Public transport availability in Wales: analysing the availability of railways stations and rail services

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Summary

This paper introduces initial work on the availability of railway stations and rail services in Wales. It investigates how accessible the rail network is to 193 key settlements using the concept of transport availability – the degree to which railway stations can be accessed based on a variety of measures such as proximity, transport provision, frequency of service and amenities. The work provides a classification of stations in Wales and railway availability scores for the settlements in Wales. These scores are analysed in relation to socio-economic and demographic settlement characteristics to understand the spatial variation in railway accessibility.

KEYWORDS: accessibility, railway stations, spatial equity, first and last mile, amenities

1. Introduction

There has been a great deal of research in the UK and beyond on transport accessibility (the ease at which people in an area can access key services or destinations using public and private transport) and far less research on transport availability – the level of transport service provision in an area such as proximity to transport nodes, frequency of service, quality of service etc (Sun & Thakuriah, 2021). This is especially so for public transport availability (PTA), and transport and logistic planners have begun to use the concept of 'first and last-mile' to capture the problems associated with the first and last legs of a journey, recognising that access to and from public transport nodes (stations/stops) is a major problem for encouraging public transport use (Monzonab, Alonsoa, & Lopez-Lambasab, 2017) and is often found to be the weakest link in a trip using public transport (Stam et al., 2021). Key variables, such as distance to a station, walking or driving route directness, land-use diversity, service and facility quality, bus connection to train stations etc, all affect the accessibility to railway stations and their importance can vary by different groups of people such as the elderly (Lin, et al. 2014). More generally, research has indicated that satisfaction with the level and quality of the access to the railway station is an important dimension of the rail journey and that the quality and level of accessibility is an important element in explaining rail use (Givoni & Rietveld, 2007; Brons, Givoni, & Rietveld, 2009). Improving and expanding the quality of access to the railway station is probably a more cost-efficient approach to increase rail use more generally, and especially for attracting infrequent rail passengers (Brons, Givoni, & Rietveld, 2009). PTA of railways stations also play an important role in Transit Oriented Development (TOD) in urban planning and policy (Lyu, 2016). The aim of this paper is to map public transport availability to railway stations and rail services in Wales. The objective is to identify areas in Wales where access to railway stations could be improved, identifying spatial gaps in provision for people who are socially disadvantaged, especially in terms of households who have poor access to private transport. Past studies have researched such issues at a city / regional scale, but very few have undertaken a national scale study before (e.g. Sun & Thakuriah, 2021), and there has been none undertaken for Wales. The research has emerged from a wider project – Understanding Welsh Places (http://www.understandingwelshplaces.wales/en/) – and uses data and methods developed as part of this work.

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2. Data and Methods

Much of the data utilised in this analysis was compiled as part of Understanding Welsh Places (UWP), a project focused on providing data and geographical information about places in Wales for the benefit of local communities (UWP, 2021). For this paper we use the same 193 key Welsh 'places' defined in UWP as Contiguous Built-up Areas (CBUAs) with a resident population of 2,000 people or over, a cut-off chosen to make robust statistical analysis possible (UWP, 2021; ONS, 2013). PTA measures to a station were based on those proposed by Minocha et al. (2008) and Wells and Thill (2012) and include road network travel distances and travel times from the CBUA to a station, the frequency of service (times of day / weekday / weekend), number of routes served by the station, whether a line is on a direct route to an airport or ferry terminal, and whether the station is a request stop. It has information on amenities (e.g. toilets / waiting room / shops), modal interchange facilities (e.g. car parking, cycle storage), staffing levels and opening times. All stations in Wales and 22 stations along the Welsh border were included, totalling 245 stations – **Figure 1**.

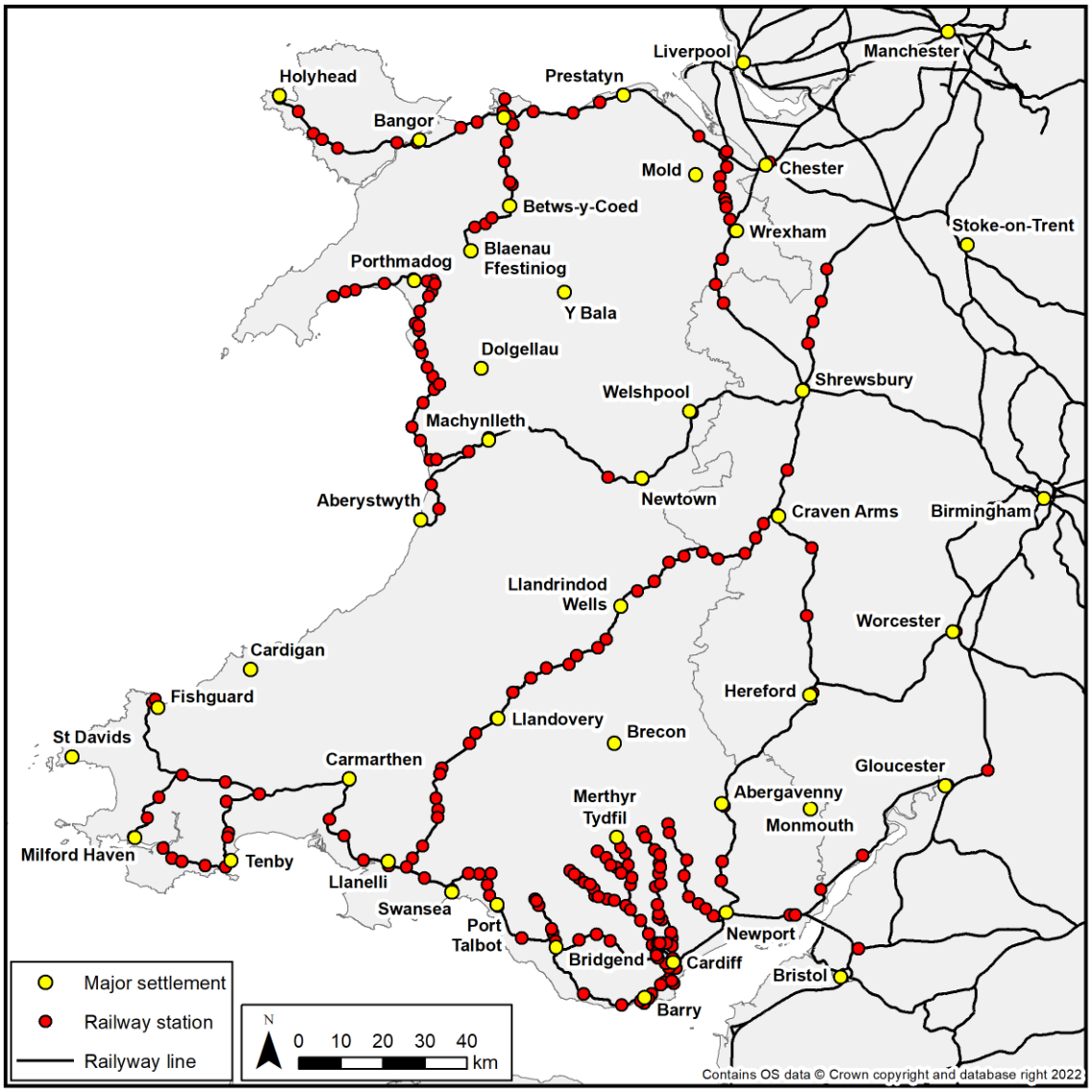

Figure 1. Railway stations in Wales and the Welsh borders

The travel distances and travel times to each station were calculated using Ordnance Survey's Highways network data and ESRI's Network Analyst Origin-Destination cost matrix algorithm from the centre of

each CBUA based on conventional measures of town and city centre locations. Frequency of service was from GB Rail Network timetables of train services in operation across Great Britain. The train station measures are based on The Office and Rail and Road (ORR) statistics on estimates of station usage Table 1410 – and has been supplemented by data from Transport for Wales and other train companies. **Figure 2** is a summary of some of the PTA metrics for the Llanwrda station based on distance and travel time from the town of Llandovery (from the Understanding Welsh Places website). **Table 1** is a summary of some of the railway station metrics.

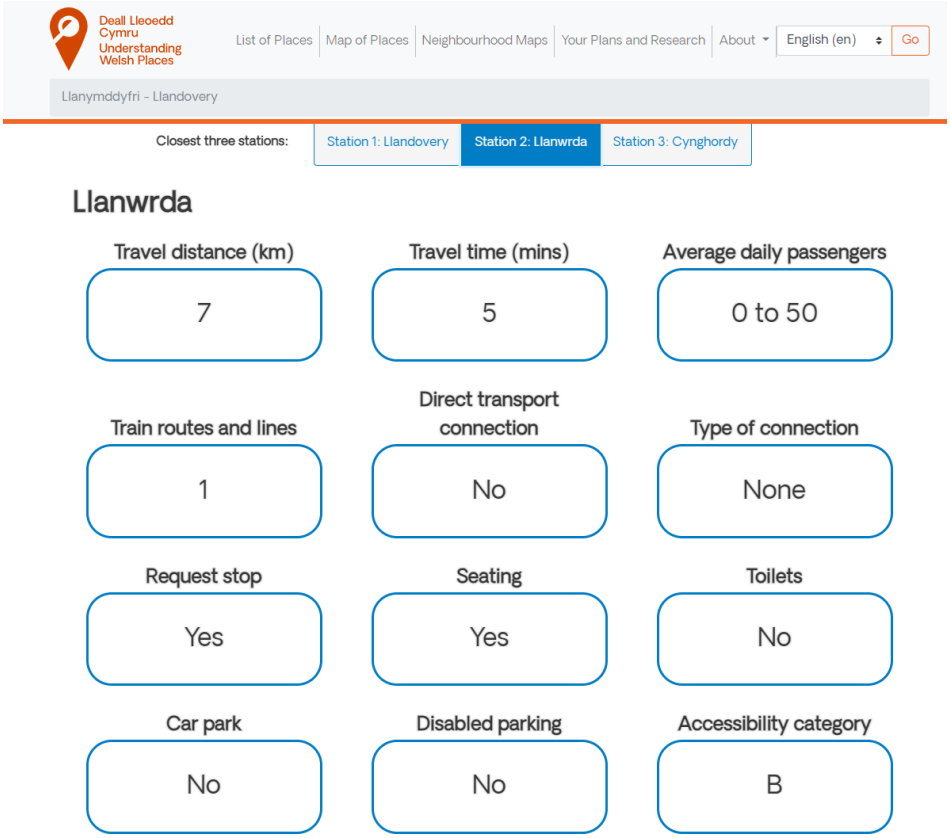

Figure 2. Summary of the Station Metrics from the UWP website

Following similar work by Caset et al. (2018) and Sun & Thakuriah (2021), a classification of comparative availability profiles was created for all stations covering Wales and the borders. The classification differentiated between usage (e.g. passenger numbers), rail services (e.g. frequency of services, number of routes, request stop etc), station amenities (e.g. ticket office, toilets refreshment facilities etc) and modal interchange (car parking, cycle storage, bus stops). The classification was then used to calculate a weighted PTA score for each CBUA based on distance and travel time to each station (Sun & Thakuriah, 2021). The scores were then analysed in relation to the socio-economic and demographic characteristics of the CBUAs, and particularly measures relating to deprivation (e.g. having access to private transport).

Table 1 Summary of some of the railway station metrics

Station Amenities		
Car Park	No	35%
	Yes	65%
Toilets	No	86%
	Yes	14%
Ticket Office	No	78%
	Yes	22%
Ticket Machine	No	50%
	Yes	50%
Refreshment Facilities	No	88%
	Yes	11%
	Missing	1%

Station Passenger Usage		
Average Daily Passenger Numbers	Mean	810
	Std Dev	2740
	Min	0.5
	Max	36000
Average Daily Passenger Numbers	0-50	30%
	51-100	12%
	101-500	29%
	501-1000	14%
	1001-5000	11%
	Over 5000	4%
Station Rail Services		
Request Stop	No	73%
	Yes	27%
Routes	1	71%
	2	15%
	3	8%
	4 or more	6%
Direct Connection	Airport	18%
	Airport; Ferry	10%
	Ferry	20%
	None	52%

3. Conclusion

The research is an initial investigation into PTA in terms of railway stations for the main settlements in Wales. The work has important implications for spatial equity of access to the railway network and for accessing destinations and key services such as jobs, education and health care, especially in places which have a large proportion of people living in low-income households who have limited access to car ownership, such as towns in the Welsh Valleys. It is part of emerging work on the first and last mile in transport planning and its role in active travel. The work will be developed further to include bus stops and bus services, which will allow a fuller treatment of PTA in Wales to be developed.

4. Acknowledgements

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6. Biographies

Scott Orford is a Professor in GIS and spatial analysis at Cardiff University School of Geography and Planning and WISERD. His research is on the spatial and statistical modelling of social and economic processes.

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