

## Planning Scotland's future public transport network

# Jacobs

### The Challenge

- Create a new tool for analysing, modelling and displaying transportation data

### The Benefits

- Improved understanding of public transport accessibility
- Clear visualisations of complex, nationwide data
- A flexible, easy-to-use analysis tool
- Tangible evidence to inform future transport investments

The engineering services company Jacobs has built a tool using ArcGIS that analyses the accessibility of public transport in Scotland and displays data in highly visual and interactive web maps and dashboards. Delivering enlightening evidence about public transport needs, the tool is now being used to help Transport Scotland make crucial investment decisions for the future.

### The Challenge

Transport Scotland had an important, yet complex, question to answer. How should the public transport network in Scotland be developed over the next twenty years to make it accessible to more people, encourage more sustainable travel choices and support the Scottish economy? It launched a Strategic Transport Project Review and appointed Jacobs to help it gather the data and insight it needed to enable ministers to make evidence-based decisions about future investments in public transport services.

The challenge for Jacobs was enormous. Existing public transportation modelling tools had considerable limitations, and public transport behaviour could not be reported or analysed at national, regional and local levels. Jacobs therefore set out to create a new tool for analysing, modelling and displaying transportation data that could be used easily by many teams for different purposes during the Strategic Transport Project Review and other projects in the future.

### The Solution

A specialist geographic information system (GIS) team at Jacobs built the new solution using Esri's ArcGIS software and ArcGIS web apps in combination with other technologies. Called the National Public Transport Accessibility Tool (NaPTAT), it considers over 2 million potential journey origin points (from a 200m x 200m grid), takes into account the frequency of public transport services from over 53,000 public transport stops and calculates journey times to over 7,000 key destinations relating to employment, education, healthcare, retail and food stores.

Jacobs used the Network Analyst capabilities of ArcGIS Pro to calculate the distance and walking or cycling time between each point of journey origin and the nearest public transport stops, within a threshold distance. It then used the Network Analyst outputs and Python scripting to calculate specific accessibility scores based on the number of public transport stops nearby, the distance away and the frequency of services at these locations. "ArcGIS Pro was one of the most important solutions we used, as it helped identify public transport in the vicinity of each point of origin, as well as the destinations that can be directly accessed by walking or cycling from any of the origin points," explains Jaime Rodriguez Gozalo, Principal GIS Consultant at Jacobs.

Next, Jacobs used ArcGIS Online to build a web app that enables people to visualise the transportation data on an interactive map of Scotland alongside relevant third party data, such as the Scottish Index of Multiple Deprivation. Users can zoom into the map, turn different layers of data on and off and interrogate the data to gain insight.

Esri UK | Millennium House  
65 Walton Street | Aylesbury  
Buckinghamshire HP21 7QG  
T 01296 745500 | F 01296 745544  
E [info@esriuk.com](mailto:info@esriuk.com) | [www.esriuk.com](http://www.esriuk.com)

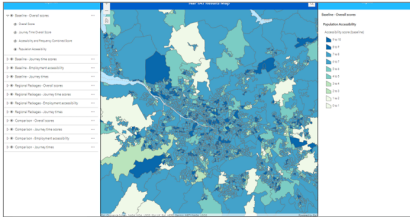
© ESRI (UK) Limited 2021. Registered in England and Wales  
No.1288342. VAT No.787 4307 91. Registered Address:  
Millennium House, 65 Walton Street, Aylesbury, Bucks HP21 7QG.  
All rights reserved.

The Esri globe and Esri products, services and trademarks mentioned are trademarks of Environmental Systems Research Institute, Inc. Other companies and products mentioned herein are the property of their respective trademark owners.

Learn more at: [esriuk.com](http://esriuk.com)

“The spatial components of the tool were imperative to assist in analysing the public transport accessibility across Scotland.”

Kyle Chesney, Principal Transport Planner, Jacobs



Jacob's National Public Transport Accessibility Tool (NaPTAT), built using ArcGIS Experience Builder

As a further extension to NaPTAT, Jacobs also created a series of interactive ArcGIS Dashboards, enabling users to not only view the data but also customise it for their own study. One dashboard displays the current performance of public transport in Scotland, while another shows comparisons between the current status (baseline results) and modelled improvement scenarios.

### The Benefits

#### Improved understanding of public transport accessibility

ArcGIS Pro and Network Analyst provide the core analysis capabilities of the NaPTAT solution, revealing just how accessible public transport services are, at each location and for discrete groups, such as people travelling to employment in urban areas, as compared to rural jobs. Recognising the key role played by ArcGIS in NaPTAT, Kyle Chesney, Principal Transport Planner at Jacobs, says, “The spatial components of the tool were imperative to assist in analysing the public transport accessibility across Scotland.”



An ArcGIS Dashboard highlighting the accessibility of key destinations by public transport and comparing the results for the baseline and the proposed scenarios

#### Clear visualisations of complex, nationwide data

ArcGIS Online is another core component of the NaPTAT solution, as it has enabled Jacobs to display the results of its nationwide transportation analysis in a highly visual way, on interactive maps and dashboards. Consequently, it is much easier for users to identify previously hidden patterns and accessibility issues. “We were not only able to create one single, detailed database of results, but we were able to really go to town using Esri’s online suite of applications to display this in the best way possible for all the teams involved in the project,” says Leigh Wilson, GIS Analyst, Jacobs.

#### A flexible, easy-to-use analysis tool

Using ArcGIS Online, Jacobs has been able to build a tool that is incredibly easy for people from a wide variety of teams to use, without having to reach out to the GIS team for support. The ArcGIS Dashboards for example, give users just the information they need, in a format that they can easily interact with to find the answers to their questions. “The data, information and conclusions can all be interrogated, filtered and used by anyone,” Wilson says. “You really don’t need to know how to use GIS to analyse these results or make any sort of calculations.”

#### Tangible evidence to inform future transport investments

Most importantly, the NaPTAT solution has met the needs of Transport Scotland and is now being used to gather evidence to inform new public investments. For example, users can clearly see on the ArcGIS Dashboard that proposed changes to the transportation network in the Edinburgh and South East region will enable over 25,000 more people to access a hospital in under 30 minutes, in what will be a major improvement to the public transport network.

Esri UK | Millennium House  
65 Walton Street | Aylesbury  
Buckinghamshire HP21 7QG  
T 01296 745500 | F 01296 745544  
E info@esriuk.com | www.esriuk.com

© ESRI (UK) Limited 2021. Registered in England and Wales No.1288342. VAT No.787 4307 91. Registered Address: Millennium House, 65 Walton Street, Aylesbury, Bucks HP21 7QG. All rights reserved.

The Esri globe and Esri products, services and trademarks mentioned are trademarks of Environmental Systems Research Institute, Inc. Other companies and products mentioned herein are the property of their respective trademark owners.

Learn more at: [esriuk.com](http://esriuk.com)