The Most Powerful Force in Transport

How Esri mapping software is revolutionising the UK's leading transport agencies

esri UK

THE SCIENCE OF WHERE™

Welcome to a new era of mapping in transport

Maps are at the heart of the transport industry. In 1791 the Ordnance Survey was founded to provide paper maps to guide travellers to their destination, maintain roads, and monitor turnpikes. The arrival of accurate maps paved the way for geological surveys, military planning, and property surveying. Then in the twentieth century, paper maps gave way to digital representations, and the possibilities for analytics in the transported industry exploded.

Today the world's leading mapping software company is Esri. The Esri ArcGIS platform lies at the heart of organisations from key public providers such as Transport for London and the Highways Agency, to complex private organisations such as the Crown Estate and Manchester Airport Group.

This report aims to reveal how the UK's best transport organisations deploy Esri ArcGIS.

Mapping and spatial analytics software is versatile. It can be used to define the beat of a police officer, or model customer flow around an airport terminal. It can provide a unified source geospatial information for hundreds or thousands of workers on a construction project, enabling collaboration by engineers, lawyers, drivers, architects, and project managers.

Esri ArcGIS is the most formidable tool in the mapping industry. It is able to fuse hundreds of information layers within a single map. These can be derived either from the vast Esri library of datasets, or from the user. Network Rail used a fleet of helicopters equipped with Lidar, a form of light-based radar, to map its entire rail infrastructure in 3D, accomplished with Esri ArcGIS.

Advanced mapping is taking transport into a new era of precision and performance. This is your guide to the possibilities.

137

Countries covered by Esri's authoritative demographic data

25%

Revenue spent on R&D by Esri

67

Offices around the world

75%

of Fortune 500 companies deploy Esri Software

> ***"Data meets geography at Esri, a billion-dollar company whose mapping technology enables feats like predicting flash floods, managing supply chains in real time, and cutting disease outbreaks off at the pass."***
>
> - Fast Company

> ***"[Esri has] some of the most extensive capabilities for capturing spatial data and the analyses, presentation, and delivery of spatial insights."***
>
> - The Forrester Wave: Geospatial Analytics Tool

> ***"Esri products are so versatile that they have been used to combat deadly viruses, thwart terrorism, clean up environmental disasters and cheat at Pokémon Go."***
>
> - Portland Press Herald

Asset Management

Crossrail uses Esri ArcGIS to map and manage assets in hundreds of programmes.

The Challenge

Crossrail is Europe's largest infrastructure project. The new trainline slices across London east to west. Its a 42 kilometre route with 40 stations, including ten new ones. Crossrail managers needed to map out the route, complete with every technical detail from trees and pylons, to electrical cabling and light fittings. Furthermore, it is mandatory to track the location and ownership of every physical asset along the route.

The Solution

Crossrail works with Esri to manage hundreds of ongoing programmes. For example, land and property is mapped and monitored. A temporal slider lets managers see which contractors are responsible for any parcel of land at any moment in time."Temporal layers in GIS showed us who was occupying the land at any time," says Daniel Irwin, geospatial lead for Crossrail. "If we hadn't got the system in place, they would have needed three times as many people, so GIS transferred into a significant quantitative benefit."

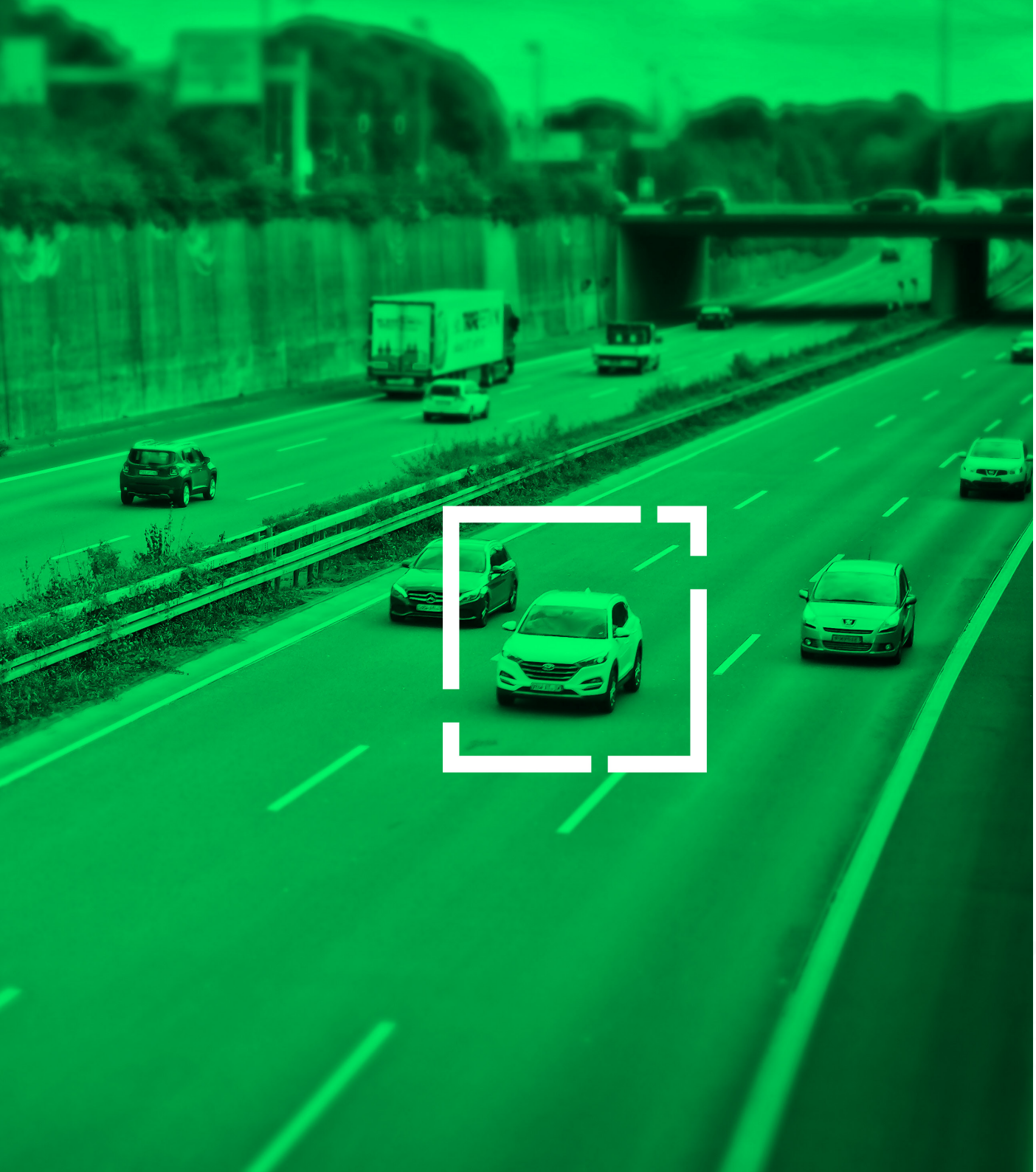
Crossrail involves tens of thousands of workers, across hundreds of organisations. Esri provides a single source of information for all parties to work from. A mobile app means field workers can update information whilst on-site. Managers can use the GIS to better understand conditions and status of works on the ground. Analytics tools track usage metrics.

The public are kept informed too. A service called "Near You" shows where tunnelling is taking place, and how work is progressing. It's easy to publish using Esri

Irwin says, "I believe this is the way forward for asset and facilities management, especially in major infrastructure projects."

+80%

Productivity Uplift of Crossrail's asset protection engineers



Planning & Analysis

How Highways England manages road maintenance

The Challenge

Highways England has the formidable job of keeping all motorways and A-roads under its purview in perfect working condition. There can be thousands of jobs to keep track of at any time, and the agency struggled to monitor progress and identify project clashes.

The Solution

What Highways England needed was a mapping application able to track each and every job. It created the Regional Programmes Map which shows the location of schemes which are planned for construction in the next 3 years. The Map has an in-built intersect analysis to flag up project overlaps. For example, a road development scheme due to be delivered on the A404 was cancelled after it was identified that a series of improvements planned by other Highways England teams on the A404 and neighbouring roads would deliver significantly greater benefits for the route. By cancelling the scheme Highways England saved several million pounds and avoided unnecessary planned roadworks.

Now all departments have the opportunity to plan works more efficiently, to minimise the amount of road works and optimise the deployment of the workforce. The application is an Esri ArcGIS Online app. The Regional Programmes Map is function rich, able to include layers such as the political constituency the location falls in, and who the MP is to resolve disputes more rapidly. It has rendered old methods of working, which included emailing spreadsheets to other agencies, obsolete.

Highways England is now seeking to work more closely with our contractors, local authorities and other partner organisations to plan works across our artificial boundaries.

highways england

Real-time Operations

Transport Scotland uses real-time data to optimise road gritting

The Challenge

Snow can cause chaos. It's Transport Scotland's job to keep the roads open after snowfall. Also, it has a duty to keep the public informed as to which roads are fit for travel. So Transport Scotland needed a way to pass road safety information onto the public.

The Solution

Transport Scotland produced a mobile app called Trunk Road Gritter Tracker to provide a near real-time view of road gritting during snowy conditions. At the heart of the app are in-vehicle GPS devices to map the location of gritters, and where they have travelled in the previous 24 hours.

Historically, Transport Scotland published static maps showing the public treatment and patrol routes, as well as the planned number of gritters being deployed, but in the age of smartphones and real-time information, the organisation needed to go much further in providing details on gritter treatment activities through digital means.

Transport Scotland said the app would give drivers confidence that the roads are safe in adverse weather conditions, and helped the organisation to fulfil its obligation to deliver a safe, efficient, cost-effective and sustainable transport system.

Esri UK's Head of Government, Paul Clarke, said: "Winter treatment costs a lot of money; Transport Scotland's Winter Service costs between £12-13 million per year. The additional insight provided by ArcGIS into the timing and routes used in real life by the gritters leads to optimisations for Transport Scotland that saves money and improves safety."

Information is then distributed via the app, to keep the public well informed.

TRANSPORT SCOTLAND

Field Agent Mobility

Canal & Rivers Trust empowers staff to act no matter where th ey are

The Challenge

The Canal & River Trust protects 2,000 miles of inland waterways. The work involves a large network of team members and third-party contractors, who inspect and repair canals, towpaths, locks and bridges. Information must be shared across a large workforce.

The Solution

The Trust created a central information service for all workers to use. The new platform means workers can upload photos, survey data, and reports whilst on location. The information instantly populates the main database. "Historically, this was a complex process," recalls Ingrid Aldridge of the Trust, "with data being manipulated and processed at multiple stages often taking weeks before it finally became available to the decision makers."

Workflow is managed using the platform. Not only are jobs distributed, but field workers are able to input the results of their inspections as they happen.

Template forms make it quicker to generate and file reports. Inspecting a single bridge used to take days, with hundreds of steps. Now the entire process takes less than a day.

The result is a mobile workforce able to perform with peak productivity as they travel across the UK.

Canal &
River Trust

3D Visualisation and Analysis

Network Rail flew helicopters the entire length of Britain's railways to create a 3D map.

The Challenge

Network Rail owns and operates 20,000 miles of track, plus 40,000 bridges, viaducts and thousands of tunnels, signals and crossing points. Due to growing pressures on the railway and increased passenger and freight use the business needed a complete overview of its physical operations, taking into account every asset and facility from St Ives to John O'Groats.

The Solution

Network Rail carried out an aerial survey in 2014 using helicopters fitted with three high-resolution multi-spectrum cameras across the entire network, flying at a height of 250 metres. Light Detection And Ranging, or Lidar – a form of light-based radar capable of sensing the physical infrastructure - was used to produce digital terrain and digital surface models.

"You build up 3D images with Lidar," explains Charles Kennelly, CTO at Esri UK. "By simply scanning the terrain you build up a point cloud. If you shine a laser at something it bounces back a certain distance, and you have a dot that tells you what it bounced off and what colour that dot was and you use that to construct models of what's there."

The results were then fed into Esri ArcGIS to create high-resolution 3D models, to an accuracy of 25mm. This level of accuracy is improving safety by reducing the need for manual ground surveys in the early planning stage of infrastructure projects.

The data and imagery is accessed through the Geo-RINM Viewer, a desktop tool with more than 140 data layers of information from flood risk data to land-ownership data. This allows engineers and planners to carry out inspections and surveys over difficult terrain and close to tracks from the safety of the office.

The ability to analyse trees and vegetation close to tracks makes it possible to identify those that present the highest risk to the railway and carry out targeted, proactive vegetation management – reducing the need for trackside inspections and avoiding costly delays to train services.

Over time, new digital information is gathered and cross-referenced, boosting the accuracy of analysis such as erosion and subsidence: "This is just the beginning. We are building the base layer and then with future surveys we can prepare the various datasets captured at different times to derive the delta, so we can see if there has been any movement on the ground"any movement of the ground."

Collaboration

Transport for London needs to give 1,500 staff access to hundreds of projects on a single platform.

The Challenge

Transport for London is responsible for the capital's transport infrastructure. This encompasses roads, tunnels, bridges, pedestrian areas, and cycle paths. TfL needs all staff to be able to collaborate across many simultaneous projects.

The Solution

A new app, Surface Playbook, unites information previously held in different systems and departments, in mixed formats, and makes it available to everyone. "Surface Playbook provides a comprehensive picture of our road network, assets, current works and projects in one place, giving employees the best information from which to make important planning and operational decisions," says Fiona Clowes, GIS Lead at TfL.

Now there is a single source for all operational information, from road works to bus performace. Teams are able to co-ordinate around projects scheduled long into the future. Duplicated effort is eliminated. The new application has transformed the way TfL thinks about collaboration.

Transport for London

Inform Public Policy

TfL deploys multiple datasets to inspire and refine decision-making at the highest levels

The Challenge

London's population is soaring to 10m, placing strain on the water, energy, and transport infrastructure. The mayor, and the GLA, needed a new way for infrastructure providers to plan and deliver the necessary upgrades.

The Solution

TfL recently built a new tool to give policy-makers immediate access to spatial data, in an easy-to-understand visual format. Called the City Planner Tool, the platform based on Esri ArcGIS provides the ability to access, query and examine over 200 datasets. These include the location of trees and air quality, to underground access points and bus performance. It's transforming policy making and scheme prioritisation and making it more aligned to the London Mayors Transport Strategy (MTS) outcomes and Healthy Streets initiatives. These outcomes include improved air quality, safety and public transport reliability. The City Planner Tool is used to review datasets for each criteria in the context of the MTS, and support decision-making around the types of interventions that would help TfL work towards its goals for the capital.

"ArcGIS has enabled us to create an invaluable new support tool that will help us make the right decisions sooner and accelerate the delivery of schemes to create Healthy Streets for Londoners." - Henry Cresser, principle strategy planner, TfL

Transport for London

Analyse passenger flow and footfall

Manchester Airport models passenger flow from Airport choice to transport preference.

The Challenge

Manchester Airport is 80 years old, and today handles 28 million passengers housed in three terminals. The owner, Manchester Airport Group, is committed to improving the profitability and performance of the passenger and freight transportation hub. It also wants to examine environmental metrics, aviation safety, security, and impact on the local community.

The Solution

The airport is mapped out on an enterprise Geographic Information System (GIS) application, based on Esri ArcGIS. This allows a systematic analysis of operations. For example, during the renovation of the terminals, MAG employed GIS to model the retail spaces, and demonstrate the passengers journey through the airport. This optimised both the revenue of MAG, and that of the retailers who were able to forecast with accuracy the shopper numbers and likely spend.

Engineers at MAG use the service to complete condition surveys and request maintenance whilst out on site.

The movement of passengers is mapped on the GIS. This allows customers to be sent accurate information about the best place to park and other relevant information about the airport.

MAG's community relations team used GIS to analyse flight paths, noise contours and residential areas and identify the individual properties that qualified for funding for secondary double glazing under the Sound Insulation Grant Scheme.

"Our use of GIS helped us create a more efficient workforce," says Vickie Withnell, Group GIS Manager at MAG. "At the same time, we managed to focus on customers activities and strategic development improving our profitability focussed on great customer service."

manchester airport

PART OF M.A.G

Begin Your Journey

"Modern mapping techniques are phenomenally powerful. At Esri we are constantly amazed by the uses our clients find for geospatial analysis to solve business challenges.
The UK's top transport and infrastructure organisations all use the Esri Platform to drive innovation, efficiency and improved customer service. To begin your journey with Esri UK, please get in contact."

Craig Hayes, Head of Transport Practice, Esri UK

Esri UK supports transportation organisations with:

- Strategic planning
- Operational Intelligence
- Asset Management
- Collaborative working
- Incident management
- BIM processes

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