

Innovation, Technology and Research Strategy

Our approach

Introduction

This strategy for innovation, technology and research is a response to a key requirement of the Government's 2015 Road Investment Strategy.

It builds on our successful track record of innovation, from pioneering the use of more efficient and effective pavement materials to developing and building the world's first smart motorways.

Our strategy also supports the Government's 2040 vision for us to be a key economic enabler, supporting breakthrough vehicle technologies and maximising capacity, whilst leaving a positive environmental legacy.

This strategy sets out:



Why innovate?

Innovation will support our strategic objectives and create value for customers and stakeholders. Innovation will also be critical in helping us meet the economic, environmental and efficiency challenges we will face in our changing world over the next 25 years.

The Innovation Designated Fund, which provides £150 million for innovation capital projects between now and 2021, will deliver a step change in how we demonstrate and implement emerging technologies, new materials, and ways of working.

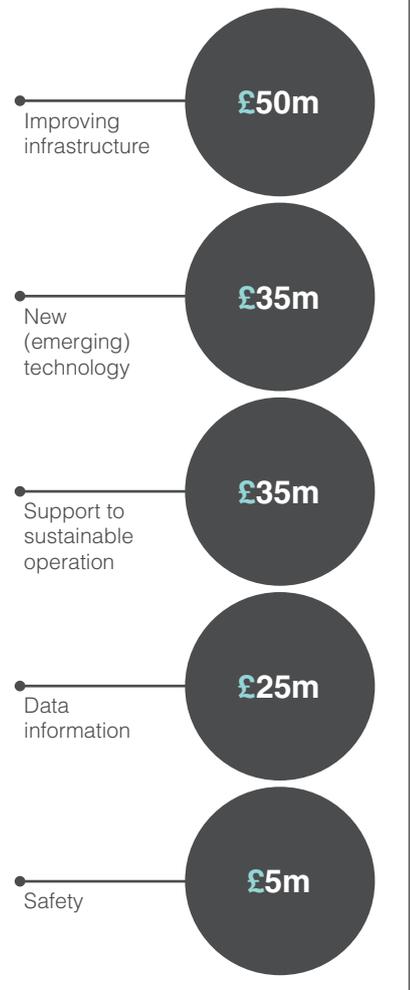


Delivering innovation

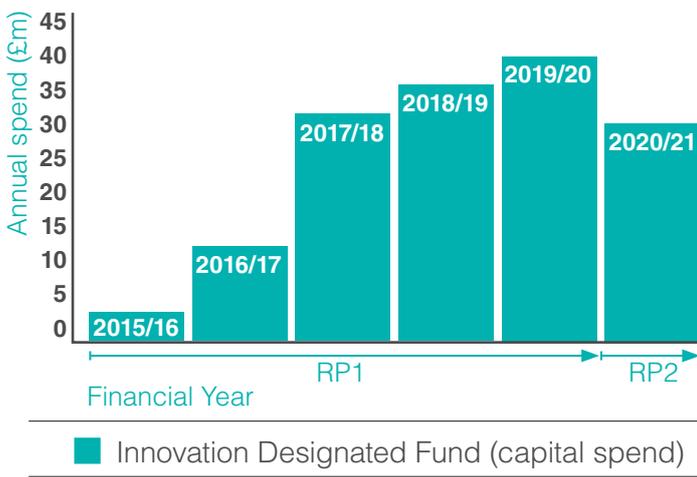
Our Delivery Plan makes a commitment to deliver £150 million of innovation capital projects using ring-fenced funding between now and 2021. Additional funding for innovation will be provided by our research and development programme.

The £150 million Innovation Designated Fund will be used to support key priorities set out in the Road Investment Strategy. These include trials of connected and autonomous vehicle technologies, provision of better information to customers and improved management of our network and infrastructure assets.

The projects we are supporting through the Innovation Designated Fund are spread across all areas of innovation, with high level allocations shown in the figure to the right. We have not fully allocated all funds to specific projects, to allow us to respond flexibly to new ideas and innovations as we progress through the funding period from 2015 to 2021.



Indicative spend profile for innovation between 2015 and 2021 (does not include activities under other Designated Funds)



Initial projects to be funded include:

- The first motorway to motorway traffic management scheme, to improve journeys for our customers.
- Testing tunnel detection systems in the Hindhead tunnel contributing to improved safety in these environments.
- Work with the Department for Transport (DfT) and the freight industry to deliver freight platooning, and trial a 'connected corridor' in the South East.
- A Collaborative Traffic Management programme on the M25.
- Fuel price signs on the M5, which will allow customers to make informed purchasing decisions during their journeys.

A number of specific activities will support the planned and future innovation projects, including:

- Exploring the creation of a Test and Innovation Centre, which would provide a safe (off road) environment to test and develop new highway technology solutions.
- Seeking to use smart motorways to test innovations and prepare them for connected vehicles, for example trialling radar technology to detect stationary vehicles in live lanes.

Other Designated Funds will also support innovation including the:

- Environment Fund.
- Cycling, Safety and Integration Fund.
- Air Quality Fund.
- Growth and Housing Fund.

Additional innovative work will be funded as embedded activity throughout the organisation.

For Highways England, innovation means the application of a **new process or product that benefits our customers and stakeholders**. To maximise those benefits we will work to ensure we have the right processes and culture to support innovation. We want our staff and our external stakeholders to see us as an organisation that can make innovation happen.



Our innovation focus areas

We will structure our innovation activities around the eight key outcomes (focus areas) set out in the Government's Road Investment Strategy.

1. Making the network safer

The safety and welfare of all those who use, work on, or are indirectly impacted by the road network, is our priority and is at the core of everything we do. We aspire to reduce the number of people killed or injured on the network as close as possible to zero by 2040.

	We want to improve the inherent safety and the protective quality of the network for the benefit of all road users.
Safer roads	

	We will actively support the deployment of improved vehicle safety technologies on our network. This includes connected and autonomous vehicles that could be the breakthrough innovation that we need to achieve the 2040 safety ambition. We will seek to trial autonomous vehicles on our network by the end of 2017.
Safer vehicles	

	We will develop intelligence led, innovative programmes to improve road user behaviour. We will also look for innovative ways to make our own people safer when they work on the roads.
Safer people	

2. Improving user satisfaction

We will radically improve the experience of road users to achieve the highest levels of user satisfaction. We will keep abreast of the changing technology landscape and actively seek new opportunities to deliver better information to our customers over new and emerging channels.

In order to understand what an ideal end-to-end journey looks like to our customers, we will look at differing customer groups using in depth customer interviews, statistical surveys and accompanied drives with customers.

Partnering with vehicle and system manufacturers will help us to deliver focused information to customers, supporting our long-term aim of supplying advice and information through in-vehicle systems without the need for roadside infrastructure.

We're collaborating with Rijkswaterstaat, operator of the strategic road network in the Netherlands, to deliver innovative solutions to customers through the **CHARM project** which is defining and delivering a new generation of traffic management systems.

3. Encouraging economic growth

Our network carries a third of the country's overall traffic and two thirds of its freight traffic, and plays a crucial role in supporting UK economic growth. We need to make sure our planning and decision-making capability reflects the role of the network in **unlocking economic potential as part of a wider, integrated transport system.**

Within our approach to traffic appraisal modelling and economics we will explore integration of our development models with city and regional growth models as well as other transport modes and major projects such as HS2. This will provide a more holistic and robust appraisal process for economic growth.

We will also look to apply innovative approaches to the Development Consent Order application process, utilising technology to speed up and better communicate scheme and planning information.

4. Delivering better environmental outcomes

We aspire to create a network that operates in harmony with its human and natural surroundings to deliver improved environmental and social outcomes. The development of Ultra Low Emission Vehicles (ULEVs), which we are actively supporting, will play an important part in meeting this aspiration.

Supporting the provision of infrastructure for alternative fuel systems on our network for cars and freight, will enable the shift towards a low carbon future. Through working with our supply chain we will progress the development of low carbon material and construction techniques.

We will promote innovation and research into measures that mitigate the environmental impact of vehicles on our network and on measures to encourage innovative solutions to improve overall air quality.

Our understanding of noise issues will continue to improve through our use of noise laboratories which accurately simulate traffic noise and the impact of noise barriers. We will develop and trial new low-noise road surfaces.

5. Keeping the network in good condition

Remote asset sensor technology will provide us with better intelligence about asset condition and the impacts of increasing traffic flows and changing climatic conditions.

Combining this information with innovations in data driven asset management will enable us to optimise maintenance work to keep the network resilient and in good condition. Our Integrated Asset Management Systems will continue to develop and support our business needs.

We will improve ways of managing and operating our network through exploiting the **"Internet of Things"**, where vehicles and other technology, such as smart sensors monitoring our physical assets can communicate with each other without human input. This has the potential to bring benefits across many of our innovation focus areas.

This includes using new developments such as analysis of the chemical composition of the road surface to provide information on its condition.



All this work to improve the way we gather and use information about our assets will support our ability to manage the associated risks to safety, serviceability, availability and environmental outcomes. This will strengthen our collaboration with others to deliver a resilient national infrastructure system.

6. Supporting the smooth flow of traffic

We are already supporting platooning and connected vehicle trials on our network to help us plan and prepare for the introduction of new vehicle technologies. We will use these trials to ensure we are providing the necessary infrastructure and technology to support the vehicles of the future. This has the potential to bring dramatic improvements to network capacity and the management of traffic.

There is huge potential to use “**Big data**” (the massive volumes of data we now own and can access) to improve our understanding of customers’ expectations. We can draw valuable insights from monitoring social media, or analysing and understanding travel patterns better. By making smarter use of this data we can ensure we make the right decisions about the services we deliver and how we invest in our network.

The next generation of smart motorways will achieve smoother, more controlled flow. Building on the success of smart motorways, we will develop innovative concepts to apply to our ‘expressways’ such as use of advanced incident detection technology to improve journey performance on some of our busiest A roads.

We are also delivering the first motorway to motorway traffic management system where traffic lights on slip roads operate in conjunction with smart motorways, leading to improved journeys for our customers.

7. Achieving real efficiency

Innovation in our design process will be increasingly focussed on enabling rapid capital delivery and achieving a network with reduced maintenance needs. Our future highway design will be simpler, safer and have less visible roadside technology.

We will continue to capture and share continuous improvements to construction and material technology, with a particular focus on the pavement and improvements to extend the life of the road surface.

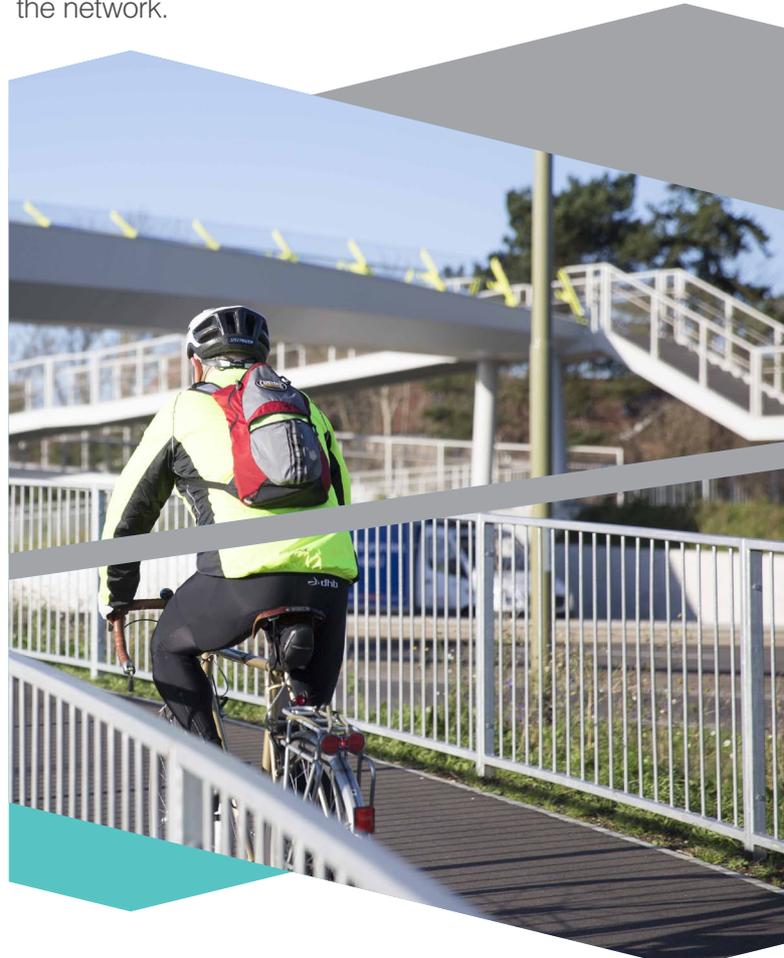
Our speed of capital delivery will increase through the use of lean techniques, modular construction and building information modelling, and the development and definition of a common data environment for highways.

We have talked to our existing supply chain through our Engagement Council, and we know that our suppliers can be better incentivised to deliver to quality, time and budget through new types of contracts, clear instructions, improved partnering and predictable work flow.

8. Helping cyclists, walkers and other vulnerable users of the network

By looking at how innovative technologies, or new road and junction design approaches, can be employed, we will ensure that we are a considerate neighbour and make the minimum impact on the communities our network serves.

Other options such as walking and cycling shall be made available on appropriate routes, and we will make it easier and safer to access and cross the network.



How we manage and accelerate innovation

Partnering and open innovation

We will pursue a strategy of open innovation, increasing our external focus to identify potential partners, opportunities and promising new areas of research and technology. We will identify new internal and external paths to market where our partners can share risk and reward.

Internationally, we will continue our strategic research collaboration with other European road authorities within the umbrella of the Conference of European Directors of Roads (CEDR), investing around 5% of our research budget here. This collaboration has already delivered significantly more cost effective research (leveraging up to eight times the value of research we would have carried out independently). It helps us avoid repetition and duplication, and gives us access to the best international practice and a wider range of suppliers.

Working with the Government, academia, small to medium enterprises, other transport authorities and wider industry will help us to share and stimulate new ideas. Key partners will include the Catapult Centres, InnovateUK, Transport Focus, the Centre for Connected and Autonomous Vehicles (CCAV) and the Office of Low Emission Vehicles (OLEV).

We are developing a collaboration agreement and joint programme of research with the Transport Systems Catapult, one of seven technology and innovation centres established by InnovateUK. This will give us access to innovation and cutting edge research carried out in academia and industry.

Our plans for more open innovation include:

- Annual innovation challenge ‘competitions’, where we bring together a wide range of organisations to identify ideas and develop innovative solutions.
- Using knowledge networks to encourage knowledge transfer and cross-fertilisation.
- Making it easier for someone with a good idea to engage with us. For example we will publicise a single point of contact within Highways England to encourage organisations who are unfamiliar with our structures to send us innovative ideas.

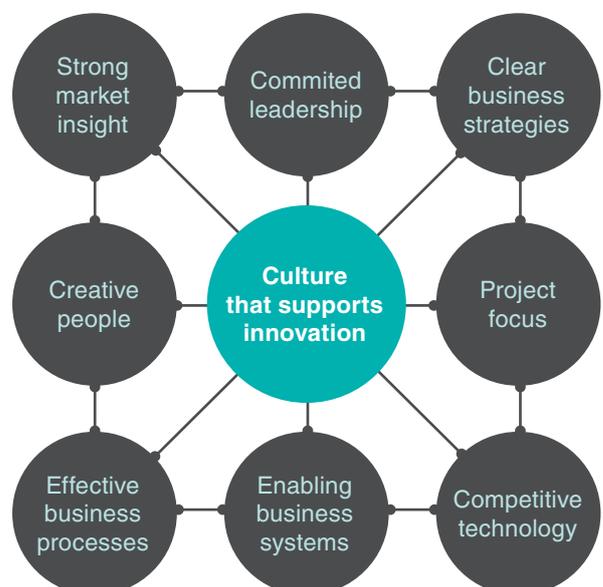
- Being flexible and responsive around procurement and contracting approaches. We will explore how we can place greater emphasis on innovation within our procurements.
- Developing ‘open-source’ solutions and actively sharing insights from innovation with others.
- Encouraging third parties to develop insight on our assets and operations and connect us with innovative ideas as to how our service can be delivered more efficiently and effectively.
- Taking the opportunity for us to take a leadership role by sharing best practice and new ideas, in particular around technology, with our supply chain.

We have consulted with users of our standards and are considering ways to improve their usability and ensure that they are not seen as a barrier to innovation.

Improving our innovation culture and capability

We know that successful innovation is as much about the talent and creativeness of people as technology. We recognise the importance of changing our innovation culture and behaviour, including developing an acceptance that not all innovations will succeed but that we can apply the learning gained from the failure to future projects.

We also understand that to be more innovative, we will need to develop our capability in a number of areas, see figure below.





Risk and reward

The roads sector has typically used innovation to deliver incremental improvements in what it does. Even where a breakthrough innovation is achieved, the pace of renewal of civil based assets on the network can mean that the rate of improvement is relatively slow.

We seek to balance incremental innovation with breakthrough innovations that could offer more transformative improvements. In delivering this strategy we will identify areas of innovation where, as strategic roads operator, we want to become global leaders (as we have done with smart motorways). Elsewhere we may look to follow the lead set by other organisations.

A prime example of break-through innovation is future-proofing the network for connected and autonomous vehicle technologies, which could unlock major safety, traffic flow, environmental and economic benefits.

To support and enable these benefits, we will work in partnership with government and industry to prepare our network for the vehicles of the future, through:

- Investigating operational and behavioural issues and risks.
- Trialling connected and autonomous vehicles on our network.
- Developing relevant infrastructure standards.
- Developing future strategies for operating and managing the network.

We are currently engaging with car manufacturers and undertaking feasibility studies to inform our plans to trial connected and autonomous vehicles on our network, investigating different technologies, infrastructure and data requirements.

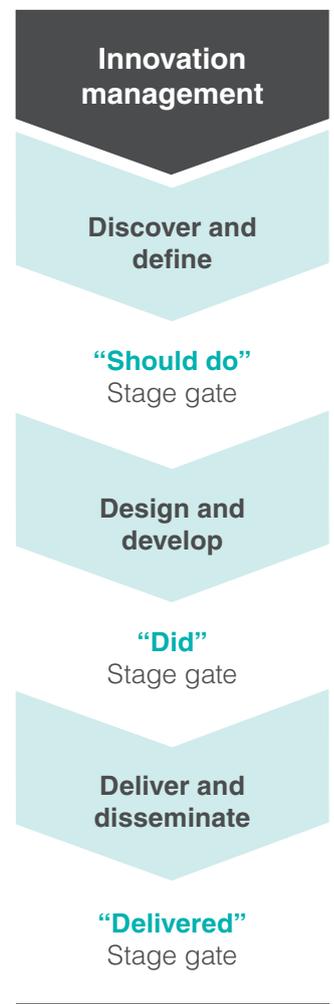
Innovation management

We will capture the benefits that our innovation activity delivers, and record how innovation can contribute to efficiency outcomes for this road period, and in the future.

Robust systems for governance and decision making will be put in place. Adopting a stage gate process around the lifecycle for innovation, as illustrated below, will allow us to monitor and mitigate risks.

This will allow us to identify, prioritise, monitor and evaluate our innovation activities, develop a balanced portfolio, ensure that our investments align to our objectives and continue to deliver value for money.

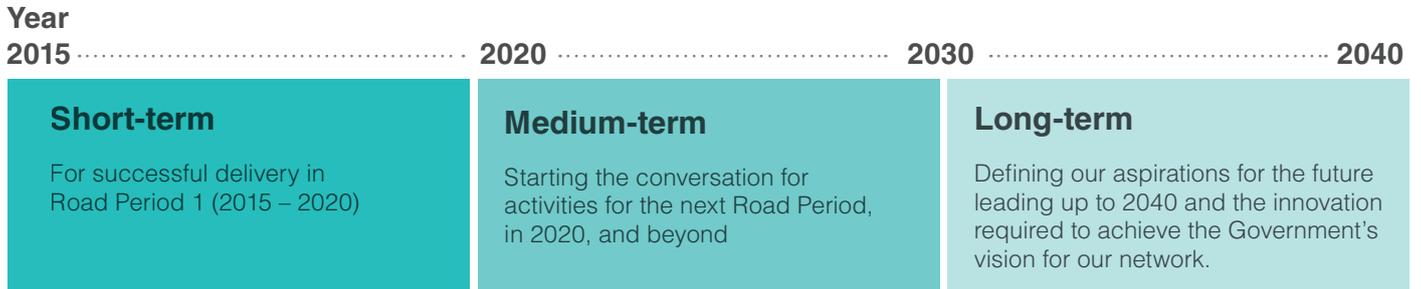
All the innovation that is on-going within Highways England will be shared with stakeholders and our potential supply chain. This greater visibility (similar to the greater transparency we are providing to our supply chain about our capital programme) will allow more effective and efficient decision-making by our partners.



Timescales

While many innovations and technologies will deliver short-term benefits, some will take longer to realise large-scale benefits - for example, air quality

improvements resulting from ultra-low emission vehicles, or safety benefits of autonomous vehicles. We will consider innovation activities across three time periods.



This strategy for innovation will be refreshed at the beginning of the next road period (2020).

Next steps



Implementation Plan

We are developing a more detailed plan, setting out how we will implement our innovation strategy which will be published at the end of April 2016.

The Implementation Plan will include action plans centred around the stages of the innovation lifecycle and underpinned by the development of an innovation culture and capability across the business.

Innovation is about people working together to create value by implementing good ideas and new ways of thinking. Please contact:
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