The Data Lab MSc Data Challenge 2022

Innovation Week

Krusty Krabs Report for VisitScotland

Introduction

With tourism being a major contributor to, and a key growth sector of, the Scottish economy, together with Scotland's ambition to become the world leader in 21st century tourism, the Scotland Outlook 2030 strategy has been developed.

A key focus of this strategy is ensuring that growth of the Scottish tourism industry is done in a responsible and sustainable manner that positively impacts visitors, businesses, people, communities and the environment.

For innovation week, we have been set the challenge of helping challenge sponsor and key contributor to the Scotland Outlook 2030, VisitScotland, better understand the impact different visitor market segments have on people, places, businesses and the environment.

Where VisitScotland's primary aim is to market Scotland as a tourism destination through advertising, promotion and public relations. Our analysis will be used by VisitScotland to make data-driven decisions on how best to allocate resources to target market segments that maximize the positive impacts of tourism and minimize the negative impacts.

The focus of our analysis is the environmental impact of travelling in and around Scotland with a focus on the railway. Our topic also links the different target segments of VisitScotland to one another in that they share the requirement to source reliable transport.

Background

Having observed the decline in train use in Scotland during the Covid-19 pandemic from an initial exploration of the datasets provided by ScotRail, Transport Scotland, and VisitScotland, we have decided,

as a team, to explore deeper into the reasons why people choose not to take the train and how we can encourage more train use as people begin to travel again. As well as this, we investigate rail features in Scotland and how these influence the feasibility of tourism reliance on rail. There is a major need to maintain and improve rail services to encourage their use amongst tourists, which we highlight.

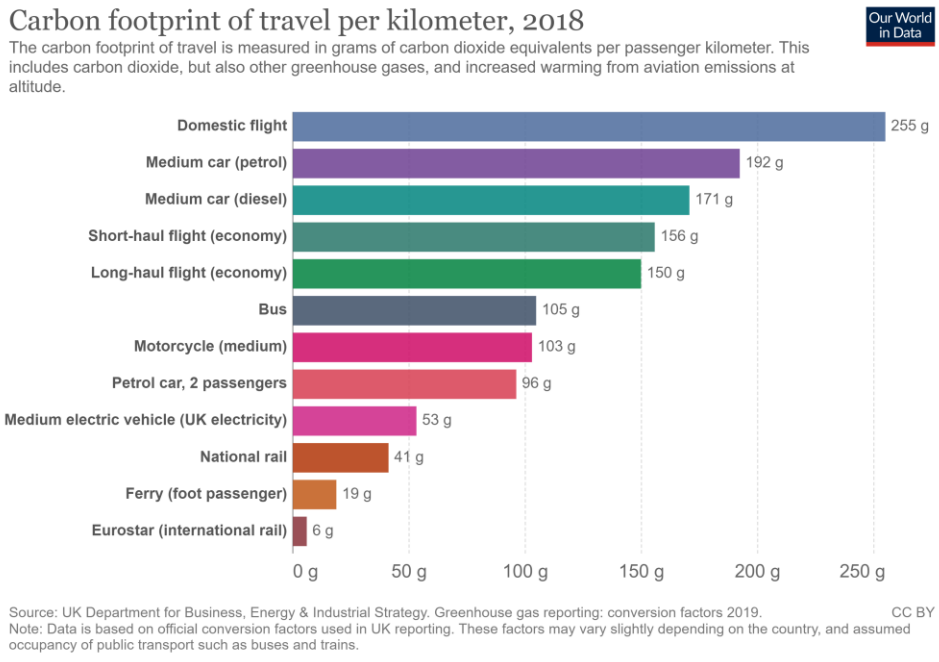
Trains are believed to be the most sustainable mode of transport. There is also ongoing electrification across the national rail network, with none of the same limitations on journey range that are experienced by electric vehicle users. However, there may be a sentiment amongst travelers that they would rather not be on a train for long periods due to COVID risk and personal preference.

Analysis / Exploration of Datasets

We chose to use the following datasets which are relevant to VisitScotland:

- ScotRail
- Transport Scotland
- Office of Rail and Road

In terms of environmental impact of travel into, out of, and inside Scotland, we were interested in the carbon footprint of the various travel modes. We observed from the below that rail and ferry (foot passenger) modes offered the lowest footprint. It can also be seen that medium electric vehicles offer a low carbon footprint in comparison with other travel modes.



Ref - https://ourworldindata.org/travel-carbon-footprint

From this data, we wanted to understand the uptake of rail travel and electric vehicle rental by travelers. For example, we wanted to understand if travelers were arriving at say, Edinburgh airport, and opting for car rental to explore Scotland, or whether they were opting for rail travel.

Intuitively, we understand aspects such as parking restrictions around Edinburgh City Centre may influence whether a rental car is chosen by those who would be visiting the city itself as part of their trip. Furthermore, aspects such as limited onward connections from the more remote railway stations around Scotland, may influence whether rail travel is selected for trips outwith the major towns or cities.

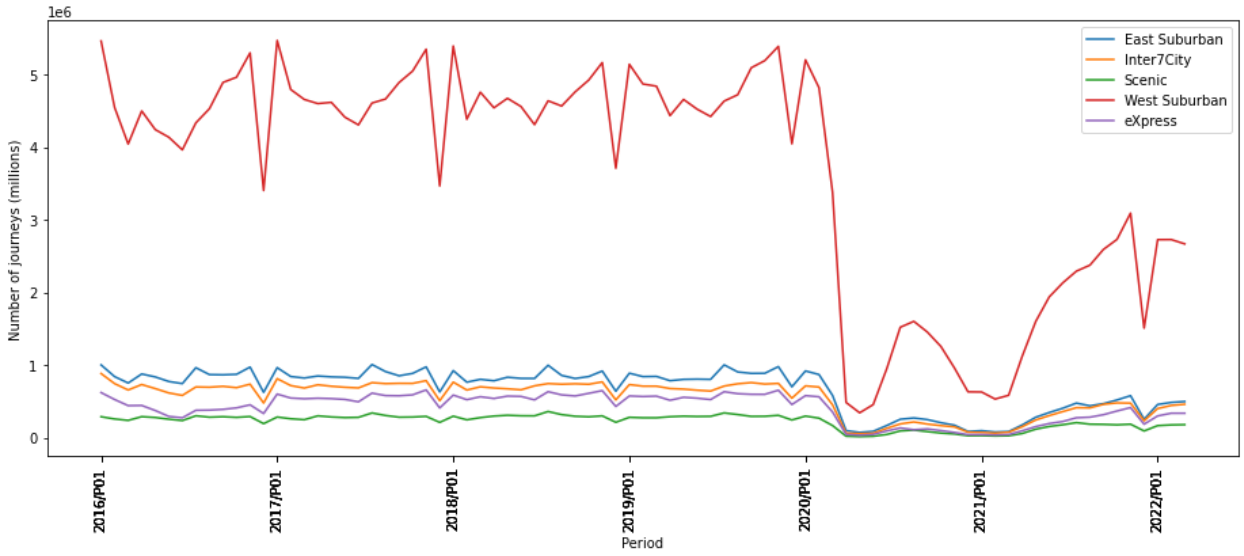
However, we wanted to explore the data available, seeking to support this intuition.

Considering first how best to understand the uptake of electric vehicle rentals by travelers coming into Scotland, we explored the Office for National Statistics, and their data on car rental by region (https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/adhocs/12090carrentalbyregion). However, this did not offer the segmentation desired.

On further exploration, there is a lot of data around electric vehicle update from a domestic perspective, but not from a rental perspective. Private companies, such as Ecosse EV, near Edinburgh Airport, offer Tesla electric vehicles for rental and market the North Coast 500 prominently within their literature as an activity they can connect you with. Perhaps data from this and similar private companies may be available in the future.

At this point, we turned our attention to rail travel data, and whether its uptake matched the attractiveness of the low Carbon footprint.

As a step toward this, we utilized the Scotrail dataset (scotrail-journey-data-2016-2022.csv), and plotted the number of rail journeys across all routes as a time series. The sharp drop off for all routes as a result of COVID can be observed in period 04 of 2020. It can also be seen that the routes have not yet fully recovered to pre-pandemic levels.



Ref - https://github.com/JoshYang1/Innovation-Week-Krusty-Krabs

Exploring this plot further, it can be observed that the Scenic routes make up the least of the rail journeys taken within Scotland, pre- and post-pandemic, with the West Suburban routes making up most journeys. Generally, five times the number of any other route.

These groups of routes consist of different rail lines across Scotland, which are each categorized based on shared geography and features.

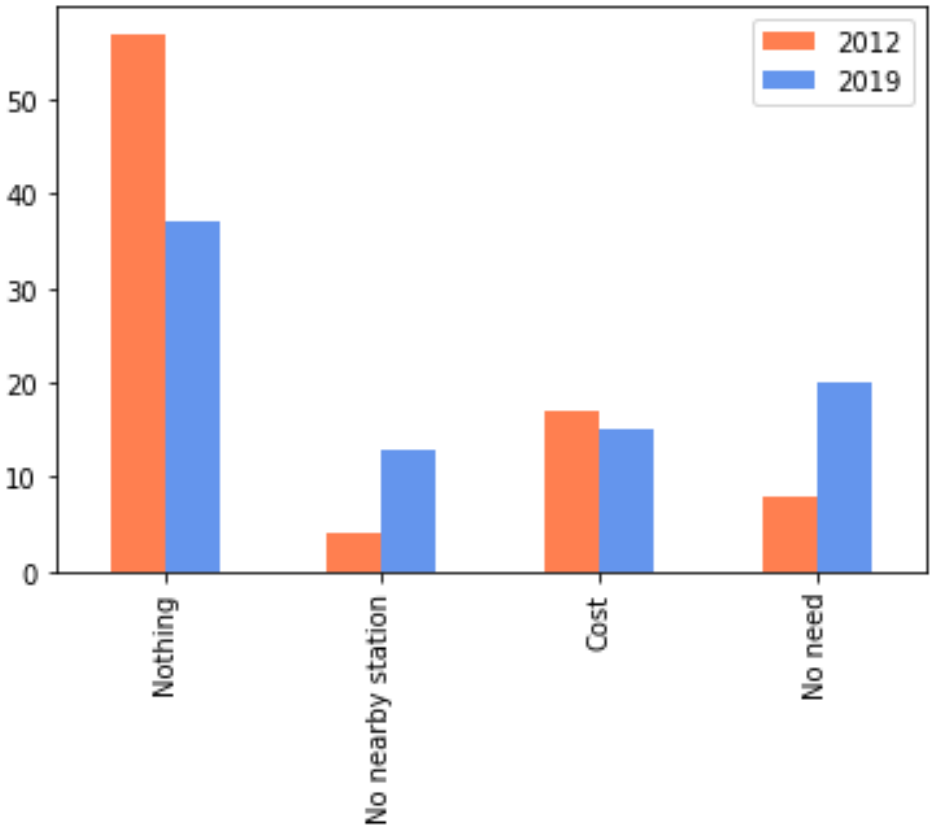
We wanted to understand more about the reasons for these observations.

Ideally, surveying the population post-pandemic on their reasons for not using the train would likely offer interesting insights, but in the absence of such data, we turned to survey data from Transport Scotland. These were results taken from the Scottish Household Survey.

(https://www.transport.gov.scot/publication/transport-and-travel-in-scotland-2020-results-from-the-scottish-household-survey-pdf-version/)

It offers domestic views on rail travel. Considering what discourages people from using the train, the main reasons are plotted below from the above dataset, offering a comparison of how these views have changed between 2012 and 2019.

Views on local train services of people over the age of 16 who had used the train in the previous month were also collected in the survey.



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Unfortunately, the reason given “Nothing” does not offer any directly tangible reasoning, but could be explored further outwith the Data Lab challenge by means of analyzing proxies and other data sets, etc.

The reason of “No need” also does not offer much direct insight but could be explored further outwith the Data Lab challenge, and perhaps cross-referenced with car usage and other modes of transport, as well as cross-referencing against any increases in people living closer to work and amenities, or indeed having less need to travel for a variety of reasons.

The reason “Cost” remains at a relatively consistent level from 2012 to 2019, but interestingly, the reason “No Nearby Station” has become more prominent in 2019 than it was in 2012. Perhaps the latter may relate to housing development, and a residential sprawl away from nearby train stations. The reasons could be explored further outwith the Data Lab challenge.

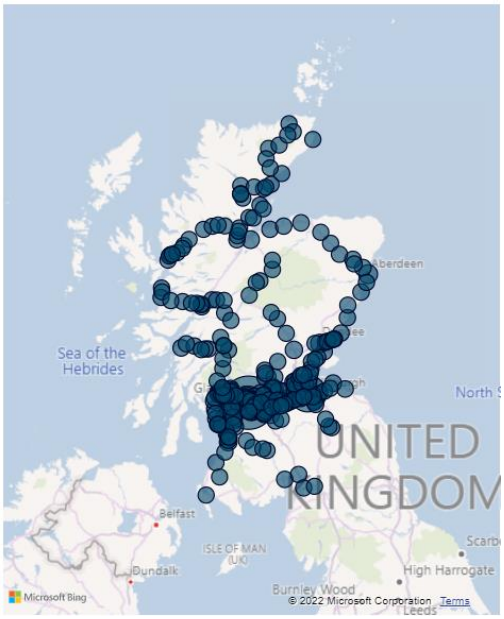
Also using Transport and Travel in Scotland 2020: Results from the Scottish Household Survey, a plot was generated offering a Likert agree / disagree scale of train user views on their experiences using trains.

Ref - https://github.com/JoshYang1/Innovation-Week-Krusty-Krabs

The Train Fare Value aspect of the above plot correlates with reason of Cost from the previous plot, in that there is disagreement that the fares are good value.

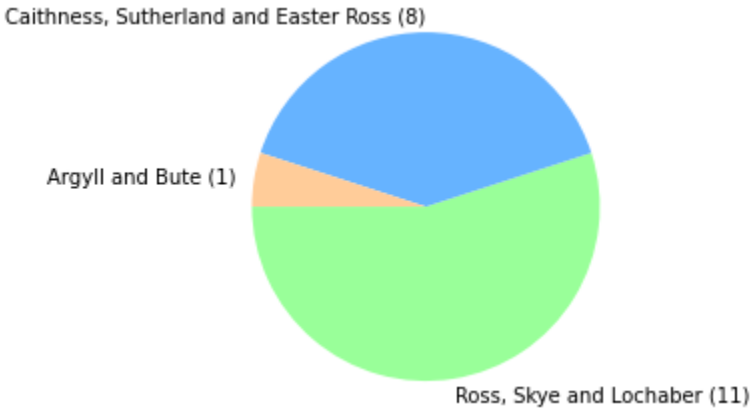
Another interesting insight is that there is also agreement that it is easy to change from trains to other forms of transport. It would be worthwhile to understand which stations are being referred to in these surveys, and whether the surveys consider the more remote stations. It would be good to undertake further analysis outwith the Data Lab challenge in order to gain some firmer insights into this aspect.

This is a map of Scottish train stations which show national access to these services. Figures on the usage of stations measured in entries and exits are also recorded, with the highest ranking station as Glasgow Central and the lowest ranking as Lochluichart on the Kyle of Lochalsh line in 2019-20.



Ref – Office of Rail and Road Data Portal (https://dataportal.orr.gov.uk/statistics/usage/estimates-of-station-usage)

The pie chart below shows the constituencies of Scottish train stations that require users to request stops. This is a relevant consideration for VisitScotland, as tourists may not be aware of this requirement and its rules. So, for access to these much smaller stations (such as Dunrobin Castle or Corrour) there is extra consideration needed. Over half of these stations are in Ross, Skye and Lochaber, which have very low geographic access to services according to the Scottish Index of Multiple Deprivation (simd.scot), and are also popular tourist destinations.



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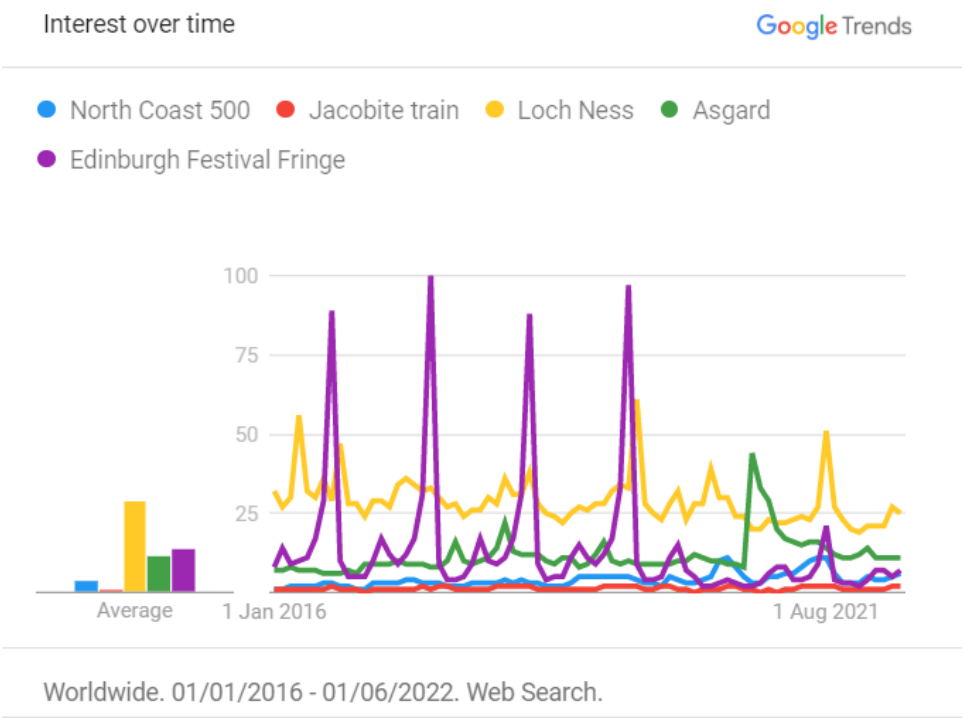
A question arose about tourists specifically and how they travel within Scotland once they have arrived. From our analysis on Google Trends, we can see that there is a consistent large uptick in searches in August for the 'Edinburgh Festival Fringe', disregarding the disruption COVID-19 has caused in recent years. Interestingly, searches for 'Loch Ness' experiences an uptick soon after. Our intuition leads us to believe that once tourists have arrived in Scotland for the Fringe, they then wish to explore other attractions.



Ref - https://trends.google.com/trends/explore?date=2016-01-01%202022-06-01&q=%2Fm%2F013d5rwr,Jacobite%20train,%2Fm%2F04p17,%2Fm%2F0q3c,%2Fm%2F022t8s

If VisitScotland can influence and guide tourists to use more sustainable modes of transport for these day or multi-day trips, there can be a significant benefit on the environmental cost. For example, if a group of tourists rented a large petrol car and travelled from Glasgow Queen Street to Fort William the greenhouse emissions would be 48,905.96 gCO2e whereas if they were to catch the train it would be 8,013.15 gCO2e (length of trip was taken from https://my.railmiles.me/mileage-engine/). There are also additional benefits for taking the train as the West Highland Line, which stops at Glasgow Queen Street and Fort William, is considered one of the most scenic routes in the world.

Conclusions and Final Recommendations

The train user surveys analysed highlighted two main areas in what discourages people from using the train: cost and convenience of station locations.

The cost of rail travel is understood to be related to the cost of operating and maintaining the rail network. These costs may be outwith the scope or the control of the Scotland Outlook 2030 strategy, but what

could be within scope is to make rail travel more popular across Scotland. Higher passenger numbers could lead to an ability to lower the cost to the traveler.

In an effort to make rail travel more popular, there could be a focus on providing more value from the service, in areas that are within the scope of the 2030 strategy. For example, creating more flexibility from what is a fixed rail network, with limited proximity to changing tourist hotspots.

Such flexibility could be gained via focusing on onward travel provision at the more remote railway stations. This could be via a pool of electric vehicles made available for rental at these stations, which could be VisitScotland fleet vehicles, a pool of fleet vehicles operated by a local business association, or even a pool of local resident owned vehicles offered to travellers as part of a democratised vehicle sharing scheme. For example, a similar scheme to Getaround (https://uk.getaround.com), but with more local ownership such that the revenue remains within the Scottish economy, and such that local residents and businesses are invested and taking ownership, giving the scheme every chance to be successful.

In the wake of the pandemic, people, their businesses, and the multitude of aspects that can attract tourists, could be located anywhere in Scotland. In many cases, these could be located well away from the more traditional tourist hotspots, awaiting the curious traveller who seeks serendipity.

Although a fixed rail network alone cannot provide reach to such dynamic aspects, it can be supplemented such that its existing stations are made more convenient for ever changing trends.

These statistics show that trains continue to be a popular and viable mode of green transport. Therefore, if VisitScotland is to encourage the growth of the tourist industry in a sustainable way, they must support these services and pay attention to obstacles in their provision, such as strikes, cuts or closures. Maintenance of infrastructure is essential if rail is to continue as a current and effective component in the tourist experience throughout Scotland.

Overall, we conclude that advocating for rail is a beneficial investment of resources, attention and energy for VisitScotland due to the factors presented in this report. Tourists should be able to seamlessly navigate both central and remote areas of Scotland without anxiety and ensuring a robust and environmentally sound transport service through trains will optimise their chances of doing so.