

Accessibility Constraints Mapping for Walking and Public Transport in the Sutherland Shire

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1. Introduction

Accessibility is vital to the liveability of an area, its economic, social and environmental well being. The ability to obtain goods and services, participate in the workforce, interact with each other and undertake recreational pursuits is highly dependant upon accessibility. Council's through their infrastructure development, land use planning and social / community services have a major influence on accessibility, however information with regard to accessibility and its potential impact can be very limited. It is within this context that an accessibility constraints map (ACM) and index for walking and public transport modes was developed by Sutherland Shire Council using its existing data resources, GIS mapping and community survey capabilities.

The development of the ACM provides a basic but useful planning tool for Council that helps to identify areas where residents are most likely to experience greater difficulty and lesser opportunities in accessing key social needs such as health services, shopping, employment, education and recreational activities particularly, if they must rely on walking and public transport as their main mode of transport.

2. Background

In the Sutherland Shire the main mode of transport chosen to access key community needs such as health services, shopping, employment and recreational facilities is by the private motor car. The most recent data available from the NSW Transport and Population Data Centre estimates that 77% of all trips undertaken by shire residents in 2005 were by car and of these trips, 46% are made for distances of less than 5km.

The strong demand on private motor car use is further emphasised by the high level of car ownership. The Australian Bureau of Statistics 2001 Census data shows that approximately 38% of households in the Sutherland Shire owned 2 vehicles and 15% of households owned more than 3 vehicles, which is 8.5% and 4% higher respectively than for the Sydney Statistical Division.

The high use, ownership and dependence on the motor car in the Sutherland Shire however, masks a major underlying problem for the elderly, young, disabled and low income households where limited access to a motor vehicle can be a major constraint to access shopping, services, recreational and community activities. For these residents the feeling of isolation can be accentuated where alternative transport options are few and physical constraints such as hilly topography prevail. This and related transport issues were canvassed at Council's Older Persons Advisory and Access Committee Transport Forum in 2004 and it became apparent

that a better understanding of the constraints affecting accessibility was needed before a holistic solution to the problem could be further explored.

2.1 Older Persons Advisory and Access Committees Transport Forum

On the 19 November 2004 a transport forum was conducted jointly by Council's Older Persons Advisory and Access Committees. Together with key community and government stakeholders the aim of the forum sought to identify and prioritise actions that would help to reduce car dependence and improve accessibility for the mobility disadvantaged in the shire such as the elderly and disabled.

The forum highlighted that for many Shire residents not having a motor vehicle can preclude or limit their access to shopping, education, recreation and services, particularly if they are situated in areas that are distant from major centres and where few alternative modes of transport are available. Also, having limited access to a motor vehicle is not always voluntary but may be due to factors such as ill health, financial constraints or their car is being repaired.

In furthering this issue it was considered necessary to firstly overcome the fragmented and anecdotal information available. To undertake this task and to determine how accessible the Shire is for residents without a motor vehicle, Sutherland Shire Council's Environmental Science and Policy Unit was requested to undertake this research in conjunction with the Community Services Division.

3. Measuring accessibility

The need to better understand accessibility and its spatial constraints is complicated by the various interpretations of accessibility that exist in the literature and the highly technical measures used to describe and model it, Halden, Jones and Wixey (2005), Stradling et.al (2005), Berquin (1998), Pool and Hall (1997). The challenge faced by Council officers was how to best deliver information about the constraints affecting residents using public transport and non motorised transport modes, using existing data sources and resources. The method chosen was to develop an accessibility constraints map (ACM) that would provide a measure of accessibility for walking and public transport based on a number of key but easily measurable factors.

3.1 Methodology

To develop the ACM and measure accessibility by walking and public transport a number of key factors were selected based on the following considerations:

- The ready available data resources at Council,
- whether the data was easily measurable and regularly updated on Council's GIS,
- data cost,
- transferability of data with other Councils (with the future intention to develop a regional map)

- and whether it contributes to a reasonable appreciation of accessibility constraints affecting residents that choose to walk and use public transport.

The selected factors used are:

- Distance to a Bus Stop and Railway station
- Topography /Gradient
- Bus and Rail Service frequency
- Distance to a major and lower order centres
- Centre Hierarchy
- Presence of a Paved Footpath

In deriving an accessibility constraint value for each parcel of land in the Sutherland Shire an accessibility value was determined for each factor and given a score ranging between 10, the highest value (reflecting a high level and / or influence on access) and 0 (reflecting a low level of access and / or influence on access). The scores given were based on research literature and various data sources associated with travel demand management and travel behaviour. The value with regard to the level of service of buses was determined from the NSW Ministry of Transport's minimum service requirements for the bus contract areas.

3.2 Accessibility scores weighted by community input

In developing a measure of accessibility for walking and public transport it was considered important that the accessibility scores be weighted to reflect the community's opinion on what factor most influenced their travel decisions, for example, is topography more important than the distance to a bus stop or frequency of bus services?

To weight the accessibility scores a survey of shire residents was conducted. The survey program was developed in house at Council through a joint collaboration between Council's Senior Environmental Scientist and members of the Strategic Planning Unit. The survey questionnaire was administered using Council's in-house computer aided telephone (CATI) system and call centre facilities.

The survey required that residents choose between the importance of one accessibility factor over another. This means that with regard to walking, that a weighting value of 3.0 (out of a score of 10) for gradient for example reflects the relative importance placed on that factor over other factors such as the distance to centres, the provision of footpaths, and level of services at local or neighbourhood centres which may have a value of 2.5.

For each accessibility factor a weighting value was determined and then multiplied by the accessibility score to produce an accessibility "index". The accessibility index was then mapped for each parcel of land in the shire on the GIS.

3.3 Survey data collection

The survey was undertaken on Monday to Thursday evenings from August 19th to 26th 2005 between 5pm and 8:30pm each evening, with daytime call backs when requested by participants. Households across the whole of Sutherland Shire were chosen at random from the telephone directory White Pages.

Individuals in the household aged 16 years or more were selected at random using a “youngest person in the household” (aged 16 years or older) criterion. A total of 400 completed and useable surveys was achieved at the conclusion of the data collection campaign.

The data analysis was carried out by Council’s Strategic Planning Unit personnel using SPSS statistical analysis software. The sample of 400 respondents provided results at a statistical accuracy level of $\pm 5.0\%$, for a 95% confidence interval.

3.3.1 Survey results

Other than the level of service for public transport which showed a higher level of importance, the other accessibility factors such as the gradient, distance to centre, footpath provision and distance to bus stop showed a similar level of importance for residents across the shire.

Further analysis of the data was undertaken to determine if the survey responses varied on a suburb by suburb basis which may reflect local constraints such as topography, distance to centres etc., however, no significant variation was found. Similarly, the response from residents of different age groups was analysed, with only a slight variation in response found for residents aged 60 years and over. For residents aged 60 years and over the gradient, level of public transport services and provision of footpaths was only marginally more important than for residents aged less than 60 years.

4. Accessibility constraints map (ACM) – results

From the accessibility index data collated, an accessibility constraints map (ACM) was produced using Council’s GIS. An additional series of map layers was also developed showing the changing pattern of access on weekdays and weekends that reflect the change in number of bus and rail services. Map layers were also developed showing the difference in weighting of factors from shire residents greater than 60 years of age.

Across the Sutherland Shire the accessibility constraints map shows that accessibility by walking and public transport to services is greatest for residents that live within close proximity to the major centres, railway stations and the flatter ridge areas. The peninsula suburbs which have steeper topography, more limited public transport and provision of services than the ridge areas of the shire show a lower level of accessibility. However even at a local scale in the ridge areas, accessibility can also be seen to vary significantly where a combination of factors such as the lack of

provision of footpaths and distance to bus stops and level of public transport service can change within a short distance.

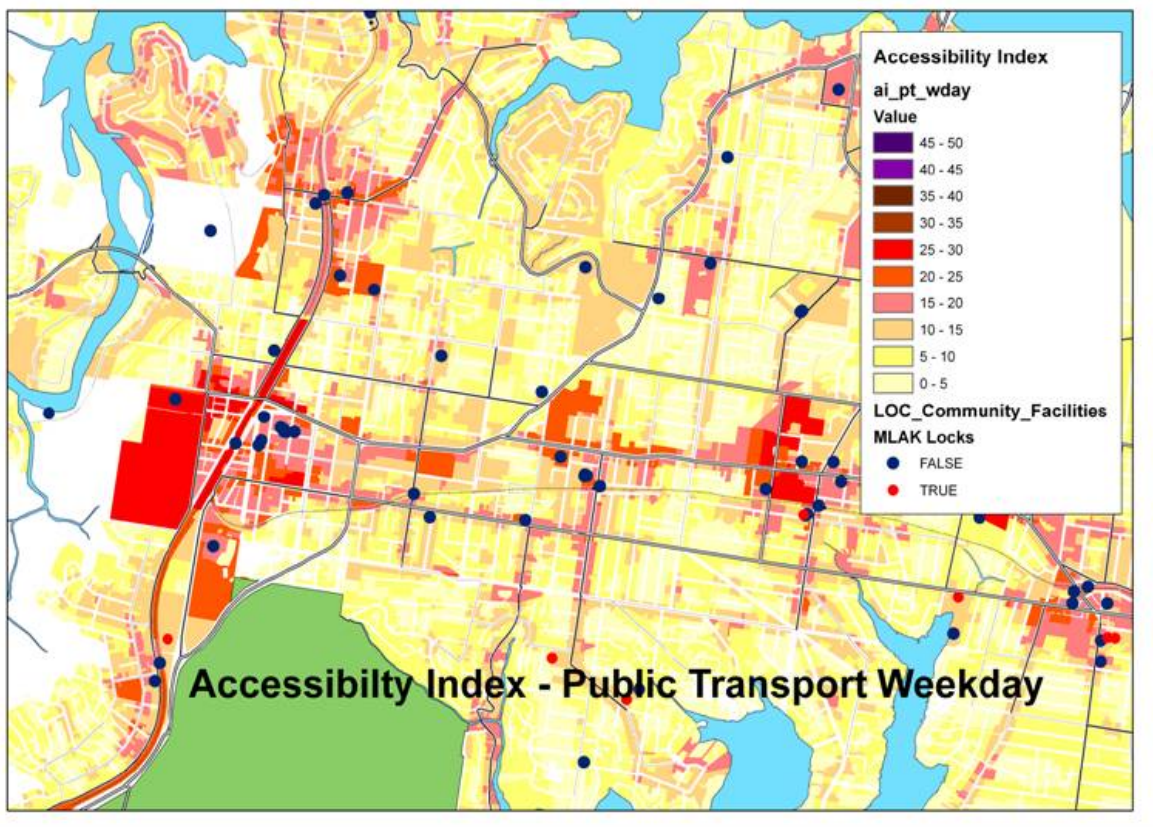


Figure 1 Accessibility Constraints Map for Public Transport and application for community facilities.

Figure 1 is an example of the application of the ACM and shows where the constraints to access public transport are greatest (the lower the index value (the lighter the colour) the greater the constraints influencing access). Figure 2 demonstrates the constraints influencing walking.

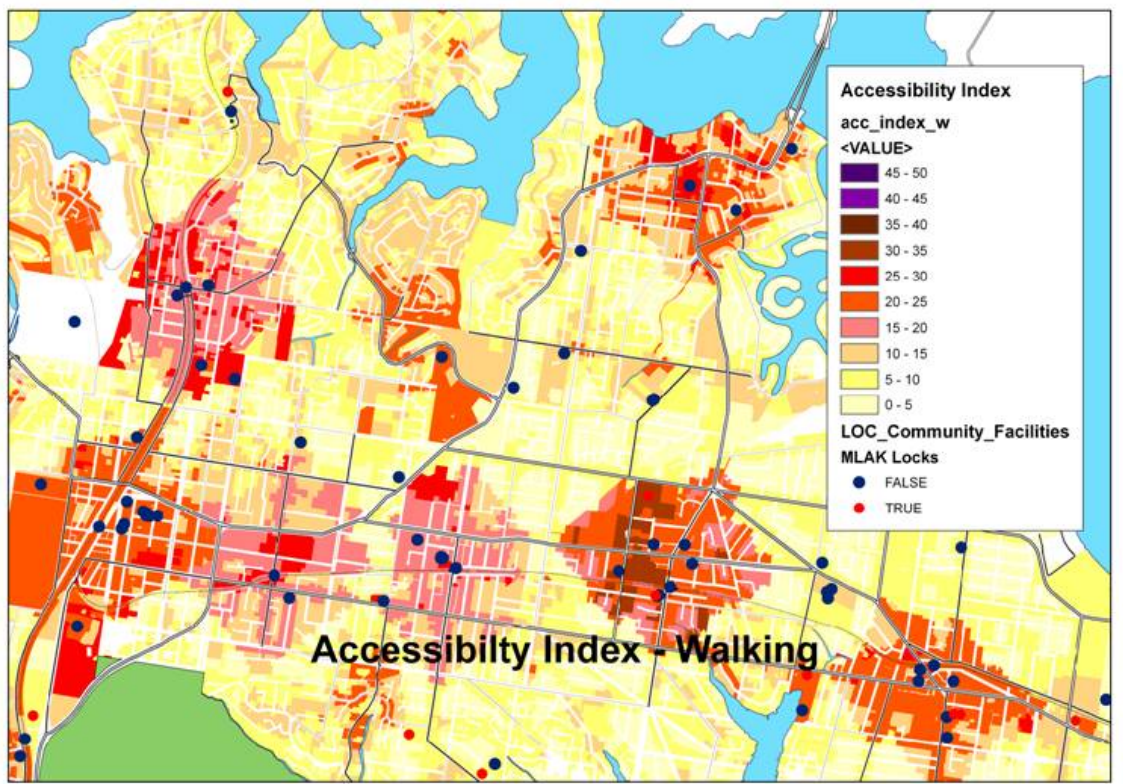


Figure 2. Accessibility Constraints Map for walking and application for community facilities

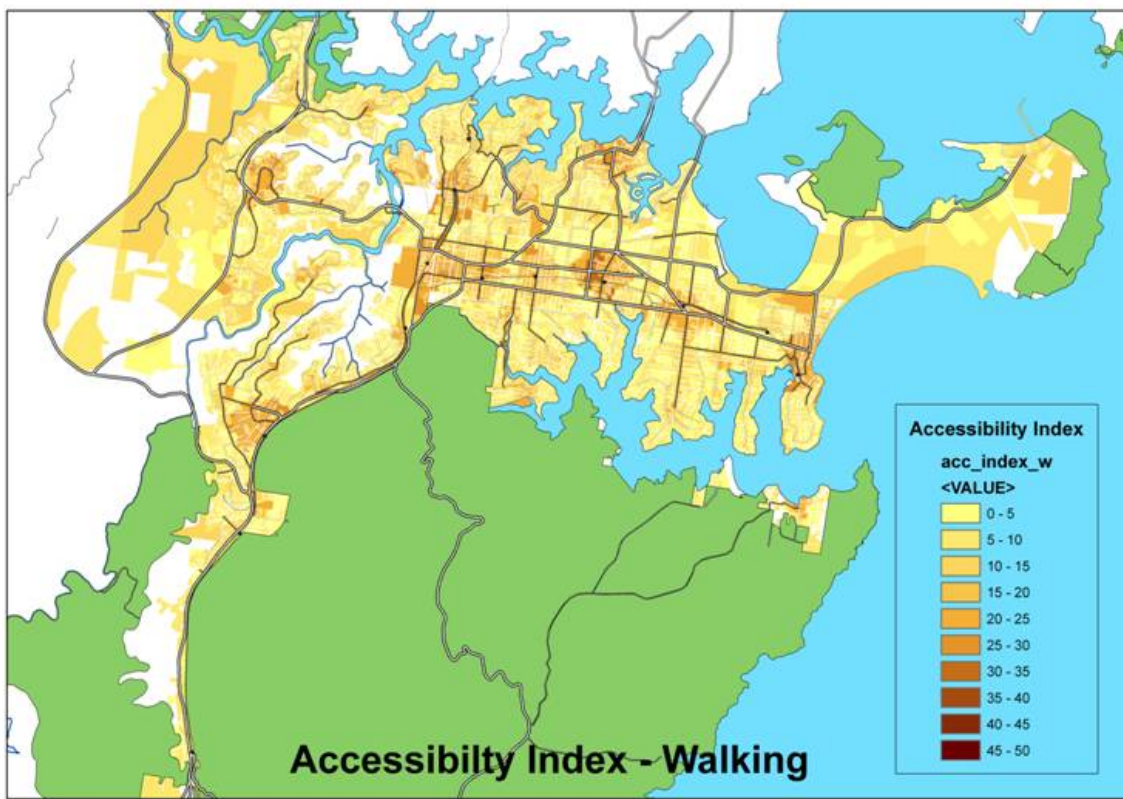


Figure 3. Accessibility Constraints Map for Walking

Figure 3. shows the application of the constraints mapping for walking for the local government area. As indicated the areas with least constraints are seen to occur around the town centres which are generally situated in flatter areas and have greater provision of supportive infrastructure such as footpaths.

4.1 Application of the accessibility constraints map

As a layer on the Council's GIS system the ACM is available for use within a policy and strategic planning context for various sections of the Council that includes land use planning, development assessment, plans of management for parks, provision of community facilities and services and in the development of transport infrastructure such as better targeting footpath and bus shelter construction.

The constraints map is also being used to inform discussions between Council and key stakeholders with regard to the development and provision of alternative transport options in areas of the shire where car dependency has occurred through necessity rather than choice.

Due to the model's simplicity the inputs of the model can be regularly and easily updated to reflect for example, changes in bus and rail services and provision of footpaths.

To address accessibility around the shire's main centres the methodology used could also be applied at the micro level with the inclusion of factors such as lighting, pavement condition, location of pram ramps, bicycle parking provisions and safety.

5. Conclusion

Until the development of the ACM little has been understood about how key factors such as topography, provision of footpaths, proximity to services, frequency of bus and rail services can influence the decision to use alternative transport to the motor car such as walking and public transport use. The development of an accessibility "index" and ACM has been pursued to better understand what is important to the community and whether in Council's endeavour to develop a more sustainable urban future its facilities, services, infrastructure and land use development is both appropriately located and supportive.

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