TECHNICAL NOTE

MEASURING PUBLIC TRANSPORT ACCESSIBILITY TO EMPLOYMENT SITES IN THE AUCKLAND CBD

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ABSTRACT

There is current global focus to increase the use of alternative modes of transport, particularly the use of Public Transport (PT). Part of this change is to improve accessibility. If the PT modal share is to be increased, the transport authority, transport planners and other professionals need to ensure the service is available to as many people as possible.

To enable measurement and monitoring of PT, quality of service and accessibility ratings allow local authorities to define the level of service available to users at various times and locations. To date measuring PT accessibility in New Zealand has been limited. This paper outlines a proposed methodology for assessing PT accessibility to work places in the Auckland CBD from the surrounding areas with the aim of mapping the CBD area according to calculated PT accessibility levels. In addition to providing information on PT service levels, it is expected this information can be used in planning to influence decisions around land use, Travel Demand Management schemes and planning regulations such as minimum or maximum parking requirements as well as being a useful tool to help predict modal share from new developments.

INTRODUCTION

The aims of this research project are:

1. To propose a suitable methodology for measuring public transport accessibility to employment destinations in Auckland.

2. To test the methodology by applying it to the Auckland CBD and to produce a PT accessibility map of the Auckland CBD area.

3. To investigate ways in which this information can be used in developing policies aimed at increasing the PT modal share and reducing congestion during peak times.

METHODOLOGY

Methodology Selected

Public Transport accessibility ratings are used in a number of countries overseas, most notably in the UK (Transport for London, 2003), the United States (Kittleston and Associates 2003, Rood 1997 and Rhyus et al, 2000) and the Netherlands (Martens and Griethuysen, 1996). Some examples can also be found in Australia (City of Sydney, 2005 and Queensland Department of Main Roads, 2005) and in New Zealand (Abley and Williams, 2008).

Having reviewed the various definitions of Public Transport Accessibility, it was decided for the purposes of this research, PT accessibility would be defined as:

'The potential for employees to travel to a place of work using public transport'.

To enable measurement, a new index entitled the total Potentially Accessible Working Population (PAWP) was developed. This index incorporates some similar data to other previously developed indices (Transport for London, 2003 and Gent and Symonds, 2005) but has been developed specifically for accessing employment sites by PT.

This methodology is trialled for the first time in this research paper using the Auckland CBD as a case study. The Auckland CBD will be defined as the area included in the Auckland City District Plan – Central Area (Auckland City Council, 2004).

As the aim of the research is to focus on accessibility to work places, the methodology considers the CBD as a destination only. Therefore the map produced shows PT accessibility for employees only and does not consider residents living in the CBD.

Implementing the Methodology

The PAWP value is calculated by determining the total working population who are able to access an employment destination by PT during the morning peak in sixty minutes or less. The sixty minute travel time includes a maximum of thirty minutes 'in transit' travel time and a maximum of thirty minutes of walk and wait time (including origin and destination).

To enable the PT accessibility ratings to be mapped across the Auckland CBD, the area was split into 100m grid squares called CBD Polygons. The PAWP figures were then calculated for each CBD Polygon. The PAWP calculation has been split into six steps and these are outlined below.

1. Identify all PT service points which are located within five and ten minutes walk of the CBD Polygon (the destination PT service points).
2. For each PT service point, identify all PT services that arrive within the morning peak (7-9am).
3. For each PT service, identify all origin PT service points (those outside of the employment zone) which are accessed within a 30 minute travel time (Note this will be the 30 minutes prior to the service arriving at the destination PT service point).
4. Determine which Census meshblock each origin PT service point is located and the working population (age 15-65) of each meshblock.
5. Calculate the total working population for the route by summing together all of the working population totals for each meshblock and multiply the total by the frequency of the service.
6. Repeat the same process for all PT services and sum together to calculate the total PAWP for the CBD Polygon.

Step 1 was achieved by mapping five and ten minute walking catchment areas using GIS network analysis. A walking time of 1.3m per second was assumed which resulted in a distance of 390m for a five minute walk and 780m for a ten minute walk.

Steps 2-6 were achieved by means of a code written with Visual Basic for Applications (VBA). The final output of the code is a Final Results Table which lists the total PAWP values of each CBD Polygon. The total figures were then split into five categories ranging from Zero (No morning peak services are within the specified distance) to Very High (81-100% of the range).

The Data

To complete the PAWP calculations data was gathered from the Auckland Regional Transport Authority (ARTA), Statistics NZ and the Auckland City Council. ARTA provided the location of all bus stops, train stations and ferry terminals in the Auckland region, the routes of all PT services and a transport Planning Extract from the ARTA Integrated Public Transport Information System (IPTIS) database. Census 2006 meshblock boundaries for the Auckland Region and the working populations for all meshblocks were gathered from Statistics New Zealand. Finally Auckland City Council provided the area boundary, kerb line and road centerline databases for the central area.

Assumptions

The methodology includes a number of assumptions which are stated below:

- The origin catchment area is considered to be the census meshblock only and therefore it assumes that all residents within a meshblock can access the origin PT service point and that no residents within neighbouring meshblocks will access the PT service point.
- The PT services will follow the printed timetable.

- All PT modes are equal.
- The capacity of the PT vehicle is unlimited.
- Transfers between PT services are not considered.

RESULTS

Result Maps

As part of the research project a number of maps were produced using different GIS analysis techniques to enable comparison of results. It was found that the most meaningful results were obtained using the GIS network methodology for a five and ten minute walking distance. These maps are shown in Figures 1 below.

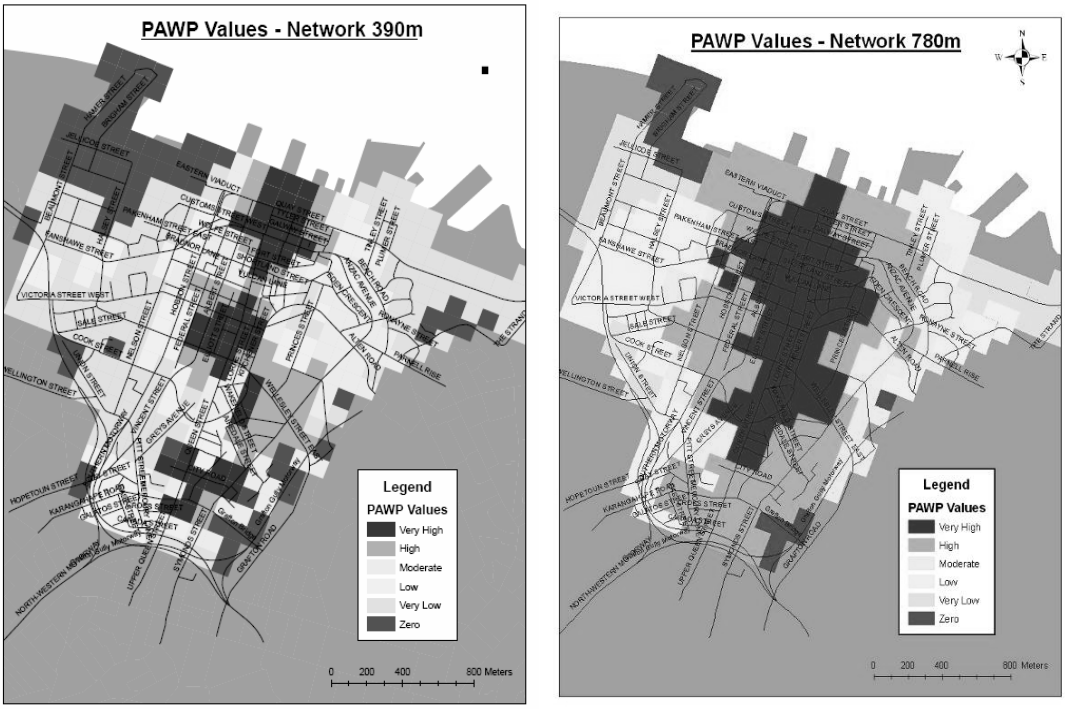

Figure 1: Results - Five and Ten Minute Walking Distances

The following general conclusions can be drawn from the results:

1. The Auckland CBD area is generally accessible by public transport with very few areas outside of a ten minute walk of an inbound PT service point.
2. The 'Wynyard Quarter' area (north west) currently has the lowest potential to be accessed via PT.
3. Accessibility to PT is not solely centred around the Britomart Transport Centre with other areas in the southern side of the central CBD resulting in higher PAWP values than Britomart.
4. There is generally an east/west bias in favour of the east which although related, cannot be solely explained by the general split in population distribution.

Incorporating Transfers

One of the recognised limitations of the methodology is the fact that it does not account for PT users transferring between services. To address the possibility of transfers at the destination end, Figure 2 shows the 390m network results map overlaid with the routes of what has been determined to be 'Local PT'. Local PT routes are defined as those that occur very frequently and follow a set route around the employment area (eg city centre loop route or local shuttle service). For the Auckland CBD, the Local PT has been determined as the Link and the City Circuit routes, both of which have a frequency of ten minutes in the morning peak.

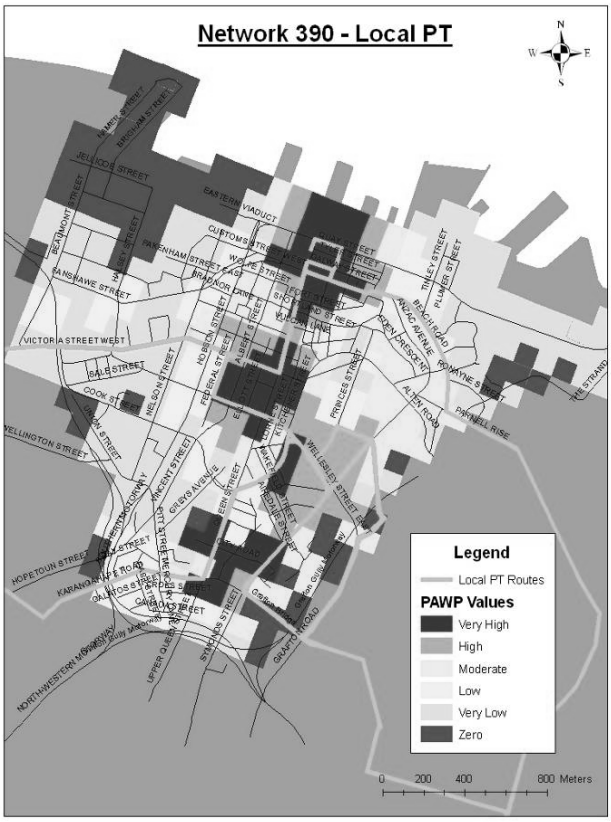

Figure 3: Local PT

It is noted from the map that the Local PT accesses the majority of the areas classified as 'Very High' but the potential for it to increase the accessibility rating of the least accessible areas is limited to those sites along Beach Road to the east and Victoria Street West and the western end of Karagahape Road to the west. There is still a large section of western side of the city where the Local PT will have a limited impact on the low accessibility rating.

CONCLUSIONS AND RECOMMENDATIONS

The results illustrate that the PAWP index proposed provides a suitable methodology for measuring public transport accessibility to employment destinations. The methodology has been tested using the Auckland CBD as a case study and found to produce significant results.

Some recommendations to increase the accuracy of the methodology include the incorporation of a detailed pedestrian network dataset, consideration of local PT transfers at the destination end of the trip and consideration of park and ride facilities at the origin end.

However, despite the minor improvements, it is considered that the potential uses of such a methodology are wide and varied. Initial investigations show the results being of particular relevance to PT route planning, land use planning and proposals, parking management plans and work place travel plans.

It is considered PT accessibility should have an important influence on the future transport and land use planning of NZs urban centres, and the results of this research provide a significant contribution to this work.

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