# Department for Transport

# Transport Artificial Intelligence Action Plan: Transforming Ambitions

# Contents

# Transport Secretary Foreword

Artificial intelligence (AI) could be transformative for transport. It can help us tackle some of the biggest challenges we face as a country, enabling us to reduce our carbon emissions, improve our air quality, enhance our mobility and safety, integrate transport and create new jobs and industries. AI is capable of unlocking new opportunities for growth, innovation and inclusion, creating a transport system that works for everyone.

AI can optimise traffic signal timing to reduce congestion, provide predictive maintenance for vehicles to help prevent breakdowns, and offer real-time updates and personalised route suggestions to commuters. But it is not without risks and challenges - we need to get this right. How do we make sure that AI for transport is accountable, safe and transparent? How do we manage the impact of AI on our workforce and skills? How do we ensure that AI is fair and inclusive, and does not discriminate or exclude?

So we need to have a clear vision and a strong framework for how we want to use AI in transport. We will engage with the public, industry, academia and society, and listen to their views and concerns. We will look to balance the benefits and risks, the opportunities and challenges, and the requirements of the innovation and regulation communities.

That is why I'm bringing forward this Transport Artificial Intelligence Action plan, the first of its kind. This is a series of actions that will harness the vast benefits of AI for transport, including supporting the deployment of automated vehicles and grasping the efficiencies that AI offers. I want to see AI enable more reliable infrastructure which is cheaper to construct; better coordinated transport where road, rail and the other modes truly talk to one another for the benefit of passengers; and a more robust system which is better able to react to and recover from things like bad weather. We developed this action plan based on our

commitment to deliver the Government's Missions because we recognise that the opportunity for AI to boost productivity and break down barriers to opportunity cannot be ignored.

We are at a critical moment in the development and deployment of AI in transport and across our society. We have a unique opportunity to shape the future of transport with AI, and to ensure that it serves the public interest. AI is not a distant future. It is here and now, and it can change transport for the better. But we need to act now to shape the future of transport with AI, and ensure that it serves the public interest and reflects our common values. This action plan is our roadmap to do just that.

# Government Chief Scientific Adviser Foreword

Transport is on the brink of extraordinary transformation, driven by the unprecedented pace of advancements in artificial intelligence (AI). AI is a critical technology with enormous potential to support growth right across the UK, especially with the government focused on delivery of the AI Opportunities Action Plan. This Transport AI Action Plan, developed by DfT, seeks to seize the opportunities for the transport sector and presents an exciting vision across a range of important sectors, including reducing transport's environmental impact and supporting adaptation to a changing climate. This new action plan represents a pivotal step forward in harnessing AI to revolutionise our transport systems, delivering safer, greener, and more efficient mobility for all.

The application of AI in transport is already shaping how we move goods and people, from self-driving vehicles and predictive maintenance to real-time traffic management and intelligent logistics. Scientific breakthroughs and innovations across the sectors such as these have the potential to unlock significant economic, social, and environmental benefits – reducing emissions, improving accessibility, and fostering sustainable economic growth. Research and development are fundamental to this progress. From my previous experience as the Ministry of Defence Chief Scientific Adviser, I understand the innovative yet complex nature of transport engineering underpinning the operation of the transport system – both in the coordination of vehicles and craft movements across land, sea, and air, as well as the systems required to support them. These two factors along with the large market which transport represents – as the second highest element of household expenditure – mean that it is a great place for innovation and a great place for government to be supporting ongoing work.

The transport sector contributes significantly to both our research capabilities and economic potential as a country. I am excited about the ambition of this action plan, especially in prioritising a world-class research and development ecosystem in the sector. Transitioning to new solutions in our transport system will require an ambitious vision and support for research and development alongside international collaboration. This makes a concerted push to implement AI integration and research across transport timely and essential.

The UK aims to be a leader in the AI revolution, and I am pleased to see transport in the group of early movers and adopters. I look forward to seeing the research developments and the range of new smart digital solutions that emerge in UK transport.

# Executive summary

AI is already delivering real impact across the transport system, but we are now on the cusp of a step-change in opportunity.

This Transport AI Action Plan sets out how DfT will work with the transport sector to exploit the opportunities from AI while managing potential risks. The action plan focuses on setting the foundations to embed AI in transport, preparing both the sector and the organisations which enable it for rapid change. The plan sets out longer-term ambitions for an AI-enabled transport future and how it will help to deliver the Government's Missions and DfT priorities including, kickstarting economic growth, breaking down barriers to opportunity, delivering greener transport and cementing the UK position at the forefront of the AI revolution.

The vision for an AI enabled future transport system is:

> Responsible AI embedded in a resilient transport system delivering cheaper, cleaner, and safer journeys for all.

To achieve this vision, DfT and the transport sector will work together to:

**Adopt AI responsibly to deliver better transport for all** by ensuring that AI systems are ethical, safe, secure, and accountable, and that they respect the rights and interests of users, workers, and the public.

**Maximise the economic benefit from AI applications in transport, whilst reducing transport's environmental impacts** by supporting innovation and investment, creating new jobs and skills, and enabling a safer, greener and more efficient transport system.

**Secure the UK position at the forefront of transport-related AI applications** by supporting a world-class research and development ecosystem, promoting international collaboration and standards, and showcasing the UK's leadership and excellence in transport AI.

**Utilise AI to enhance the quality, efficiency, and effectiveness of DfT** by strengthening DfT's own data and digital capabilities, embedding AI across policy and delivery functions, and providing guidance and oversight to the transport sector.

These objectives will be secured by action across five areas:

1. **Leadership:** Providing policy, guidance, governance, and oversight.

2. **Skills and Capabilities**: Ensuring both the transport sector and the DfT family of organisations are equipped to use, regulate, guide, and assure AI systems effectively.

3. **Infrastructure and Data:** Enabling access and providing guidance and stewardship.

4. **Applications:** Identifying, supporting, and steering to maximise public value.

5. **Engagement:** Collaborating with other government bodies; sharing learnings domestically and internationally; working with operators, regulators and innovators; keeping open dialogue with the public.

## Summary of key actions:

| Action Number | Action | Mapping to Action Plan Objectives |
|---|---|---|
| 1.1 | Work with the private sector to develop leadership statements for AI implementation in discrete parts of the transport sector. | 2. Maximise the economic benefit from AI applications in transport, whilst reducing transport's environmental impacts |
| 1.2 | Investigate the barriers to implementing AI solutions in local transport systems, as well as the barriers to AI adoption in transport areas that DfT is responsible for. Agree plans to overcome these barriers and accelerate implementation of beneficial AI in local transport systems. | 3. Secure the UK position at the forefront of transport-related AI applications |
| 1.3 | Delivering measure that would enable advanced trials and early commercial pilots to take place in 2026 ahead of the full regime being implemented in 2027 (subject to safety assessments), and sharing lessons to support development of standards and regulatory approaches for adoption and deployment of automated craft in the sky, on our waterways and at sea. | 3. Secure the UK position at the forefront of transport-related AI applications |
| 1.4 | Work with our regulators to ensure they have the right capabilities, balance the need of safety and innovation and are looking to accelerate AI developments. | 3. Secure the UK position at the forefront of transport-related AI applications |
| 1.5 | Work with combined and local authorities to drive transformational change in the use of AI for traffic and road network management. | 1. Adopt AI responsibly to deliver better transport for all |

| Action Number | Action | Mapping to Action Plan Objectives |
|---|---|---|
| 2.1 | Review existing AI Commercial Frameworks. Develop commercial guidance to contract for AI and ensure standard terms and conditions for digital contracts contain the right commercial provisions. | 1. Adopt AI responsibly to deliver better transport for all |
| 2.2 | Work with AI leaders to deliver AI apprenticeships and host secondments in DfT and transport agencies. | 4. Utilise AI to enhance the quality, efficiency, and effectiveness of DfT |
| 2.3 | Deliver a training needs analysis and internal AI training for DfT staff, including senior leaders. | 4. Utilise AI to enhance the quality, efficiency, and effectiveness of DfT |
| 2.4 | Develop a Transport sector AI Community of Practice to bring together colleagues from different organisations to share learning, coordinate activities and accelerate adoption. | 4. Utilise AI to enhance the quality, efficiency, and effectiveness of DfT |
| 2.5 | Engage with colleagues across the wider transport sector to share AI skills requirements and priorities, to inform future skills programmes and initiatives. | 2. Maximise the economic benefit from AI applications in transport, whilst reducing transport's environmental impacts |
| 3.1 | Develop the Transport Data Action plan 2025 which will set the conditions for the productive use of transport data for AI. | 1. Adopt AI responsibly to deliver better transport for all |
| 3.2 | Create or support mechanisms to actively (e.g. hackathon events) or passively (e.g. APIs) link data and challenge owners with AI innovators to demonstrate the benefits of new AI solutions in transport. | 2. Maximise the economic benefit from AI applications in transport, whilst reducing transport's environmental impacts |

| Action Number | Action | Mapping to Action Plan Objectives |
|---|---|---|
| 4.1 | Work with partners to showcase innovative uses of AI in transport, run hackathons, and develop a use case heat map to show where opportunities lie within the transport sector. | 1. Adopt AI responsibly to deliver better transport for all |
| 4.2 | Publish a DfT assessment on opportunities for AI to improve transport security and transport system resilience. | 1. Adopt AI responsibly to deliver better transport for all |
| 4.3 | Explore how AI can enable a reduction in transport's environmental impact and help the transport system adapt to a changing climate. | 2. Maximise the economic benefit from AI applications in transport, whilst reducing transport's environmental impacts |
| 4.4 | Develop a roadmap for sensing and cyber-physical interfaces (e.g. robotics) that allow AI to interact with the physical world of transport. | 3. Secure the UK position at the forefront of transport-related AI applications |
| 4.5 | Develop AI models that drive efficiencies within DfT's operations and unlock innovative analytical insights. | 4. Utilise AI to enhance the quality, efficiency, and effectiveness of DfT |
| 4.6 | Require major transport infrastructure projects to review their use of AI, analyse barriers to its adoption, investigate potential cost and carbon savings (both capital and operational) associated with its implementation and publish details of beneficial use cases. | 2. Maximise the economic benefit from AI applications in transport, whilst reducing transport's environmental impacts |
| 4.7 | Undertake an analysis of current AI transport system risks and mitigations. | 1. Adopt AI responsibly to deliver better transport for all |
| 4.8 | Establish how the use of Geospatial Foundation Models could bring together planning, operation and decarbonisation of the transport system. | 4. Utilise AI to enhance the quality, efficiency, and effectiveness of DfT |

| Action Number | Action | Mapping to Action Plan Objectives |
|---|---|---|
| 5.1 | Work through DfT and UKRI partnerships and innovation investments, such as DfT's Transport Research Innovation Grants, to engage with and support SMEs in bringing forward transport AI solutions. | 2. Maximise the economic benefit from AI applications in transport, whilst reducing transport's environmental impacts |
| 5.2 | Work with transport agencies, ALBs and the Transport Research and Innovation Board to produce ambition statements and articulate how they want to employ AI to improve transport and what steps they plan to take. | 1. Adopt AI responsibly to deliver better transport for all |
| 5.3 | Undertake social and behavioural research and engage with the public around AI in the transport system. | 1. Adopt AI responsibly to deliver better transport for all |

# Introduction

## The Transport AI Action Plan

The adoption of AI in transport will only lead to the benefits we all hope for if we take a systems approach and involve all actors and stakeholders in the discussion from the outset. This document sets out the context and case for change, offers a positive vision of the future and explains how DfT will take action, in step with our partners, to move in the right direction.

The long-term implications of AI remain uncertain, but what is evident is that there will be a profound and swift transformation driven by the frontier of AI. This document sets the foundations to embed AI in transport, preparing both the sector and the organisations which enable it for rapid change. It builds upon the Transport Data Strategy and the AI Opportunities Action Plan to align the transport sector with the broader AI agenda and maximise the benefits of AI for transport users and society.

This action plan sets out longer-term ambitions for an AI-enabled transport future to deliver the Government's Missions and DfT priorities.

The plan starts by setting out the opportunities to unlock value in the transport sector. It then sets out the vision for AI in transport and lays out the objectives needed to reach this vision. Finally, it details actions which will be taken in the five areas of leadership, skills and capabilities, infrastructure and data, applications, and engagement.

## Working in Partnership with the Sector

Transport is a complex system which has many points where people and technologies intersect. Change to complex systems presented by the adoption of AI creates risk and requires responsible adoption. It is only by engaging proactively, collaboratively and continuously with all parts of the transport sector that we will realise the benefit of this change.

This plan is founded on partnership between government, academia, and industry and recognises the role of DfT as a convenor. Identifying challenges and opportunities that cut across multiple parts of the transport sector, and committing to supporting the linking up of those issues, to ensure a consistent approach to regulation and support. However, DfT cannot do this alone, and this plan challenges the sector to come together, to discuss and understand the risks encountered in use of AI and consider the best ways in which to manage those risks, whilst ensuring a safe, secure, efficient and environmentally responsible transport system.

During this early period in the growth of new and more capable AI models, DfT will:

- work with stakeholders across the transport sector to explore the opportunities for AI to improve transport,

- build new links to facilitate R&D and implementation,

- work with local and combined authorities to ensure people and place are at the heart of AI projects and policies,

- and work with partners to understand what other ingredients the sector will need to have a successful AI journey in transport.

## Innovative DfT AI events: the Data Science in Transport Conference & AI Hackathon in Transport

In September 2024, DfT delivered the finals of the **AI Hackathon in Transport**, in collaboration with Google Cloud and PA Consulting, at DfT's Data Science in Transport Conference.

The top three teams, out of an original 20 teams, were decided upon based on their innovative use of AI to tackle real-world transport challenges. The following ideas are now eligible for seed grants to be developed further, ideally into operational readiness:

- Use AI to generate a rich dataset on bus stop accessibility and present them in an easily navigable Accessible Stops Dashboard so users can plan their journeys confidently.

- Combine road accident and Google maps satellite image data with AI-enabled analysis to present easily digestible information on the safety of roads to decision makers.

- Use a range of road data, machine learning models, and optimised road routing technology to save overall travel time and emissions across the road network.

The **Data Science in Transport Conference** saw 240 professionals across industry, academia and government come together to learn, share, and connect on AI-enabled transport. 36 presentations across two rooms covered a broad range of topics, from the most cutting-edge technical AI solutions to innovative research on public perceptions. These events are crucial to strengthening ties between industry, academia and government to unlock opportunities of AI in transport.
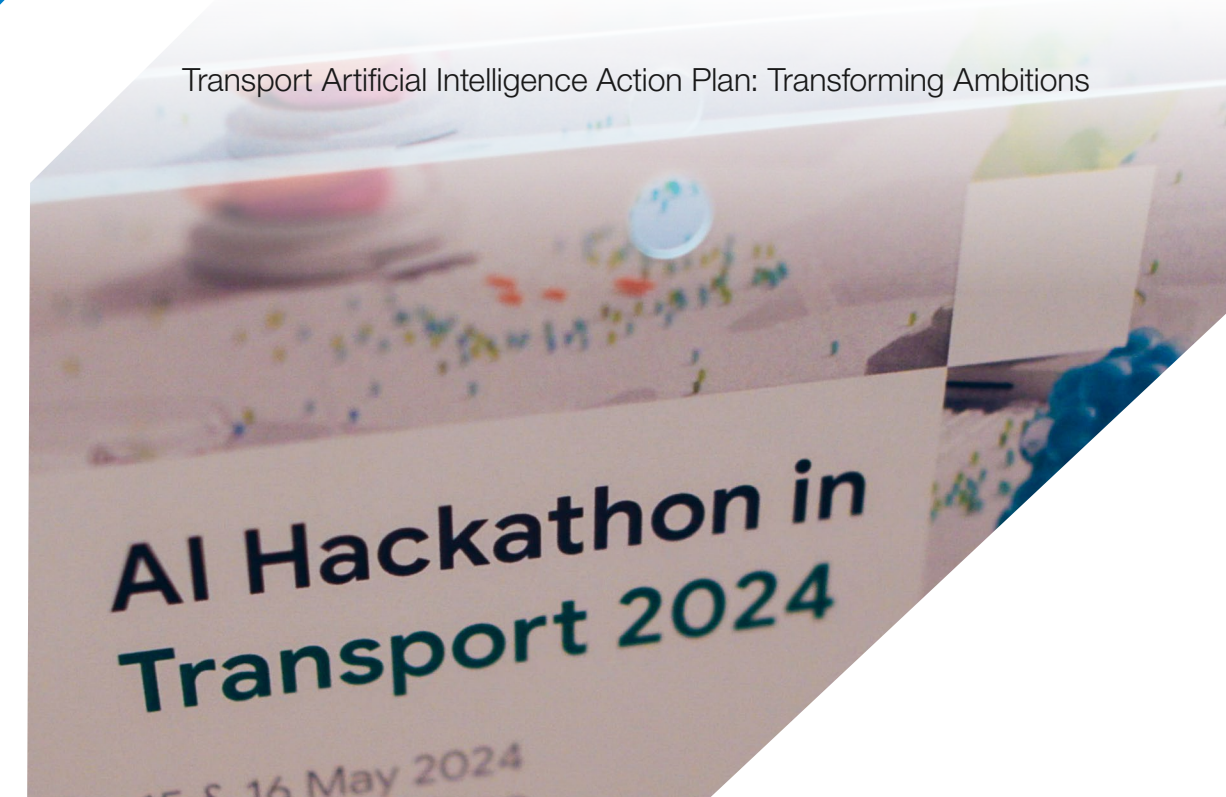
# Unlocking Value: Delivery of DfT Priorities

High profile applications of AI in the transport sector include the development of automated vehicles, vessels and aircraft.

Road vehicles have had significant private investment in automation, driven by the huge markets that they represent, with road transport making up the lion's share of both journeys and freight miles.[1] In recent years, there has been large investments of private capital into other sectors, including, unmanned drones, personal air mobility, Maritime Autonomous Surface Ships (MASS) and Autonomous Underwater Vehicles (AUVs).

However, some of the most impactful implementation of AI reach far beyond autonomy including smart traffic management to create quicker journeys for the user and better optimise the network, machine vision to enable more efficient maintenance targeted where it is needed most, and in major project planning

and design to identify potential delays, bottlenecks and decrease overall costs.

Transport is crucial for delivering on the Government's Missions, particularly kickstarting economic growth and attracting investment. The UK self-driving vehicle industry is expected to be worth £42bn and create 38,000 more skilled jobs by 2035. The transport sector is the highest consuming energy sector and its decarbonisation will be vitally important to ensuring that Britain becomes a clean energy superpower[2]. Moreover, the AI sector already employs more than 50,000 people in the UK and contributes more than £3.7 billion to our economy every year. By 2035, our AI market is forecast to grow to over $1 trillion[3].

To deliver on the Government's Missions DfT has a set of priorities which AI will accelerate in delivering:

| DfT Priority | How AI Can Contribute |
|---|---|
| **Improving performance on the railways and driving forward rail reform** | - Automated inspection of infrastructure<br>- Predictive maintenance<br>- Smarter timetabling<br>- Better responses to disruption |
| **Improving bus services and growing usage across the country** | - Dynamic routing<br>- Demand-responsive transport<br>- Smart ticketing<br>- Efficient and responsive bus timetabling<br>- Better planning of new routes<br>- Optimised real-time traffic management |
| **Transforming infrastructure to work for the whole country, promoting social mobility and tackling regional inequality** | - Digital platforms for mobility as a service<br>- Supporting smart cities and placemaking<br>- Better manage delivery of transport projects<br>- Removing barriers to disabled passengers travel experience |
| **Delivering greener transport** | - Improving fuel and transport system efficiency<br>- Promoting modal shift<br>- Enabling carbon accounting |
| **Better integrating transport networks** | - Facilitating personalised travel assistance<br>- Interoperability and integrated transport control<br>- Multimodal journey planning<br>- Seamless response to travel disruption |

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1    2022 Transport Statistics - 88% of passenger kilometres and 77% of domestic freight travelled by road.

2    Energy consumption in the UK 2023 - GOV.UK (www.gov.uk)

3    Vote of confidence in UK economy as British AI company Wayve secures over $1 billion to develop AI for self-driving vehicles - GOV.UK (www.gov.uk)

## AI within DfT

The Department for Transport (DfT) has launched an internal AI programme to effectively adopt and exploit the potential of artificial intelligence. This programme is structured to ensure safe and effective adoption, balancing technical innovation with effective upskilling and effective governance and assurance. It will provide confidence that AI is being applied in a way that is consistent with our values, principles and obligations, and that we respect the rights and interests of our staff and the public, by identifying where AI can be best applied and consulting on how to ensure that the most benefit is realised.

A pipeline of pilot projects is being developed alongside key social research and clear governance structures. Early tools which have been piloted as part of this programme have included:

**Computer vision**

The use of computer vision has given us a way to deliver efficiencies to areas which require the analysis of large sets of images. Deep learning algorithms have been used to recognise characteristics of vehicles in images captured at the roadside. This has allowed previously labour-intensive aspects of a traffic survey to measure compliance with vehicle excise duty to be automated, saving hundreds of hours of work.

A similar approach has been implemented to highlight potentially fraudulent applications for grants that the department administers. The magnitude of efficiencies which can be delivered here is huge, for a data set with 130,000 images, 85 million comparisons would need to be made to identify any duplication. The heavy lifting can be carried out by an algorithm, in comparison to the thousands of human resource hours it would otherwise take.

**Natural Language Processing (NLP)**

NLP has the potential to deliver great efficiencies to the department both in delivering greater speed and accuracy in the analysis of large amounts of text and in supporting more efficient responses to requests from the public. Large language models are being explored as a way to help respond more efficiently to departmental correspondence, and to analyse public consultation responses more rapidly and accurately.

# Responsible AI in Transport: Helping People and Strengthening Places

All technological development brings change. Driving change well means proactive engagement with the public, mapping the change to spot potential unwanted consequences and, of particular relevance in transport, understanding the impact of change on places.

# Equitable and Responsible

Typically, technology provides a mechanism for us to do tasks faster, more easily or more cheaply. People who can take advantage of the technology in question then reap the benefits. But what about those who are not so able to be involved? One of the roles for government in managing technology change is to make sure benefits are available as widely as possible. DfT will strive to ensure that equality and removing barriers to access, remain in focus as the sector implements AI in the transport system.

There is a role for government in ensuring that technologies are designed and employed responsibly. This is particularly important in the digital space, where technologies can be rapidly made available, accessed freely and often able to scale before regulation can catch up. It is even more evident with AI where complex, expensively developed models have been made available for anyone to use.

Much of this is addressed at a government-wide level in the UK. Academia also contributes through research delivered through consortium such as the £31 million UK Research and Innovation (UKRI) funded Responsible AI UK and the £33 million Trustworthy Autonomous Systems Hub (TAS Hub).

In transport, as well as working to ensure that digital transport technologies are accessible to all and do not lead to disenfranchisement of sections of the population who have barriers to access. DfT will collaborate with those working with AI to better understand how bias in training data leads to bias in model behaviour. DfT will follow wider government guidance on safety and security and play a full role in cross-government efforts to identify, manage and mitigate risks associated with the AI transition, including around the irresponsible use of emerging tools.

## Automated Vehicles Act

The Automated Vehicles Act puts safety at the heart of the roll-out of self-driving vehicle technology and positions the UK as world-leaders of this exciting £42 billion industry, which could create up to 38,000 jobs. Self-driving vehicles could help reduce deaths and injuries from drink driving, speeding and driver tiredness, with 88% of road collisions having human error as a contributory factor.

It delivers one of the most comprehensive legal frameworks of its kind anywhere in the world for self-driving vehicles, with safety at its core, and secures the UK's position as a global leader in this high tech, and high growth industry.

As a testament to the UK's AI and self-driving ecosystem, in May 2024 UK AI company Wayve secured over $1 billion to develop the next generation of AI-powered self-driving vehicles. This marks the biggest investment in a UK AI company in history and cements the UK's position as a world leader in AI and self-driving technology.

The capability of this technology is advancing rapidly, and the Centre for Connected and Autonomous Vehicles are looking at how we can best support the next phase of pilots in advance of the new regulatory framework coming into force.

Ahead of full implementation in 2027, we are working closely with industry to explore options for enabling advanced trialling and early commercial pilots to support an iterative development of our regulatory framework, recognising that safety is paramount. Such trials would improve public understanding, allow industry to test commercial models and strengthen safety cases, and boost government readiness for full implementation.

# People

## Why public attitudes matter

No technology has a function without people. Given AI's far reaching potential impact and esoteric nature, it is essential that we bring along both the people who run the system and the people who use it.

It is imperative to recognise that AI will not replace human judgement, especially in understanding the contextual and human implications of policy development, and is deployed in such a way that it forms an effective part of our systems alongside our workforce. Therefore, we will maintain a human-centred approach, where AI serves to assist and augment human capabilities, with human understanding and decision-making remaining at the core of our service delivery. Guidance on using AI safely and securely in the public sector is set out in the AI Playbook for the UK Government which includes in the ten common

principles the need for meaningful human control at the right stage.

DfT is also committed to ensuring that its policies and practices comply with the Data Protection Act 2018 and the Equality Act 2010, which protect the rights and freedoms of individuals in relation to their personal data, prevent discrimination and advance equality of opportunity in the provision of public services.

Technological development in the AI space is happening at a phenomenal rate. AI has the potential to transform the transport sector, delivering significant improvements to the experiences of users of the transport system by delivering faster, more reliable, greener, and cheaper services. But to achieve that potential, it is vital that the public are taken with us, and that DfT and the wider transport sector build their trust.

# What DfT knows about public attitudes

DfT has a good understanding of the public attitudes to self-driving vehicles, and published findings from The Great Self-Driving Exploration. The sector's understanding of public attitudes to other aspects of AI is less well developed. DfT welcomes the research that has been undertaken to date to track and explore public attitudes to AI. It is essential that DfT continues to use research to develop our understanding of public attitudes to the application of AI in the transport sector and engage regularly with the community, particularly disabled people, to understand their needs and gather feedback on AI-driven transport solutions.

Existing studies show us that the public's awareness of the term AI is increasing, but more in-depth understanding is low, with many people expressing a lack of confidence about potentially using or relying upon it. For some people, their reference point

are the chatbots they experience when dealing with online customer services. It can be seen from published research that attitudes about the use of AI is highly dependent on how salient a use might be to specific groups within society. For example, research undertaken by the Responsible Technology Adoption Unit shows that people's comfort with the use of AI is heavily dependent on context.

Deliberative research undertaken by the department highlights that people recognise that AI has the potential to be used beneficially. Speed and efficiency are often mentioned by the public as some of the benefits that AI can help to deliver. But they also highlight many concerns, including job losses, society becoming over-reliant on it, and lack of empathy in outputs produced by AI. This highlights the importance of skills programmes and further public engagement.

# Place

Place and community are at the heart of any transport system. They define the needs and priorities of the infrastructure that serves them. AI holds immense promise in enhancing these connections, ensuring that people and places remain seamlessly integrated. By leveraging AI, we can provide tailored transport solutions that respect and respond to the unique characteristics of different communities.

AI technologies can analyse vast amounts of data related to travel patterns, demographic specifics, and community needs. This allows for the real-time optimisation of transport routes, schedules, and services, making sure that no area is underserved. Furthermore, AI can enhance the reliability and efficiency of public transport, thereby fostering stronger connections between communities. The predictive capabilities of AI mean that disruptions can be minimised and managed proactively, ensuring smoother and more reliable journeys for all. Through these advancements, AI doesn't merely serve the present needs but anticipates future ones, facilitating a dynamic and resilient transport network.

Recent advances in AI have transformed our ability to process huge amounts of data and map the physical world, digitally. This opens up an array of possibilities for transport that can make people's experience of the transport system easier, safer, more accessible and, most importantly, tailored to their needs. Behind the scenes, AI and other digital technologies can give operators much more information about what is taking place, more precise control and a wider array of responses to unexpected events. This adds up to making a transport system which is more efficient, more reliable and more productive: an integrated transport system.

## AI for Better Bus Services

AI can help public transport authorities and operators to deliver more reliable, frequent, and quicker bus journeys. By analysing traveller behaviour, service quality, and network efficiency, AI can suggest and implement interventions that can improve the passenger experience and traffic management.

**TfGM Bee Network**

Transport for Greater Manchester (TfGM) has partnered with CitySwift, a platform that provides insights, recommendations, and predictions for public transport operators and authorities. CitySwift helps TfGM to optimise the performance of its franchised Bee bus network by adjusting timetables, routes, and identifying pain points.

**Tees Valley Digital Twin**

Tees Valley Combined Authority has created a traffic digital twin, a virtual representation of their transport network that can simulate, monitor, and optimise its performance. The digital twin uses simulation and data analytics to predict future network conditions and implement traffic management actions. The digital twin identifies and prevents delays at the level of the entire corridor and predicts up to 60 minutes into the future allowing identification of buses that are likely to fall behind schedule and helping them to get back on track before a delay even occurs.

# The Vision for AI in Transport

" Responsible AI embedded in a resilient transport system delivering cheaper, cleaner, and safer journeys for all. "

Transport is an ideal place to act as a test bed for developing AI and automation. Transport can be used to drive technological change, is highly tangible, conceptually accessible for innovators, and can offer innovators large value streams to dip into and disrupt. As a department which has a long heritage of supporting technology development, DfT wants to support a sector that is adventurous and willing to learn through experimentation and embrace the spirit of innovation.

## Objectives

To achieve this vision, this plan has four objectives which DfT in collaboration with the transport and technology sector will strive to achieve:

**1. Adopt AI responsibly to deliver better transport for all**

To *set the foundations*, DfT will work collaboratively with transport regulators, local authorities, ALBs, executive agencies and others across government to identify AI opportunities and risks and communicate them to both the public and innovators/industry to give a clear sense of direction and ambition for the sector. Secondly, DfT will explore public sector procurement levers to drive implementation and create markets, specifically analysing the procurement of AI solutions, to see what barriers exist.

*Longer term*, DfT will continue to work with industry to identify and remove barriers to beneficial implementation of AI in transport using all of the levers DfT has at its disposal including policy, regulation and legislative change and

by working closely with regulators, our agencies, ALBs and partners in local authorities. DfT will work with initiatives such as Responsible AI UK, Ada Lovelace Institute, Open Data Institute and The Alan Turing Institute to collaboratively develop comprehensive AI risk assessment methodologies, building on work led centrally in DSIT and other government departments. These risk assessments will flex and grow with AI as it develops, to ensure that benefits are realised whilst risks are proportionately mitigated.

Finally, DfT and the sector will continue to engage with the public and transport colleagues to ensure proactive listening and discussions with those who will be using AI. It is vital that people are taken along the AI journey with us, including those who are disabled or who have barriers to access. If this transition is not supported to ensure equitable, socially beneficial outcomes then the UK will have missed out on the greatest opportunity to improve the impact of the transport system in generations.

# Network Rail: Automated Inspection of Vegetation Encroachment (AIVE)

This solution combines several forms of data from trackside and on-train monitors to identify and manage high risk areas for vegetation encroaching on track. Using machine learning and artificial intelligence, AIVE converts vast amounts of data into risk assessments projected on a map, producing ratings for individual sections of track. These are used to plan proactive vegetation management.



**Figure 1 On the left, a top-down image of a railway line with encroaching vegetation highlighted in orange and red. On the right, a front on image of a railway line with encroaching vegetation highlighted in red and purple.**

## Features

- On-board/aerial video, lidar (3D laser) and hyperspectral (electromagnetic) images to identify invasive plant species, hazardous trees, and other encroaching vegetation.
- Notifies colleagues in the vegetation management team when urgent action is required.
- Effectively more frequent 'inspections' due to the convenience of remote inspection monitoring.

## Benefits

Benefits include reduced risk of incident, meaning a safer railway for colleagues and passengers; increased safety for our workforce as fewer physical visits to the track are required; and more cost and time effective planning to ensure compliance with our legal obligations.

## 2. Maximise the economic benefit from AI applications in transport, whilst reducing transport's environmental impacts

This objective highlights the perspective of green and responsible growth stemming from the implementation of AI in transport. To *set the foundations*, DfT will continue funding AI R&D across the transport sector and build links between programmes looking at AI, data, and digital twins. DfT will work with the transport sector to systematically identify beneficial use cases of AI in transport and help innovators qualify the benefits to help drive inward investment. Transport technology is readily exportable as it solves challenges faced by people the world over. This builds on the success of rapidly growing organisations such as Oxa and Wayve by doing more to give UK innovators a helping hand.

*Longer term*, the vision is for systematic transport AI R&D support, from PhD to PLC; from academia all the way through to market maturity, to drive the generation of smart new solutions on our transport system, using all of government's organs, mechanisms, and partnerships. Existing partners such as the Connected Places Catapult, Digital Catapult, High Value Manufacturing Catapult, Intelligent Transport Systems UK and

Innovate UK will coordinate through the Transport Research and Innovation Board (TRIB) to maximise impact. We expect a range of economy-wide provisions to support AI to come into being and DfT will play its role in ensuring that transport is represented strongly and engages fully with these interventions as they come online.

## 3. Secure the UK position at the forefront of transport-related AI applications

The UK is one of the leading nations in the world of AI and has long been a recognised hub of transport innovation. To maintain these positions, we need to be opening up transport data by default[4] and driving international collaboration, to bring the benefits of innovative AI solutions to people on foreign soils, not just here in the UK. To *set the foundations*, DfT will work in partnership with the sector to bolster our transport AI R&D ecosystem, working hard to identify where there is beneficial high-quality data to be unlocked. DfT will use its convening power and existing international engagement, such as through the G7, International Maritime Organisation, International Civil Aviation Organisation, and International Transport Forum, to identify themes for collaboration - shared interests and priorities.

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4    As highlighted in our Transport Data Strategy and in line with The Technology Code of Practice - GOV.UK

We can also look for opportunities to access high quality data through international collaboration, to allow new AI solutions to flourish.

*Longer term*, we hope to see the widespread adoption of good practices with respect to data, including sharing by default and establishing data sharing frameworks, to ensure that the UK continues to be the place that innovators choose to work. The UK has a strong reputation for safety and good regulation. DfT can build on this strength and work to better understand safety and good regulation in a transport AI specific context to enable further investment and allow the UK to continue to lead international efforts in this space.

### 4. Utilise AI to enhance the quality, efficiency, and effectiveness of DfT

The fourth and final objective of the action plan is to utilise AI to enhance the quality, efficiency, and effectiveness of DfT and to put this technology to work in delivery of cross-government missions, like kickstarting economic growth and breaking down barriers to opportunity. Transport has some unique advantages for the early implementation of AI technology: it has a long history of engineering innovation, it is very tangible and understandable and hence accessible to innovators, and is already a massive generator of data. DfT should take advantage of this opportunity and play

its role in supporting wider ambition around AI in the UK.

To *set the foundations*, DfT will implement good governance for AI in transport both looking inward and outwards. DfT will put in place proportionate governance mechanisms appropriate for each aspect, including R&D; industry adoption; standards and regulations. DfT will support both our staff and our colleagues across the sector with tailored capability building and skills programmes. Inside the department, we will also look at opportunities for deploying AI to improve what we do and deliver more for the public.

*Longer term*, we will aim for internal data to be generated, collected, stored, and shared in an AI-ready manner by default. DfT will create smart data tools to support decision making as standard and pursue a geospatial foundation model to link planning, decarbonisation, and coordinate across infrastructure sectors. Lastly, DfT will develop robust AI evaluation techniques which build evidence to support further procurement and implementation of AI.

# AI Action Areas

Five action areas have been identified which are key to enabling the responsible use of AI in transport. These areas cut across the Action Plan's objectives and taken together will accelerate transport's AI journey.

**Leadership:** Providing policy, guidance, governance, and oversight.

**Skills and Capabilities:** Ensuring both the transport sector and the DfT family of organisations are equipped to use, regulate, guide, and assure AI systems effectively.

**Infrastructure and Data:** Enabling access and providing guidance and stewardship.

**Applications:** Identifying, supporting, and steering to maximise public value.

**Engagement:** Collaborating with other government bodies; sharing learnings domestically and internationally; working with operators, regulators and innovators; keeping open dialogue with the public.

## Leadership

The transport sector can move quickly to embrace AI in many areas and drive benefit for users of the transport system. Strong leadership is fundamental and underpins all the objectives set. DfT and the wider transport sector need to strike a balance between supporting innovators to move rapidly and ensuring the AI-transition is equitable and does not leave groups of people behind, like those who experience barriers to accessing the transport system.

To help plot progress, DfT will challenge and work with the operators and private sector stakeholders to articulate what they see as priorities and how DfT can support [1.1]. DfT expects this work to take the form of defined leadership statements from transport modes or sub-sectors (e.g. freight). These plans will be published to help guide decision making in DfT, but also build consensus around priorities in the wider industry.

To ensure that the benefits of AI are available to all, DfT will work with the Disabled Persons Transport Advisory Committee to understand what the AI transition means for disabled people and those with barriers to access.

| Action Number | Action |
|---|---|
| 1.1 | Work with the private sector to develop leadership statements for AI implementation in discrete parts of the transport system sector. |

*Table 1  Action 1.1*

The evolution of AI has been extremely rapid in the last few years. In order that the UK keep pace, DfT will work with both academia and industry to investigate how identified barriers to progress may be overcome, by making use of all the levers at our disposal and make the UK a great place to innovate in transport AI [1.2]. Additionally, attention will be given to local transport, with DfT collaborating with local authorities to examine their procurement processes for AI and digital solutions and identifying the challenges they face in achieving successful implementation [1.2].

DfT will continue the progress made by the Centre for Connected and Autonomous Vehicles, DfT's International Vehicle Standards team and look to extend this leadership in the air, and at sea, continuing to play a leading role in cross-modal international safety regulation in automation [1.3].

Transport regulations and our regulators here in the UK are some of the best in the world at keeping transport safe. DfT will continue to enable our regulators and work with them to ensure they have the right capabilities and balance AI innovation with safety [1.4]. Finally, DfT has identified an opportunity to work with local and combined authorities and provide leadership on the use of AI for traffic and road network management [1.5].

| Action Number | Action |
|---|---|
| 1.2 | Investigate the barriers to implementing AI solutions in local transport systems, as well as the barriers to AI adoption in transport areas that DfT is responsible for. Agree plans to overcome these barriers and accelerate implementation of beneficial AI in local transport systems. |
| 1.3 | Delivering measures that would enable advanced trials and early commercial pilots to take place in 2026 ahead of the full regime being implemented in 2027 (subject to safety assessments), and sharing lessons to support development of standards and regulatory approaches for adoption and deployment of automated craft in the sky, on our waterways and at sea. |

| Action Number | Action |
|---|---|
| 1.4 | Work with our regulators to ensure they have the right capabilities, balance the need of safety and innovation and are looking to accelerate AI developments. |
| 1.5 | Work with combined and local authorities to drive transformational change in the use of AI for traffic and road network management. |

*Table 2 Actions 1.2-1.5*

## Skills and Capabilities

This section of the action plan is about having the right tools, skills and capability in place. Where DfT is not creating AI tools itself, we will need to make sure that we are intelligently procuring from others [2.1].

| Action Number | Action |
|---|---|
| 2.1 | Review existing AI Commercial Frameworks. Develop commercial guidance to contract for AI and ensure standard terms and conditions for digital contracts contain the right commercial provisions. |

*Table 3  Action 2.1*

The Transport AI Board will look at capability in DfT and our partner organisations who run the transport system. DfT will work with organisations such as The Alan Turing Institute and Responsible AI UK to help arrange apprenticeships and secondments to bring in new thinking and skills and help develop future leaders in transport [2.2]. DfT will develop internal training which will be broadly available to DfT staff members including senior leaders to help the whole department and our family of organisations have a better instant grasp of what AI can offer and how to go about supporting its development [2.3]. DfT will work closely with transport ALBs and the Transport Research and Innovation Board to share skills, successes and learnings and ensure our continual collective growth [2.4].

| Action Number | Action |
|---|---|
| 2.2 | Work with AI leaders to deliver AI apprenticeships and host secondments in DfT and transport agencies. |

| Action Number | Action |
|---|---|
| 2.3 | Deliver a training needs analysis and internal AI training for DfT staff, including senior leaders. |
| 2.4 | Develop a Transport sector AI Community of Practice to bring together colleagues from different organisations to share learning, coordinate activities and accelerate adoption. |

*Table 4  Actions 2.2-2.4*

Finally, DfT recognises that the transport system will continue to undergo much change. DfT will ensure that the transition is supported and colleagues from all corners of the transport system have the opportunity to build their skills, as well as helping parts of the system which have struggled to attract new talent to modernise and upskill the roles they have, by deploying AI [2.5].

| Action Number | Action |
|---|---|
| 2.5 | Engage with colleagues across the wider transport sector to share AI skills requirements and priorities, to inform future skills programmes and initiatives. |

*Table 5  Action 2.5*

# Infrastructure and Data

Data and compute are the raw materials of AI. The Transport Data Strategy 2023 delves into the benefits of data and sets out targeted interventions to address important barriers and support a healthy transport data ecosystem. The Transport Data Action plan 2025 will recognise the significant advance in AI technology in the last few years and build on all the early enabling work to make sure we are setting the direction and enabling conditions for the productive use of data in the DfT and the wider transport sector [3.1]. On top of this, DfT have identified a key opportunity through linking data and challenge owners with AI innovators both passively through application programming interfaces (APIs) and actively through conferences and hack events to develop new AI solutions in transport [3.2].

| Action Number | Action |
|---|---|
| 3.1 | Develop the Transport Data Action plan 2025 which will set the conditions for the productive use of transport data for AI. |
| 3.2 | Create or support mechanisms to actively (e.g. hackathon events) or passively (e.g. APIs) link data and challenge owners with AI innovators to demonstrate the benefits of new AI solutions in transport. |

*Table 6  Actions 3.1-3.2*

# Applications

DfT will collaborate with key partners to showcase opportunities and innovative uses of AI in transport [4.1]. DfT will conduct deep dives into AI opportunities to boost transport security and resilience [4.2] and lessen environmental impact and make the system more able to adapt to the impacts of climate change [4.3]. We will also analyse and create a roadmap for sensing and future emerging cyber-physical technologies such as robotics, which allow AI to interact with the physical world of transport [4.4]. Together these actions will signal specific areas of focus and interest and reassure innovators that this is where they can expect the most help from DfT.

| Action Number | Action |
|---|---|
| 4.1 | Work with partners to showcase innovative uses of AI in transport, run hackathons, and develop a use case heat map to show where opportunities lie within the transport sector. |
| 4.2 | Publish a DfT assessment on opportunities for AI to improve transport security and transport system resilience. |
| 4.3 | Explore how AI can enable a reduction in transport's environmental impact and help the transport system adapt to a changing climate. |
| 4.4 | Develop a roadmap for sensing and cyber-physical interfaces (e.g. robotics) that allow AI to interact with the physical world of transport. |

*Table 7  Actions 4.1-4.4*

DfT will look at the applications of AI within our own business. Like many other departments, there is recognition that many of the processes with which DfT governs and delivers our work, are appropriate for augmentation with AI tools – there are tasks which although relatively complex are also repetitive. DfT will work collaboratively with other government departments to identify these opportunities and develop AI systems to allow delivery to be sped up and new insights to be unlocked [4.5]. DfT's most complex programmes are typically multi-billion-pound infrastructure projects. We expect to find opportunities for AI to make planning and management more efficient within these programmes, offering significant savings, better delivery risk management and improved resilience. We will work to identify and exploit these opportunities [4.6].

| Action Number | Action |
|---|---|
| 4.5 | Develop AI models that drive efficiencies within DfT's operations and unlock innovative analytical insights. |
| 4.6 | Require major transport infrastructure projects to review their use of AI, analyse barriers to its adoption, investigate potential cost and carbon savings (both capital and operational) associated with its implementation and publish details of beneficial use cases. |

*Table 8  Actions 4.5-4.6*

Whilst there are huge potential benefits from the wide range of applications that AI is capable of, there are also current and future risks to the transport network that we must work to mitigate. We will therefore undertake a review to understand how AI may impact all of the risks that DfT own or have a significant interest in, including the National Risk Register [4.7]. The planning process  for transport projects could work hand in glove with those overseeing housing and or energy, and lead to significant design and build efficiencies, as well as carbon savings. This could boost the adoption of digital twins across the board [4.8].

| Action Number | Action |
|---|---|
| 4.7 | Undertake an analysis of current AI transport system risks and mitigations. |
| 4.8 | Establish how the use of Geospatial Foundation Models could bring together planning, operation and decarbonisation of the transport system. |

*Table 9  Action 4.7-4.8*

# Engagement

The AI transition will be far reaching and impact on almost every corner of the transport system. This means that broad and open engagement is important to coordinate the change, facilitate sharing of the latest thinking and share best practice.

We will engage with innovators in the private sector and academia to ensure that we make best use of their insight and they ours. For SMEs, hailed as the engine houses of national economies, we will support them in their journeys and through tricky stages of proof-of-concept and demonstration [5.1].

| Action Number | Action |
|---|---|
| 5.1 | Work through DfT and UKRI partnerships and innovation investments, such as DfT's Transport Research Innovation Grants, to engage with and support SMEs in bringing forward transport AI solutions. |

*Table 10  Action 5.1*

# Transport Research and Innovation Grants

Since 2014, the DfT has awarded a total of £15.6m Transport Research and Innovation Grants (TRIG) to 434 projects, helping to bring early-stage innovation to life.

Previous winners have included a range of cutting-edge AI initiatives including:

AssetScan, developed by CC Informatics, can automatically identify defects in brickwork within transport infrastructure. Dŵr Cymru Welsh Water have committed to rolling out AssetScan to measure degradation of their masonry structures and Scottish Water have engaged AssetScan for a number of their dam assets. The mapping of structural deterioration allows for more precise maintenance of large assets which is both cheaper and safer. AssetScan have gone on to receive an award of £100,000 as a finalist for the Manchester Prize.

VivaCity Labs developed an AI-based system to collect and classify movement data, saving time by automatically identifying pedestrians, vehicles, and other features. Better data collection infrastructure can provide forewarning of road conditions, enable smarter traffic lights, along with allowing for real-time data-driven decisions. VivaCity labs employed 6 people pre-TRIG and now employ over 100 people. Their cameras are being used across the UK to make real-time data-driven decisions and they are working with a number of local authorities as well as Transport for London, Greater Manchester and Wales.

Other pioneering programmes include First of a Kind, which funds projects with mature technology novel to rail. This has made nearly £59m in funding available since 2017 and has supported over 170 innovative products to test on the railway, with many now in service.

First of a Kind has supported innovative AI projects like Signapse Ltd's mobile app that uses AI to turn timetable and station information into British Sign Language for deaf customers. As well as Distributed Analytics Solutions Ltd's machine learning-based simulation of network delays to improve planning and response.

As a government department, DfT's convening power can be an effective tool to bring people together and ensure that all voices are heard. We will engage broadly across our networks to help ensure that the AI transition in transport is a just and equitable transition and to prevent groups of people being left behind. This includes engaging with people who plan, run and use the transport system; helping them understand what the future may hold and ensuring that their views are taken into account as AI takes a greater role in everyday life. It also includes key partner organisations who are considering the application of AI in particular sectors, such as the Rail Safety and Standards Board.

DfT will work with our executive agencies, our ALBs, regulators and members of our Transport Research and Innovation Board [5.2] to understand what AI means for their operations and how they can engage with the innovation ecosystem. Driving the generation of new solutions within their missions' spaces and propelling collateral economic benefits.

DfT will engage regularly with the public as our prime customers and undertake social and behavioural research to understand public sentiment on AI use in transport [5.3]. DfT will ensure the public feel confident in changes they may see and, crucially, understand how and when AI is making their transport experience better.

DfT will continue to develop its understanding of public attitudes, ensuring that it shapes future decisions. In the future, DfT plan to track public attitudes to AI when used in a transport context via our Public Attitudes Transport and Technology Tracker. DfT will use Transport User Personas as a lens through which to test specific applications of AI, and what they might mean for the different segments in society.

| Action Number | Action |
|---|---|
| 5.2 | Work with transport agencies, ALBs and the Transport Research and Innovation Board to produce ambition statements and articulate how they want to employ AI to improve transport and what steps they plan to take. |
| 5.3 | Undertake social and behavioural research and engage with the public around AI in the transport system. |

*Table 14  Actions 5.2-5.3*

# Measuring Success

## Review of the Transport AI Action Plan

Assessing progress against measurable factors or qualifiable conditions is essential to learn, improve and demonstrate success in any situation. Under this Transport AI Action plan, each of the actions in this document will have a clearly defined outcome which will map directly onto key questions which DfT will pose itself a year on from publication.

Good governance will underpin the review of this Action Plan's actions and its wider impacts of AI across the transport system. DfT has already established an internal Transport AI Board to support the development of this document. After publication, the board will continue to meet to hold action owners to account, galvanising the department and driving forward our collective ambition. An important measure of success will be whether we are demonstrably progressing towards the objectives laid out previously.

Alongside this, DfT will continue to ensure an open interface with our partners in the private sector to identify areas of common cause across multiple transport modes and settings. DfT will work with the sector to steer future priorities for AI in transport and support rapid and responsible implementation.