, Innovation and Technology Plan, DfT set out its expectation that its programme of work would reflect its departmental priorities. However, DfT does not have a strong process for prioritising its funding as a whole across different outcomes. For example, ahead of the Autumn Budget 2024, DfT identified high-level priority areas for its innovation activity. However, DfT did not decide how it wanted to balance funding across these priority areas and did not monitor alignment with this balance. DfT's innovation portfolio has therefore emerged over time. In some cases, budgets reflect prior years' spending rather than an assessment of what DfT needs.

1.6 We estimate that DfT plans to spend approximately £1.1 billion on activities to support innovation between 2022-23 and 2029-30 (**Figure 1** on pages 13 and 14 and **Figure 2** on pages 16 and 17). This represents 27 innovation programmes monitored by DfT's Research and Development Board.[1] This equates to an average annual spend of £140 million. However, this figure is an underestimate, because DfT's management information does not capture all the activity DfT considers to be innovative.

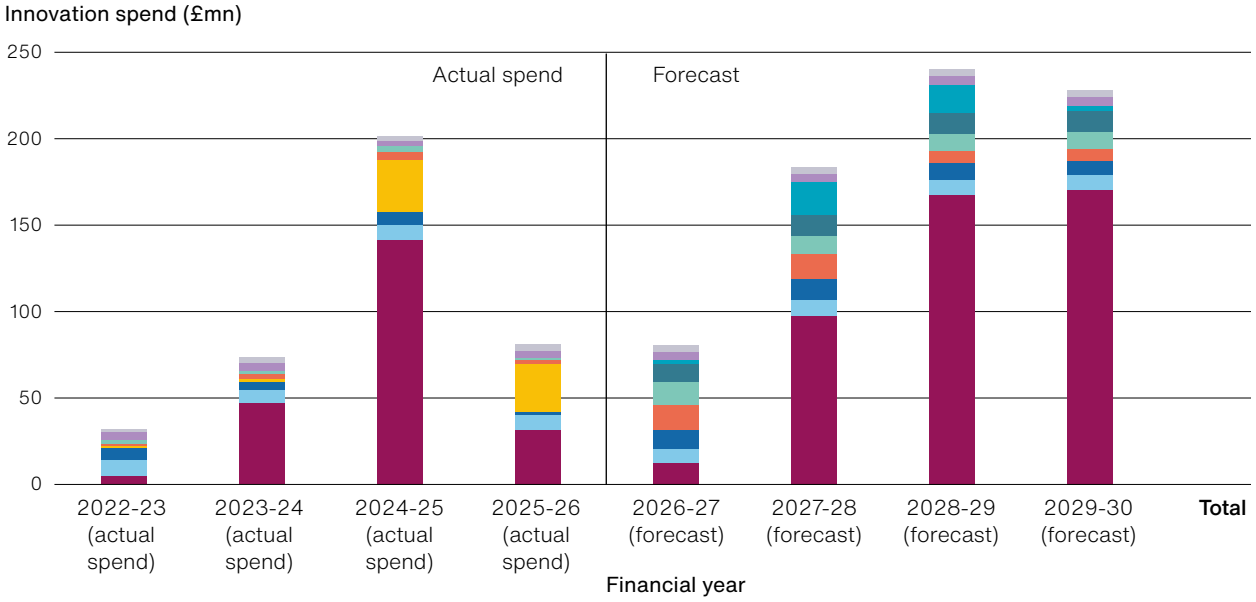
1.7 We have analysed DfT's management information, and we estimate that around 72% of DfT's actual and planned spending on innovation between 2022-23 and 2029-30 relates mainly to DfT's outcome relating to decarbonising transport. This includes its programme to reduce shipping emissions, which alone accounts for £674 million, 60% of DfT's actual and planned expenditure on innovation. We would not expect DfT's innovation spending to be equally distributed across its three departmental outcomes. However, we have not seen evidence that this distribution results from a deliberate decision by DfT about the balance.

1 This encompasses the periods covered by the Spending Review 2021 (2022-23 to 2024-25), the Autumn Budget 2024 (2025-26) and the Spending Review 2025 (2026-27 to 2029-30).

Figure 1

The Department for Transport's (DfT's) actual and forecast spend on innovation by programme (2022-23 to 2029-30)

DfT forecasts spending £1.1 billion on innovative research and development programmes between 2022-23 and 2029-30, over half of which is on its maritime decarbonisation programme



	2022-23 (actual spend)	2023-24 (actual spend)	2024-25 (actual spend)	2025-26 (actual spend)	2026-27 (forecast)	2027-28 (forecast)	2028-29 (forecast)	2029-30 (forecast)	Total
UK Shipping Office for Reducing Emissions (UK SHORE)	5	47	142	31	12	98	167	170	**674**
Rail Safety and Standards Board research funding	9	8	9	8	8	9	9	9	**69**
Others	7	4	8	2	11	12	10	8	**62**
Zero-Emission Heavy Goods Vehicles and Infrastructure Demonstrators (ZEHID)	1	2	30	28	0	0	0	0	**62**
Aviation Jet Zero	1	2	5	2	14	14	7	7	**53**
Connected and Autonomous Vehicles related research, development and innovation	2	2	3	1	14	11	10	10	**52**
Integrated Transport Digital Twin	–	–	–	–	10	12	12	12	**47**
Roads Technology Accelerator	–	–	–	–	2	19	16	3	**40**
Rail Innovation Fund	4	5	3	4	5	5	5	5	**37**
Freight Innovation Fund	2	3	3	3	4	4	4	4	**24**
Total	**32**	**74**	**202**	**81**	**80**	**183**	**240**	**228**	**1,120**

Figure 1 *continued*
The Department for Transport's (DfT's) actual and forecast spend on innovation by programme (2022-23 to 2029-30)

Notes

1 'Others' includes smaller innovation spending such as Transport Research Innovation Grants (TRIG), Tees Valley hydrogen hub, the Transport Research Innovation Board's (TRIB's) Delivering Efficiency through Technology Adoption (DETA) programme and smaller data and artificial intelligence programmes.

2 The data encompass the periods covered by the Spending Review 2021 (2022-23 to 2024-25), the Autumn Budget 2024 (2025-26) and the Spending Review 2025 (2026-27 to 2029-30).

3 The 2025-26 spending figures are provisional and still subject to audit.

4 Totals may not sum due to rounding.

5 The programmes listed do not include all innovation activities across DfT, as some do not meet the definition of research and development spending. We have also excluded research and development programmes that DfT does not consider as innovation.

Source: National Audit Office analysis of Department for Transport documents

The ways DfT can support innovation

1.8 In late 2025, DfT issued internal guidance to help its staff identify the different tools and approaches available to support innovation activity (**Figure 3** on page 18). DfT has set out how the most successful and impactful innovation programmes often use different interventions in combination with each other (**Figure 4** on page 19). We have seen examples where DfT has applied this in practice, for example in DfT's work on Sustainable Aviation Fuel (**Figure 5** on page 20).

1.9 This internal guidance brings together DfT's experience, ways of working and examples together in one place. DfT recognises that it could apply its different interventions more systematically across its work to support innovation better, particularly its use of regulation and commercial influence.

Addressing barriers to innovation

1.10 In 2022, DfT consulted with its staff to identify barriers to it successfully supporting innovation, and what it needed to do to address these. The barriers DfT identified included a risk-averse culture; a lack of clear messaging from leadership and championing of successes; staff lacking knowledge and understanding about how to innovate; and business processes that were not supportive of innovation.

1.11 Since then, DfT has worked to address these barriers. DfT now has a central team dedicated to supporting innovation across DfT, knowledge-sharing groups, engagement events and tailored support, as well as the internal guidance it issued in late 2025. DfT has also provided guidance to its investment boards. DfT identified that its investment boards, despite often reviewing high-value investments, have limited knowledge and experience of assessing innovation programmes. To address the barrier around business processes, DfT has adapted its business case approvals process for innovative activity. For example, it did so when trialling a new approach to light rail infrastructure in Coventry, which could offer lower costs and quicker delivery than conventional approaches. DfT used a bespoke approval process to allow staged funding and enable the project to be halted quickly if objectives and outcomes were not on track.

1.12 DfT published its Science, Innovation and Technology Plan in September 2025, focusing on making its activity more systematic and impactful over the next three years. One of its stated priorities is embedding a culture of innovation across the organisation. DfT staff told us that staff appetite for innovation still varies between teams.

Figure 2

How the Department for Transport's (DfT's) innovation programmes relate to its priority outcomes (2022-23 to 2029-30)

DfT's biggest innovative research and development programmes focus on its priority outcome for greener, safer and healthier transport

Innovation programme	Description	Delivery partner	Total forecast spend, 2022-23 to 2029-30	Primary focus: DfT's priority outcomes		
			(£mn)	Growth	Improving transport for people	Greener, safer and healthier transport
UK Shipping Office for Reducing Emissions (UK SHORE)	Addressing maritime decarbonisation challenges	Innovate UK, Connected Places Catapult and the Engineering and Physical Sciences Research Council	674			✔
Rail Safety and Standards Board research funding	Working towards a safer and more efficient railway	Rail Safety and Standards Board	69	✔	✔	✔
Zero-Emission Heavy Goods Vehicles and Infrastructure Demonstrators (ZEHID)	Exploring which technology is best suited to decarbonising the UK's heaviest goods vehicles	Innovate UK	62			✔
Aviation Jet Zero	Developing shared international standards, research into airport decarbonisation, preparedness for zero emission flight and other impacts of aviation beyond CO_2 emissions	Various organisations, including UK Research and Innovation and the Civil Aviation Authority	53			✔
Connected and Autonomous Vehicles related research, development and innovation	Understanding operational requirements of self-driving vehicles to implement the Automated Vehicles Act	Direct procurements with suppliers	52	✔	✔	
Integrated Transport Digital Twin	Trialling use of computer models to link and optimise operations across the transport network in real time	To be confirmed	47	✔		
Roads Technology Accelerator	Funding technical demonstrations of connectivity between vehicles, roadside infrastructure and beyond	To be confirmed	40	✔		
Rail Innovation Fund	Supporting and testing new technologies to improve passengers' safety, experience and accessbility	Innovate UK	37	✔	✔	✔
Freight Innovation Fund	Aiming to make the freight and logistics sector economically efficient, reliable, resilient and environmentally sustainable	Connected Places Catapult	24			✔
Others	Smaller innovation programmes such as Transport Research Innovation Grants (TRIG), Tees Valley hydrogen hub, the Transport Research Innovation Board's (TRIB's) Delivering Efficiency through Technology Adoption (DETA) programme and smaller data and artificial intelligence programmes	Various organisations, including Innovate UK and Connected Places Catapult	62	✔	✔	✔
Total			**1,120**			

Notes

1 We have ordered programmes by total spend over the period 2022-23 to 2029-30.

2 Total forecast spend (2022-23 to 2029-30) reflects actual spend from 2022-23 to 2025-26 and forecast spend from 2026-27 to 2029-30. 2025-26 spending figures are provisional and still subject to audit.

3 The data encompass the periods covered by the Spending Review 2021 (2022-23 to 2024-25), the Autumn Budget 2024 (2025-26) and the Spending Review 2025 (2026-27 to 2029-30).

4 The programmes listed do not include all innovation activities across DfT, as some do not meet the definition of research and development spending. We have also excluded research and development programmes that DfT does not consider as innovation.

Source: National Audit Office analysis of Department for Transport documents

Figure 3

The Department for Transport's (DfT's) four key interventions to support innovation

DfT has identified four key interventions it expects staff to consider when developing or delivering activity that can support innovation

Intervention	How it supports innovation
Partnerships and collaboration	Innovation works best when organisations work together on shared goals, and exchange knowledge, expertise and data openly. Partnerships and collaboration can connect innovative businesses with academia, public bodies and potential buyers of innovative solutions. Ways that DfT can support partnership and collaboration include: ● bringing people together to share knowledge; and ● supporting 'testbeds' where new technologies can be safely trialled, which early-stage innovators may not be able to do on their own.
Investment	DfT can support businesses to develop and commercialise innovative ideas by providing financial support at the right stage – from early research through to real-world trials. DfT can also spur innovation where private investors are unlikely to fund the work. Typically managed via DfT's key delivery partners, this includes: ● reducing risk in early-stage technologies, particularly at low-to-mid Technology Readiness Levels (TRLs), through targeted competitive grants or incubator programmes; ● demonstrator and accelerator funding for more mature, near-to-market innovations; and ● collaborating with industry, academia and other stakeholders on research and development to share risk.
Regulation	Regulation can help build market confidence, strengthen trust, and provide evidence that emerging technologies are safe, effective and sustainable. Through legislation or product certification, DfT can use regulation to: ● provide certainty for investors by setting clear and consistent rules and expectations, and ensuring that all organisations compete on a level playing field; and ● support international cooperation: innovations have global potential and a global investor base – regulation should therefore also align internationally to remain effective and future-proof.
Procurement and commercial influence	DfT does not typically buy technology or infrastructure directly. Instead, it relies on its arms-length bodies, agencies and delivery partners to build and maintain most of the country's transport infrastructure. However, DfT can play a key enabling role by: ● establishing more flexible and outcome-focused procurement frameworks;[1] ● aggregating demand across sectors and committing to buy products or guarantee revenue where markets are not yet established;[2] ● offering targeted incentives to encourage the purchase of one technology over another through tax breaks, price reductions, or financial rewards for buying specific items; and ● setting standards for adoption, which can give confidence to innovators, investors and the public that a new solution is safe, reliable and ready to scale.

Notes

1 The Procurement Act 2023 allows for earlier supplier engagement and iterative multi-stage competitions. It aims to enhance participation from small and medium-sized enterprises and startups by simplifying processes and increasing accessibility.

2 Specific tools that DfT and its public bodies can utilise include advance market commitments and revenue certainty mechanisms. Advance market commitments commit the public sector to buy products which are still being developed. Revenue certainty mechanisms are a contractual approach used by the government to reduce the risk of private investment in new technologies or markets, typically where the social value of innovation exceeds its private value.

Source: National Audit Office analysis of Department for Transport documents

Figure 4

Examples of how the Department for Transport (DfT) has used different interventions in combination to support innovation

There are a number of ways DfT has used a combination of its interventions to support innovation

Combination of interventions	How they work together	Example of where DfT has done this
Investment and regulation	Funding of pilot activity with changes to regulation to allow real-world testing	Drone trials: a controlled environment was set to test new technology against regulatory frameworks, with trials funded by innovation grants
Partnerships and commercial influence	Designing solutions with industry alongside approaching procurement in a way that supports uptake	Zero emission buses: local authorities have worked with small and medium-sized businesses to introduce zero emission buses
Regulation and investment	Regulations, including standards, to guide innovation, supported by funding	Electric vehicle chargepoints: DfT developed regulations and standards for public chargepoints, with the roll-out of public chargepoints supported by funding
Partnerships, investment and regulation	Collaborating with academia and industry to fund trials and inform future regulation	Autonomous vehicles: the Connected and Autonomous Mobility Testbed UK provides facilities to test and develop technologies for the development of connected and self-driving vehicles

Note

1 DfT has identified four key interventions it expects staff to consider when developing or delivering activity that can support innovation: partnerships and collaboration; investment; regulation; and procurement and commercial influence. These are detailed in Figure 3 of this report.

Source: National Audit Office analysis of Department for Transport documents

Figure 5

Case example: the Department for Transport's (DfT's) support for uptake of sustainable aviation fuel

DfT has used a combination of interventions to increase sustainable aviation fuel use since 2022

The challenge

Sustainable aviation fuels (SAFs) reduce greenhouse gas emissions when compared with standard jet fuel. SAF suppliers can make it from a range of sustainable waste materials and can blend it with standard jet fuel for use in existing jet engines. DfT's support to the UK's SAF industry could provide environmental and economic benefits.

What DfT has done

- **Investment and support to industry:** DfT's Advanced Fuels Fund (£198 million, 2022-23 to 2025-26) aimed to support the development of a range of SAF technologies through grant funding, enabling them to attract private investment. DfT also provided advice to potential producers.
- **Regulation:** the UK's SAF mandate requires suppliers to blend a set proportion of SAF into their overall supply, starting at 2% of UK aviation fuel in 2025 and rising to 22% in 2040.
- **Commercial influence:** the SAF revenue certainty mechanism aims to give market certainty by setting a guaranteed price. The legislation received Royal Assent in March 2026 and DfT launched a consultation on the implementation of the legislation in January 2026.
- **International partnership:** DfT has supported the establishment of an international hub to unlock financing mechanisms for the deployment of SAF worldwide.

The impact

The amount of SAF supplied to the UK is rising. The UK has exceeded its target for SAF supply in 2025. Data that DfT published in February 2026 indicate that SAF made up 2.36% of all jet fuel supplied to the UK in 2025. DfT has said that, as not all suppliers have reported yet, this is an underestimate. Final figures for 2025 are expected to be published in November 2026. DfT also supported the first transatlantic flight on a commercial aircraft powered by 100% SAF in 2023.

Source: National Audit Office analysis of Department for Transport documents and data

Part Two

The Department for Transport's management of innovation activity

2.1 This part examines the Department for Transport's (DfT's) management of its innovation activity and the approaches taken by three of its arm's-length bodies. It examines:

- DfT's governance of innovation activity, including its oversight, risk management and performance monitoring;
- how DfT's three highest-spending arm's-length bodies manage their innovation activity;
- how DfT facilitates learning across the transport sector; and
- industry views on how DfT can improve its support for innovation.

Governance of innovation activity

2.2 This section examines DfT's management of innovation activity, focusing on:

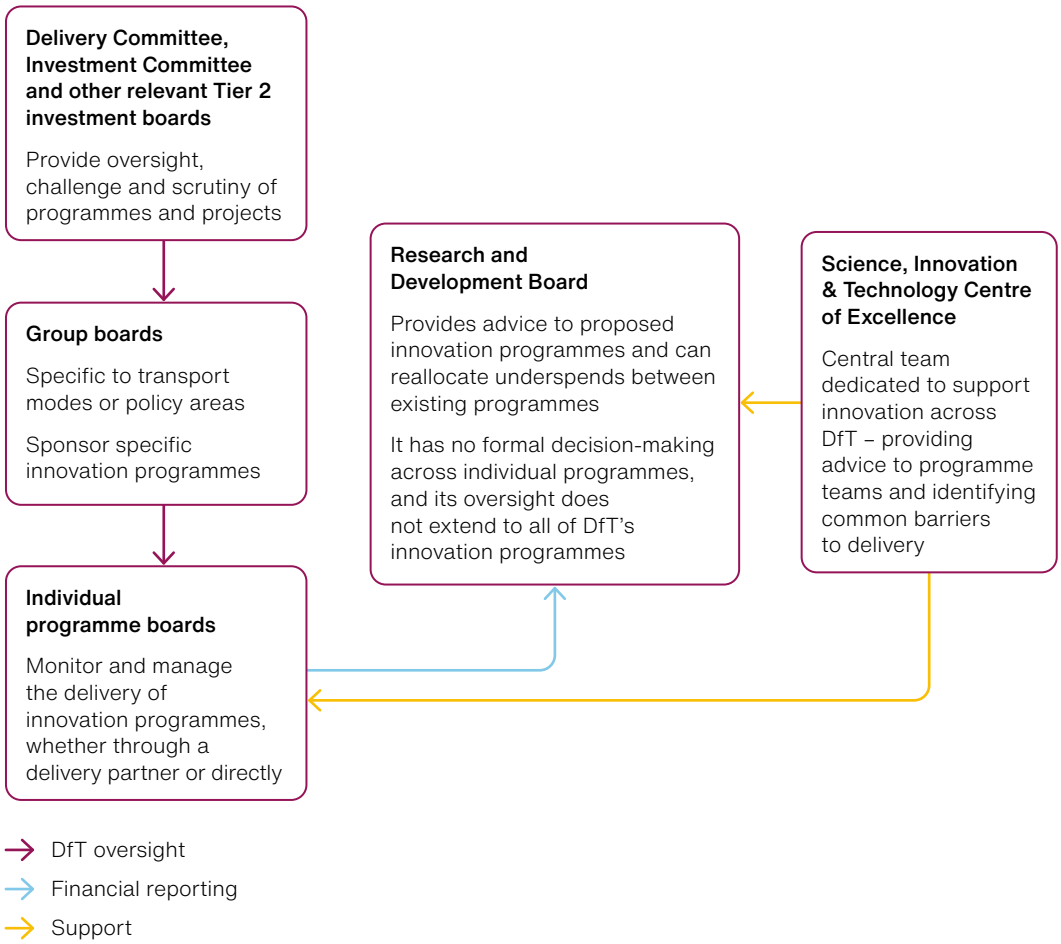
- oversight and decision-making;
- risk management; and
- performance monitoring.

DfT's internal governance arrangements relating to innovation are set out in **Figure 6** overleaf.

Figure 6

Department for Transport's (DfT's) governance of its innovation activity

The Research and Development Board has a limited role in decision-making on innovation investments, constraining the strategic oversight it provides



Note

1 DfT's Tier 2 investment boards have delegated authority over programmes and projects below £30 million in value.

Source: National Audit Office analysis of Department for Transport documents

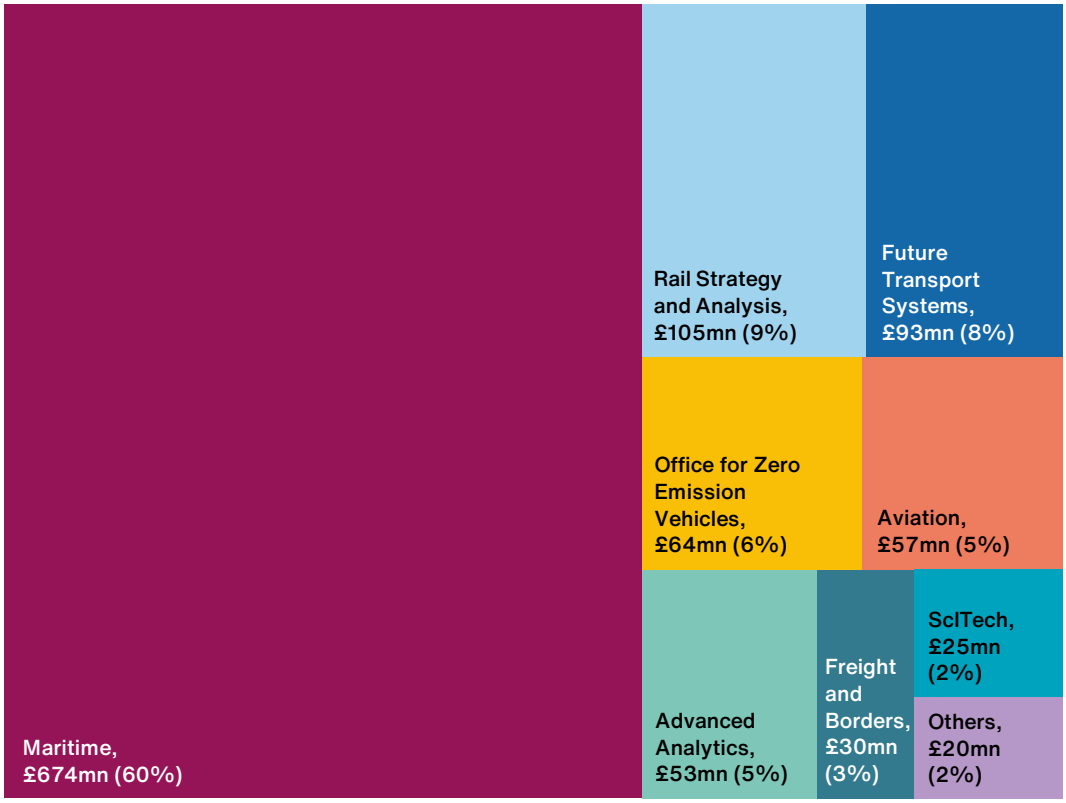
Oversight and decision-making

2.3 In its 2025 Science, Innovation and Technology Plan, DfT committed to taking a more strategic portfolio approach to managing innovation across the department. DfT intends its Research and Development Board to provide direction for its investments in transport innovation. However, in practice, the board has a limited role in decisions on areas of innovation expenditure. Policy teams make bids for innovation activity as part of the normal spending review process. We show allocations by policy area in **Figure 7**.

Figure 7

Planned distribution of innovation spending (2022-23 to 2029-30) across the Department for Transport's (DfT's) policy areas

DfT's innovative research and development programmes are dispersed across 12 policy areas, with the majority (60%) of spending on maritime



Notes

1 'Others' includes the following directorates: Environment Strategy; Buses & Inclusion; Portfolio and Project Delivery; and Analysis.

2 This figure does not include all innovation spending across DfT, as some does not meet the definition of research and development spending. We have also excluded research and development programmes that DfT does not consider as innovation.

3 The area in the chart represents the proportion of the total planned innovation spend (2022-23 to 2029-30) for each policy area. These totals reflect actual spend from 2022-23 to 2025-26 and forecast spend from 2026-27 to 2029-30. The 2025-26 spending figures are provisional and still subject to audit.

4 The data encompass the periods covered by the Spending Review 2021 (2022-23 to 2024-25), the Autumn Budget 2024 (2025-26) and the Spending Review 2025 (2026-27 to 2029-30).

5 We estimate that DfT plans to spend approximately £1.1 billion in total on activities to support innovation between 2022-23 and 2029-30.

6 Advanced Analytics is responsible for data science, artificial intelligence and machine learning.

7 SciTech is DfT's central Science Innovation and Technology team.

Source: National Audit Office analysis of Department for Transport documents

2.4 The Research and Development Board's management of innovation activity has focused on advising on the reallocation of underspends between existing programmes. However, the board's oversight does not extend to all innovation programmes across the department. For example, the Advanced Fuels Fund programme is a £198 million capital programme designed to invest in infrastructure that supports innovation in fuel technology. The board does not receive any information relating to the programme because DfT does not classify it as research and development spending.

2.5 DfT's approach allows teams who are closer to their respective modes of transport to spot opportunities for innovation and initiate innovation work accordingly. However, there is a risk that it is missing cross-cutting issues across transport modes which it could address more effectively through collaboration. For example, working together on the purchase and use of satellite data to assess ground condition and surface water.

Risk management

2.6 DfT has not clearly articulated and embedded its risk appetite for innovation to guide its investment decisions. Risk appetite is the amount and type of risk that an organisation is willing to take to meet its strategic objectives. DfT did produce a risk appetite statement for innovation for decarbonisation, in response to a request from the Department for Energy Security & Net Zero. However, the statement did not clearly set out DfT's risk appetite in this area, or across all its innovation activity, and DfT does not use it to guide decision-making. Government guidance expects teams to take risk appetite into account during planning and decision-making, including on investments and prioritisation. Setting out a risk appetite, communicating it and applying it would help DfT decide what level of risk to take in its programmes to achieve the intended outcomes. This could also guide decision-makers in their choices and help DfT identify where it needs to monitor and manage higher-risk activity.

2.7 We have seen a tendency towards lower-risk activity in the absence of any guidance to decision-makers on risk appetite. Innovation requires actively seeking well-managed risk taking, as the path to outcomes is not necessarily clear or known. Some level of failure is inevitable and an indication that an organisation is taking well-managed risks in pursuit of the outcomes it wants to achieve. Currently, DfT does not have the management information that would give it an overview of how much risk it is taking across its innovation activity, limiting its ability to make informed decisions. DfT was only able to provide us with one example of a higher-risk investment that it stopped, which it did after the project did not meet milestones for commercial adoption (**Figure 8**). This suggests that DfT has not taken enough well-managed risk.

Figure 8

Case example: the Department for Transport's (DfT's) Zero Emission Heavy Goods Vehicle (HGV) and Infrastructure Demonstrator (ZEHID) programme, 2022-23 to 2025-26

DfT included a higher-risk element to this programme, monitored progress carefully and ended it once it was clear that the project was not delivering the expected outcomes

Programme aims

DfT's ZEHID programme, delivered in partnership with Innovate UK, aimed to support the deployment of zero-emission long-haul road freight and its supporting infrastructure within the UK. It aimed to:

- deploy demonstrations of leading technologies on UK roads and identify the best technology to replace diesel HGVs; and
- identify any regulatory and planning issues to resolve.

Ending the project on hydrogen-powered HGVs

The programme included a £32 million project on hydrogen-powered HGVs, a high-risk technology. DfT started funding this hydrogen project in June 2024 and put in place milestones as conditions of further funding to ensure the project was on track to deliver the expected outcomes.

DfT and Innovate UK tried to support delivery of the project when issues arose. They suspended funding for two months mid-2025 when the project faced issues. When these issues were resolved and they restarted the project, they did so with an increased level of monitoring. DfT and Innovate UK subsequently withdrew the hydrogen project grant in late 2025 when a milestone around commercial adoption was not met. DfT and Innovate UK made the decision to stop the hydrogen project rather than spending more money on it. Other battery electric HGV projects are continuing as part of the wider ZEHID programme.

Source: National Audit Office analysis of Department for Transport documents

Performance monitoring

2.8 DfT commissions Innovate UK and Connected Places Catapult to monitor outcomes for the work they deliver. We estimate that, between 2022-23 and 2029-30, these partners will deliver about 72% of DfT's total innovation spend. These two organisations have appropriate monitoring arrangements and report regularly to DfT about the outputs and outcomes achieved by the innovation activities they deliver. A Government Internal Audit Agency report on DfT's research and development activity found that DfT had applied government project and contract management frameworks in defining clear roles relevant to monitoring and reporting. It judged that this provides a good foundation for active management of these projects. Through its central evaluation team, DfT provides quality assurance and sets expectations to its main delivery partners on monitoring outcomes.

2.9 DfT has worked with Innovate UK and Connected Places Catapult to capture consistent activity data. It has also encouraged portfolio monitoring to capture progress beyond individual projects. In 2022, DfT introduced a cross-cutting monitoring framework for programmes delivered by Innovate UK. This allows DfT to understand emerging outcomes across the transport-related activities delivered by Innovate UK. Similarly, with Connected Places Catapult, DfT has encouraged portfolio monitoring across some projects that captures outputs and outcomes at an aggregate level.

2.10 We have not seen evidence of DfT monitoring outcomes at a thematic or portfolio level outside of those managed by Innovate UK and Connected Places Catapult. We have seen examples within individual programmes of monitoring outcomes, for example in DfT's UK SHORE programme (**Figure 9**). DfT is yet to develop monitoring plans for some programmes that are at an early stage. To maximise the impact of its innovation work, DfT will not only need to assess the effectiveness of its funding. It will also need to assess how it uses regulation, partnership working and commercial influence to support transport outcomes.

DfT's arm's-length bodies' management of innovation activity

2.11 We examined the approach taken to the management of innovation activity by three of DfT's largest arm's-length bodies. We examined High Speed 2 Ltd (HS2 Ltd), National Highways and Network Rail, with a combined average spend of around £81 million a year on research and development between 2022-23 and 2024-25. We found that, compared with DfT, these bodies are more actively prioritising and managing their work to support innovation (**Figure 10** on pages 28 and 29).

2.12 Two factors support DfT's arm's-length bodies to manage their innovation activity more actively as a portfolio. Arm's-length bodies are often the potential buyer and user of the innovations that they are supporting. They also have specific remits which DfT funds them to deliver against, sometimes with fixed-year funding cycles. For example, HS2 Ltd is delivering a single, timebound project, and National Highways and Network Rail both operate within five-year funding cycles.

Figure 9

Case example: the Department for Transport's (DfT's) UK Shipping Office for Reducing Emissions (UK SHORE) programme, 2022-23 to 2029-30

DfT has made effective use of evidence from its evaluation of the UK SHORE programme

About UK SHORE

Greenhouse gas emissions from maritime accounted for around 8% of total emissions from transport in 2022.[1] In that year, DfT established the UK SHORE programme, which aims to reduce maritime emissions and support the development of clean maritime technologies. DfT expects the programme to cost £674 million by the end of 2029-30.

Evaluation commissioned

DfT commissioned external consultants in 2023 to design and lead an evaluation of the UK SHORE programme. It is gathering evidence on how well the programme is run, and its outcomes, impact and value for money.

Evidence on outcomes

Interim findings from this evaluation in March 2025 have provided some early evidence on the outcomes the programme has achieved. For example, there was evidence that some funded organisations have created jobs and progressed their technologies. The evaluation also found that the UK SHORE programme had attracted approximately £120 million of external investment alongside DfT funding, which was one of the objectives of the programme.

Use of evaluation evidence

DfT used evidence from the evaluation of UK SHORE to estimate the expected quantified benefits of further funding. It used this estimate in its successful bid for further funding from HM Treasury in the 2025 Spending Review. Evidence from the evaluation is also being used to inform the development of the next phase of the programme.

Note

1 Data available in Department for Transport official statistics on greenhouse gas emissions from transport in 2022. Available at: www.gov.uk/government/statistics/transport-and-environment-statistics-2024/greenhouse-gas-emissions-from-transport-in-2022 (accessed April 2026)

Source: National Audit Office analysis of Department for Transport documents

Figure 10

An overview of the approaches to innovation taken by High Speed 2 Ltd, National Highways and Network Rail

The Department for Transport's (DfT's) arm's-length bodies are better able to prioritise their innovation activity than DfT

	Network Rail	National Highways	High Speed 2 Ltd (HS2 Ltd)
Ambition for innovation	Its research and development portfolio aims to bring together research and development in one place and unlock benefits across Network Rail. Regional plans reflect this portfolio to help improve outcomes, including safety, efficiencies, and benefits to customers.	Transformation and modernisation of the Strategic Road Network.	De-risk new technologies and ways of working by identifying, trialling and adopting new techniques and technologies. It aims to deliver quantified benefits, commercially assured, playing a key role in driving value for money and timely delivery.
Average annual spend on innovation (2022-23 to 2024-25)	£48.3 million	Approximately £30 million	£3.1 million
Areas of focus	• Passenger experience and accessibility • Freight capability • Traction decarbonisation • Environmental and social sustainability • Optimised and resilient operations • Automation • Optimised and resilient assets • Digitisation and data	• Design, construction and maintenance • Connected and autonomous vehicles • Customers and mobility • Energy and environment • Improve operations	• Productivity • Cost efficiency • Carbon reduction • Safety improvements
Prioritisation of innovation portfolio	Network Rail publishes challenge statements detailing a specific business obstacle and inviting innovators and academia to bring forward proposals. Spending is prioritised by a hierarchy of benefits: **1** Cost reduction. **2** Safety and performance improvement. **3** Whole-life cost or decarbonisation/ sustainability. **4** Customer experience. Allocation of funding across its portfolio is also based on a balance of risk: **1** 20% to low-readiness research projects. **2** 40% to mid-readiness development and testing of ideas. **3** 40% to higher-readiness proven concepts taken into operational testing and first-in-class deployment and adoption.	National Highways identifies business challenges that it needs to address to reach its strategic ambitions. It issues open calls against these to help form its programme. The innovation portfolio splits its investment across three time horizons: **1** Short term (70%) **2** Medium term (20%) **3** Long term (10%)	HS2 Ltd directly funds trials and research if they meet HS2 Ltd's criteria on feasibility, applicability and viability. HS2 Ltd assesses proposals against three time-horizons, prioritising those that can deliver outcomes during the lifetime of the HS2 programme: **1** Ideas that are mature enough for safe use in two years' time; **2** For safe use in 10 years; and **3** For safe use in 15 years. HS2 Ltd told us that these time-horizons help it and its supply chains understand what outcomes and potential solutions are required and when. This lets them focus their efforts on reducing risks.
Management of innovation portfolio	A research and development board assesses potential investment across Network Rail's portfolio. Network Rail holds a quarterly Research and Development Advisory Board which includes DfT, National Highways, Europe Rail Joint Undertaking, train operators, Manufacturing Technology Centre and Transport Scotland, to discuss and share initiatives that have the potential to scale beyond rail.	Over the second road investment strategy period (April 2022 to March 2025), National Highways has delivered 255 innovation and research schemes. A Programme Board assesses and prioritises proposals and then oversees programme delivery and performance to ensure that programmes are achieving outcomes and expected benefits.	HS2 Ltd's innovation team manage the innovation process, with each project overseen by an Innovation Delivery Panel. There is a structured process to move projects from proposal through to trial and then scaling up. For example, HS2 Ltd's Innovation Accelerator programme provides a formal mechanism for engaging start-ups to trial productivity-enhancing technologies within a major UK infrastructure programme. HS2 Ltd has completed 185 projects since 2020.

Source: National Audit Office analysis of documents from High Speed 2 Ltd, National Highways and Network Rail

2.13 Arm's-length bodies also have clearer processes compared with DfT's for managing their innovation activity. For example, National Highways and Network Rail have clearly defined prioritisation criteria. This helps them pick the desired mix of risks or stages of technology readiness in their portfolios of innovation projects. The arm's-length bodies we examined also carried out more tracking of the outcomes and benefits across their innovation portfolios. For example, HS2 Ltd tracks the cost savings of the innovation projects it funds, as well as the impact on carbon emissions. It has identified £381 million in cost reductions resulting from its innovation portfolio and identified opportunities for up to 1.7 million tonnes of CO_2 reductions. We also saw examples of arm's-length bodies stopping activity early when it was not progressing as expected (**Figure 11**).

Figure 11

Case example: High Speed 2 Ltd (HS2 Ltd) trial of a construction robot in 2025

HS2 Ltd set up a trial with staged decision points to allow it to quickly stop if the construction robot did not perform as expected

Aims

In 2025, HS2 Ltd trialled the use of a construction robot, which was intended to improve productivity and reduce the risk of injuries during a manual construction task. The technology had shown promise elsewhere, but HS2 Ltd wanted to understand whether it could bring benefits in the specific conditions of HS2 construction.

What happened

HS2 Ltd set up the trial with staged decisions points so that it could stop it early if the technology did not perform as expected. The ability to learn quickly what does and does not work is fundamental to successful innovation. In the initial week-long phase, the trial found that the robot was unsuited to HS2 Ltd's real-world site conditions and did not deliver the anticipated benefits. HS2 Ltd therefore closed the trial after spending around £5,000, avoiding further spending on a solution unlikely to provide value for money.

Learning

HS2 Ltd learnt from this trial and is considering using the robot in niche situations which are particularly dangerous. It also adopted an alternative solution for more standard situations.

Note

1 HS2 Ltd is an executive non-departmental public body, sponsored by the Department for Transport.

Source: National Audit Office analysis of High Speed 2 Ltd documents

How DfT facilitates learning across the transport sector

2.14 In 2017, DfT established the Transport Research and Innovation Board (TRIB) to bring together representatives from organisations with an interest in transport research and innovation in the UK. Its membership is largely drawn from DfT and its arm's-length bodies but also includes representatives from research councils and the Department for Business & Trade. The board meets three times a year. Two working groups support it (on infrastructure, and on systems and data), providing it with advice on proposed projects. It is the main forum for DfT to collaborate with its arm's-length bodies and other key stakeholders on shared priorities and challenges. The board has also sought to explore specific topics of shared interest, for example artificial intelligence, digital twinning and climate adaptation.[2]

2.15 The three arm's-length bodies we spoke with were positive about TRIB. They told us that they value the opportunity it provides to have clarity over each organisation's programmes and activities and share and learn about common challenges. However, DfT's coordination of innovation activity with and between its arm's-length bodies has been limited. DfT identified that this results in duplication of activity and failure to prioritise cross-sector interventions.

2.16 In April 2026, DfT launched a £5-million Delivering Efficiency through Technology Adoption fund to address this. DfT has used this fund to establish seven programmes to support the development and adoption of new technology to be applied across the transport sector. DfT intends these programmes to provide improved co-ordination of TRIB member's activities, resources, expertise and influence. The programmes include, for example, work looking at how lower-carbon concrete alternatives could be adopted within transport infrastructure projects (**Figure 12** overleaf). As part of wider rail reforms, GBRx was established in 2025 as the strategic innovation body within Great British Railways (GBR).[3] GBR will incorporate Network Rail's functions. GBRx will aim to identify opportunities for new technologies on the rail network.

2 A digital twin is a virtual model of a system or process that is connected to its real-world counterpart by a two-way flow of data, meaning it mimics it in all aspects. This provides decision-makers the ability to test changes in advance and understand how different actions might affect the real world.

3 DfT plans to establish a new body, Great British Railways (GBR), to bring together the management of both track and train into a single "directing mind" for rail.

Figure 12

Case example: partnership working on sustainable concrete

The Department for Transport (DfT) and High Speed 2 Ltd (HS2 Ltd) have worked with others since 2023 to set out a plan to accelerate the adoption of more sustainable concrete, although progress is slower than they expected

What is calcined clay?

Calcined clay is a material that suppliers can use to produce greener concrete. It has the potential to reduce the cost and carbon associated with transport infrastructure, and improve resource security because it can be produced in the UK from waste clay. The large amount of excavation waste produced during HS2 construction could be processed into calcined clay. Other countries have already adopted calcined clay.

What are the barriers to its adoption?

Low familiarity with calcined clay creates barriers to adoption: users do not specify calcined clay because it is not available and they are not familiar with it, and suppliers do not invest in production because they are not certain that there is demand for it. There is also no UK processing or testing facility.

What are DfT, HS2 Ltd and others doing to accelerate its adoption?

HS2 Ltd took a proposal to DfT's Transport Research and Innovation Board in December 2023, seeking support to accelerate adoption of calcined clay. DfT, HS2 Ltd and others (including from National Highways, DfT's other arm's-length bodies, other departments and other infrastructure stakeholders) created an action group. This group developed a plan to accelerate the adoption of calcined clay. Progress to date includes:

- publishing a discussion document on calcined clay;
- engaging with industry through events;
- identifying support from clients and contractors showing interest in using calcined clay in future projects; and
- working with Innovate UK's Advanced Market Commitment programme, through which potential users promise to buy innovative sustainable concrete, thereby giving confidence to the market to invest in its manufacture.

The group has not yet realised its ambition to fund and create a test kiln, or to identify a site for a commercial kiln.

Source: National Audit Office analysis of Department for Transport and High Speed 2 Ltd documents

Industry views on how DfT can improve its support for innovation

2.17 We met with representatives from industry to understand their views of where DfT can improve its support for innovation. We spoke with a range of organisations of different sizes, including those that have bid for DfT-funded programmes, and those that could have done but chose not to. They identified a range of issues, with the most important themes emerging around the following: a culture of risk aversion; contractual and procurement processes that work against experimentation; concerns about intellectual property rights; and the need for better support to move trials to commercial end products (**Figure 13**). Industry stakeholders also told us that procurement practices place disproportionate burdens on smaller companies.

Figure 13

Obstacles to innovation, identified by industry stakeholders, that the Department for Transport (DfT) and government can address

Industry stakeholders identified obstacles to innovation including risk aversion in government and current government procurement processes

Risk aversion

- Risk-averse culture in government.

Procurement processes

- Long and complex procurement processes for innovation grants from government are a particular barrier for small and medium-sized businesses as they have fewer resources available to them.
- Bespoke requirements for different local authorities add complexity for innovations that involve working with local government.

Intellectual property

- Concerns about loss of control of intellectual property, and its commercial value, when applying for government grant funding.

Scaling up

- Difficulty getting funding to move beyond the early stages of innovation to commercialisation.

Data restrictions

- Restrictions on retaining and sharing data.

Sharing learning across the sector

- Lack of DfT support for learning across innovation activity in the sector, including on why some projects are successful and others are stopped.

Regulation

- Regulation can inhibit innovation and changes to regulation can happen too slowly.

Note

1 Many of the issues raised are relevant to industry's experience working with other parts of national and local government and are not unique to DfT.

Source: National Audit Office analysis of evidence from engagement with the transport industry, which included interviews with industry representative bodies and workshops with selected companies involved in transport innovation

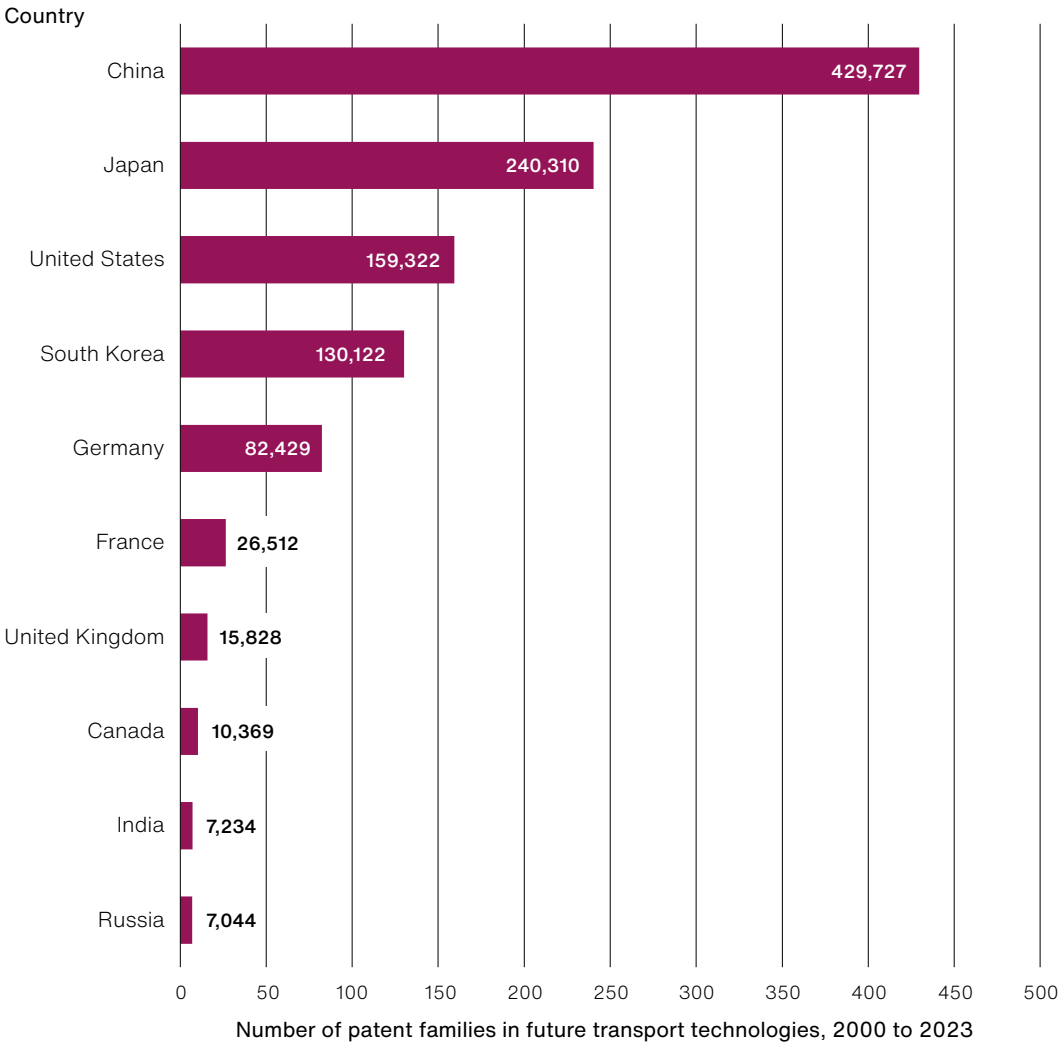
2.18 DfT has typically focused on delivering innovation grant funding programmes rather than on having longer-term commercial influence on the transport sector (Figure 3). It recognises it needs to think about potential supply chain and procurement routes from the very beginning of innovation programmes. DfT told us that it is also considering what it needs to do to better support innovation through its own procurement processes. It has led work across government to address concerns from smaller suppliers about their intellectual property rights. The government's Procurement Act came into force in early 2025 and opens further opportunities to make public procurement simpler and faster. However, many suppliers are bound by existing long-term contracts which operate under the old regime.

2.19 Patenting activity is an indication of innovation, showing where researchers are investing their resources. International data show that the UK was in the top 10 global locations for transport patents relating to sustainability and digital technologies between 2000 and 2023 (**Figure 14**). However, between 2018 and 2023, the UK's average annual rate of growth has slowed and is falling faster than all the other top locations except Russia (**Figure 15** on page 36). This compares to a broadly steady rate of patent publications across the whole UK economy.

Figure 14

World Intellectual Property Organization data on locations for patenting activity relating to future transport technologies, 2000 to 2023

The United Kingdom was rated seventh in the world for patenting activity relating to future transport technologies between 2000 and 2023



Notes

1 Countries shown are the top 10 countries by number of patent families relating to future transport technologies published between 2000 and 2023.

2 A patent family is a collection of patent applications covering the same technical content. The World Intellectual Property Organization considers the number of patent families to be a good proxy for the number of inventions.

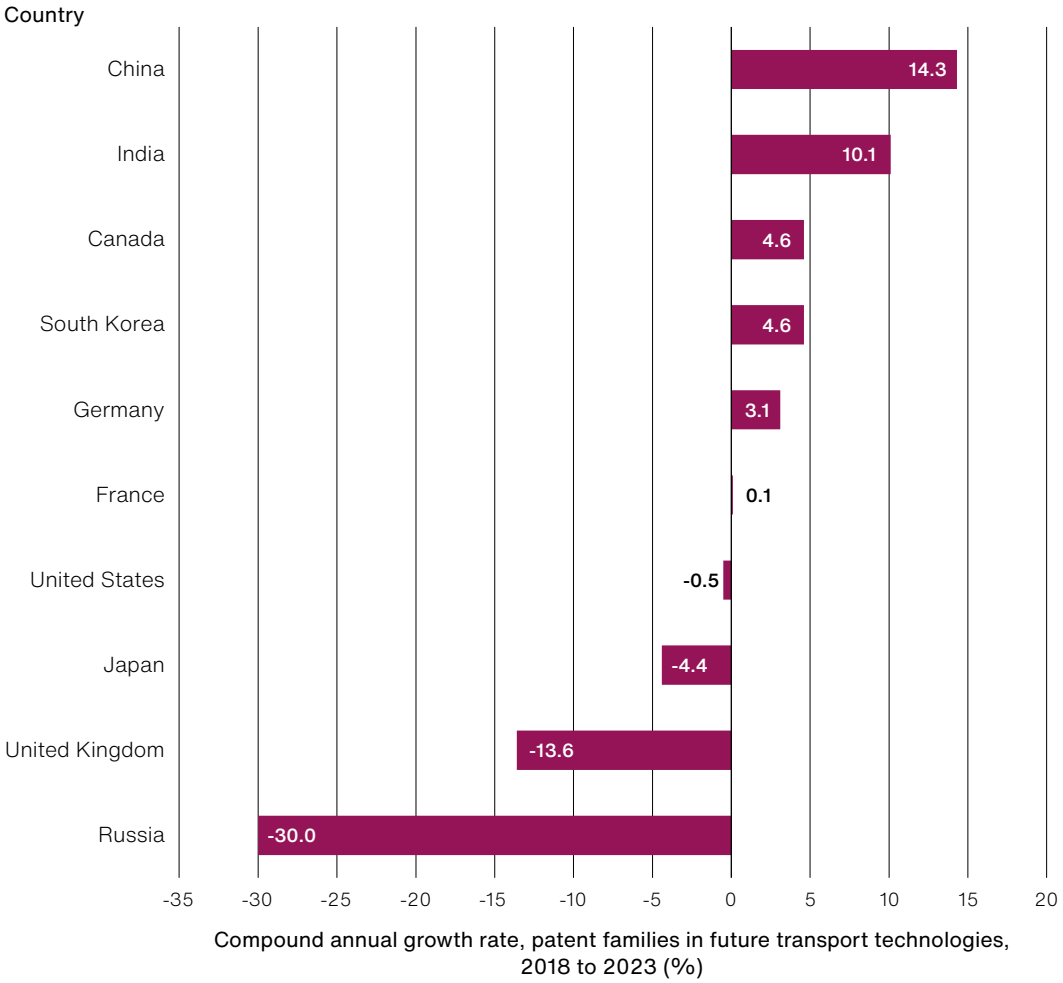
3 The World Intellectual Property Organization defines future transport technologies as those relating to the future sustainability and digitalisation of the transport sector, made up of four main technological drivers: sustainable propulsion, automation and circularity, communication and security, and human-machine interface technologies.

Source: World Intellectual Property Organization (WIPO) data in *WIPO Technology Trends: Future of Transportation,* Geneva: World Intellectual Property Organization, 2025. Available at: www.wipo.int/edocs/pubdocs/en/wipo-pub-1055-2025-en-wipo-technology-trends-future-of-transportation.pdf (accessed April 2026)

Figure 15

World Intellectual Property Organization data on growth in patenting activity relating to future transport technologies, 2018 to 2023

The rate at which the UK generated future transport-related patents in recent years was slower than in other countries



Notes

1 Countries shown are the top 10 countries by number of patent families relating to future transport technologies published between 2000 and 2023 (see Figure 14).

2 We ordered countries by the compound annual growth rate in patent families in future transport technologies between 2018 and 2023. The compound annual growth rate is the rate at which patenting activity grows each year, on average.

3 A patent family is a collection of patent applications covering the same technical content. The World Intellectual Property Organization considers the number of patent families to be a good proxy for the number of inventions.

4 The World Intellectual Property Organization defines future transport technologies as those relating to the future sustainability and digitalisation of the transport sector, made up of four main technological drivers: sustainable propulsion, automation and circularity, communication and security, and human-machine interface technologies.

Source: National Audit Office representation of World Intellectual Property Organisation (WIPO) data in WIPO Technology Trends: *Future of Transportation, Geneva: World Intellectual Property Organization, 2025*. Available at: www.wipo.int/edocs/pubdocs/en/wipo-pub-1055-2025-en-wipo-technology-trends-future-of-transportation.pdf (accessed April 2026)

Appendix One

Our audit approach

Our scope

1 The report contains our independent conclusions on whether the Department for Transport's (DfT's) approach to innovation in transport is delivering value for money. We reached these conclusions following our analysis of evidence collected mainly between October 2025 and February 2026.

2 We examined whether the DfT:

- has set out a clear approach to supporting innovation; and
- is managing its activity to support innovation effectively.

3 We also included spending on innovation by three of DfT's arm's-length bodies with dedicated innovation budgets: High Speed 2 Ltd (HS2 Ltd), National Highways and Network Rail.

4 This report focuses on the creation and application of new scientific or technical knowledge to improve transport. We do not comment on activity aimed to improve internal processes or efficiency.

Our evidence base

5 In forming our conclusions, we drew on a variety of evidence sources, as described in the paragraphs below. We looked across different sources of evidence to support each of our findings.

Document review

6 Between October 2025 and February 2026, we reviewed documents sent to us by DfT, including:

- strategy documentation setting out DfT's strategy for, approach to, and the objectives of its innovation portfolio, including its risk appetite and how it will work with others;
- monitoring and reporting of the research and development (R&D) portfolio through the R&D Board, which reviews budgets and forecasts and considers delivery confidence and cross-cutting risks and issues;

- governance documentation, including: R&D Board papers; process maps; terms of reference; oversight structures and processes for arm's-length bodies; and oversight management structures for different thresholds of spending;
- existing evaluations and evaluation plans;
- a small number of business cases for innovation programmes, including the highest value and a mix of medium and lower-value programmes;
- information on what DfT has done to understand and change its organisational culture to support well-managed risk taking to seek innovation opportunities; and
- documentation related to potential examples of good practice in innovation.

7 We also reviewed innovation documentation from three of DfT's arm's-length bodies: Network Rail, National Highways and HS2 Ltd. These bodies have dedicated innovation budgets. We reviewed spend data in addition to strategy and governance documents. We reviewed documentation related to potential examples of good practice in innovation.

8 We reviewed and qualitatively assessed each document against our overarching audit questions. These comprised questions relating to DfT's strategy and approach, its management of innovation and its use of learning to make improvements.

Semi-structured interviews

9 We carried out 28 interviews with officials from DfT, selected to participate because of their job roles and their relevance to the audit. This included staff responsible for:

- innovation projects across various transport modes (rail, aviation, road and maritime);
- central science, innovation and technology support;
- monitoring and evaluation;
- commercial strategy;
- analysis and engineering professions;
- portfolio and project assurance;
- sponsoring arm's-length bodies; and
- counter-fraud measures.

10 We interviewed representatives from DfT's key delivery partners – Connected Places Catapult, including the Innovation Procurement Empowerment Centre which it leads, and Innovate UK.

11 We also interviewed key officials at three of DfT's arm's-length bodies with dedicated innovation budgets: Network Rail, National Highways and HS2 Ltd. We met with officials who coordinate innovation activity across these bodies and who engage with DfT and wider stakeholder groups, and with project managers of programmes that were possible examples of good practice.

12 We met with transport industry and local government representative bodies.

- UK Railway Industry Association.
- ADEPT (Association of Directors of Environment, Economy, Planning & Transport).
- ADS Group (the UK trade association for aerospace, defence, security and space).
- ARPAS-UK (the UK Drone Association).

13 We carried out interviews online, typically lasting one hour, and took detailed notes. Interviews were tailored to the job roles of those interviewed.

14 We reviewed the data against our audit questions and used our analysis to inform further lines of enquiry to follow-up with DfT and its arm's-length bodies. We also triangulated evidence from other sources (including our document review and data analysis).

Workshop with innovation suppliers

15 We held a workshop with Intelligent Transport Systems UK to discuss how DfT supports innovation in transport. We ran two parallel discussions with private sector organisations in the transport technology industry. One included representatives from micro, small and medium-sized businesses and the other included larger companies.

16 We summarised the insights from our workshop and interviews with industry representatives on the barriers to innovation in Part Two. The findings presented in this report reflect the range of views of the participating organisations. We made this assessment based on qualitative analysis. These views are not statistically representative and may not reflect the views of the whole transport industry.

Data analysis

17 We collated data on spending and budgets of R&D programmes at DfT and three of DfT's arm's-length bodies: Network Rail, National Highways and HS2 Ltd.

18 We collated actual and forecast spending data for innovative R&D programmes monitored by the DfT's R&D Board for the period 2022-23 to 2029-30. We relied on DfT's assessment of which R&D activity they consider to be innovative and based our spending analysis on this selection of programmes. We have excluded research and development programmes that DfT does not consider as innovation, such as social research. In relying on DfT's R&D data, we have excluded innovation that does not meet the government's definition of research and development spending.

Case examples

19 Through interviews and document review, we identified potential illustrative examples of innovation. We selected five examples to use in the report.

20 We selected case examples to illustrate aspects of good practice in supporting innovation. These examples included using a combination of interventions to support innovation and well-managed risk taking. We also selected these examples to illustrate the diversity of innovation activity that DfT is supporting. We chose examples across a range of transport modes and outcomes sought, as well as activity managed by DfT and its arm's-length bodies.

21 For each case example, we requested and reviewed relevant documentation. We also carried out at least one interview with relevant staff from DfT or the arm's-length body to deepen our understanding.

International comparison

22 We used patent data as an indicator of the areas in the world where transport innovation is taking place, based on information from the World Intellectual Property Organization (WIPO). WIPO defines future transport technologies as those relating to the future sustainability and digitalisation of the transport sector. This is made up of four main technological drivers: sustainable propulsion; automation and circularity; communication and security; and human-machine interface technologies.

23 The selection of countries included is based on WIPO data on the number of patent families relating to future transport technologies published between 2000 and 2023. A patent family is a collection of patent applications covering the same technical content, so the number of patent families is a proxy for the number of inventions.

24 The order in which the countries are presented in Figure 15 is based on the compound annual growth rate (calculated by WIPO) in patent families over the most recent five-year period for which data are available (2018 to 2023).

25 The periods 2000 to 2023 and 2018 to 2023 were selected based on the most recent WIPO report available during our fieldwork (*WIPO Technology Trends: The Future of Transportation*, 2025).

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