

Accessibility planning and accessibility modelling: a review

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Introduction

This paper reviews the Government guidance on accessibility planning with particular reference to the accessibility assessment (mapping audit) stages of the accessibility planning process. It then goes on to review the tools that are currently in use within local authorities and discusses how they have been applied to date, with the aim of informing the development of a tool that can be used to identify the areas and sectors that have high levels of social exclusion, and then facilitate the testing of policy options to assess the extent to which they meet user needs and increase social inclusion.

This work forms part of the scoping study on Accessibility and User Needs in Transport (AUNT) funded by the EPSRC Sustainable Urban Environment programme. The aim of the study is *to produce rigorous methodologies to develop and test sustainable policies and practices that will deliver effective socially inclusive design and operation in urban transport and the public realm from the macro down to the micro level*. The work is part of the University College London (UCL) contribution, which is a major element of the BAPTIST (Benchmarks And Policies Towards Inclusive Sustainable Transport) work package in the AUNT-SUE main project.

Accessibility Planning

In their report on social exclusion and transport (SEU, 2003), the Social Exclusion Unit recommended that accessibility planning be incorporated into the Local Transport Plan process. Government Guidance on accessibility planning was released in 2004, in time for incorporation in to the next round of local transport plans. Provisional Local Transport Plans are due to be submitted to the Government in July 2005, with the final version submitted in March 2006. These plans will cover the period 2006/7 to 2010/11.

According to the Government guidance (DfT, 2004) accessibility planning aims to reduce social exclusion by tackling accessibility problems due to, for instance, the cost, availability and design of local public transport services, the location of services and facilities, as well as problems related to the ability of the disadvantaged groups to reach public transport and non-transport services on foot and by cycle. In other words whole transport chain needs to be taken into account. The Guidance (op. cit.) stresses the importance of tackling “access to those opportunities that are likely to have the most impact on life chances”. These are listed as employment, education, health care and food shops.

The guidance recommends a process by which the Local Transport Authorities undertake accessibility planning. This process has five main stages:

1. Strategic accessibility assessment – this identifying priority areas and/or groups;
2. Local accessibility assessments – these look in more detail at particular areas, identifying local needs and objectives;
3. Option appraisal – identifying from a full range of solutions the most practical and beneficial sub-set of options;
4. Accessibility plan preparation – developing an action plan;
5. Performance monitoring and evaluation.

The guidance (DfT, 2004) emphasises the need for accessibility assessments to be carried out using a methodology that will provide consistency and comparability between areas. The mapping audits to be carried out as part of the strategic accessibility assessment and possibly as part of the local accessibility assessments would meet these requirements. The recommended methodology for these audits is laid out in the technical annex which accompanies the main guidance. The Government also commissioned MVA to produce a tool (Accession) which would help local authorities to produce mapping audits. It should be noted that the Government does not require local authorities to use the Accession tool.

The strategic mapping audit would cover a relatively large spatial area, (i.e. the local authority area) allowing problem areas to be identified relatively quickly with minimal costs for data collection and analysis, concentrating on spatial and temporal factors. Where data is available then information, physical, environmental, financial and safety factors should also be taken into account. Cross boundary issues also need to be considered (DfT, 2004). The mapping audit can be refined at the local accessibility assessment stage of the process to include a greater level of detail.

Having identified priority areas, groups and issues for action, the local authorities then need to identify a range of possible options (DfT, 2004). These potential solutions may not just be transport based but may also include non-transport interventions related, for example, to land-use planning. The options then need to be appraised for their impacts (both positive and negative). The impacts assessed should not just include the effects on the community being targeted but also on the wider community. An accessibility modelling tool could be used to model the impacts of options. However, the Government accessibility planning guidance (DfT, 2004) points out that travel time is not the only issue that should be considered and so the results of the accessibility mapping tool needs to be treated wisely. Barriers to implementation and value for money should also be assessed.

The local authorities are encouraged to consider a range of indicators. These include core indicators specified by DfT (DfT, 2004), the index of multiple deprivation, along side indicators developed locally. The core indicators are:

- Percent of pupils of compulsory primary school age within 15 and 30 minutes of a primary school by public transport;
- Percent of pupils of compulsory primary school age receipt of free school meals within 15 and 30 minutes of a primary school by public transport;
- Percent of pupils of compulsory secondary school age within 20 and 40 minutes of a secondary school by public transport;
- Percent of pupils of compulsory secondary school age in receipt of free school meals within 20 and 40 minutes of a secondary school by public transport;
- Percent of 16-19 year olds within 30 and 60 minutes of a further education establishment by public transport;
- Percent of people of working age (16-74) within 20 and 40 minutes of work by public transport ;
- Percent of people in receipt of Jobseekers' allowance within 20 and 40 minutes of work by public transport;
- Percent of households within 30 and 60 minutes of a hospital by public transport;
- Percent of households without access to a car within 30 and 60 minutes of a hospital by public transport;
- Percent of households within 15 and 30 minutes of a GP by public transport;
- Percent of households without access to a car within 15 and 30 minutes of a GP by public transport;
- Percent of households within 15 and 30 minutes of a major centre by public transport;
- Percent of households without access to a car within 15 and 30 minutes of a major centre by public transport.

Local Authorities are expected to set at least one target against either a core indicator or one of their own indicators.

Approaches currently used by local authorities

Accessibility measurement in the UK has been dominated in recent years by developments in the field of town planning. This has been driven by Government policy for an integrated approach to transport and land-use planning. In particular, Planning Policy Guidance Note 13 (Department of the Environment, Transport and the Regions, 2001) encourages local development plans that promote locations that are accessible by public transport, walking and cycling. The guidance also advocates “the use of public transport accessibility criteria for regionally or sub-regionally significant levels or types of development”.

Accessibility measurement and appraisal of transport policies are less widespread than in the field of town planning. Evidence of accessibility measures being used by transport authorities and executives other than simply to identify gaps in the public transport network is limited. A survey of Scottish organisations found that current practice of policy appraisal for integrated

transport relies mainly on qualitative techniques. However, 80% of the local authorities interviewed either made use of, or were in the early stages of, developing contour-type measures (DHC, 2000). In comparison, a survey of local planning authorities in Wales (National Assembly for Wales, 2001) found that twelve out of the nineteen planning authorities surveyed used quantitative methods to assess the accessibility of different locations. Nine of the twelve used isochrones around locations, four measured access to the public transport network and four measured either the quality or quantity of opportunities available within a given travel time or distance. Three-quarters of the local authorities only measured accessibility by public transport; very few considered all modes (for example, walk, cycle, car, PT and freight).

A number of local authorities, mainly within the London region, use the Public Transport Accessibility Level (PTAL) index to measure access to the public transport network (local accessibility). The PTAL index is a function of the walk time to a bus stop or train station and the average wait time at that stop. The closest bus stop and rail station are given a greater weighting than less accessible stops. Stops over a specified distance from the residential or other location are excluded. Several authorities are now including the PTAL measure into their development control policy (Hillman and Pool, 1997). The London Borough of Hammersmith and Fulham, for example, use the PTAL index to determine the maximum plot ratio (the ratio of the volume of development to the area of the site) to which a particular site can be developed. Standards for car parking provision are also varied according to the PTAL index and plot ratio (London Borough of Hammersmith and Fulham Council, 2003).

Buckinghamshire County Council and Wycombe District Council have linked parking standards and public transport accessibility to developer contributions. Public transport accessibility is banded into five zones of accessibility based on the number of people who can reach particular destinations within 35 minutes travel time, on peak hour timetables and frequencies, and taking into account walk times, wait times, in-vehicle times and interchange times (Wycombe District Council, 2002).

An increasing number of local authorities use the ACCMAP software to both calculate local accessibility using the PTAL system and network accessibility, measured by ACCMAP as total travel time along the network between an origin and destination, including walk time from the origin to the public transport stop, time spent waiting at the stop, on-board travel time, waiting at interchanges and time spent walking to the destination. Users of the ACCMAP software include the London Borough of Croydon, Surrey County Council, Cardiff County Council, Greater Manchester Passenger Transport Executive (GMPTE) and Northern Ireland DOE (Hillman and Pool, 1997; Wixey et al, 2004). As well as using the software to assess the accessibility of a new sports arena, LB Croydon has also used ACCMAP to assess the effects of a new tram service on accessibility and to plan mobility bus routes (Hillman and Pool, 1997). Cardiff County Council has used both PTALs and network accessibility functions to compare the changes in accessibility of fourteen different locations over a year (between 1998 and 1999) (Wixey et al, 2004).

Another package that measures network accessibility used by several local authorities is TRANSAM. TRANSAM produces travel time contours for a variety of modes (walk, cycle, bus, rail, and car) based on the lowest generalised cost route (Robbins, 1999). The model has been applied to Llanelli to test the impact of a variety of network improvements; to make recommendations for improving multi-modal access to a number of key locations in Basingstoke; and to model the effect of proposed cycle land improvements on journey times in the Horley, Crawley and Gatwick Airport area.

A number of rural local authorities (including Shropshire, Telford and Wrekin, Cumbria, Lincolnshire and Somerset) make use of SONATA (Social Needs and Transport Accessibility) developed by Steer Davies Gleave in the late 1980s during a project for Somerset County Council (Helm, 1999). Somerset County Council wanted an objective appraisal of its supported bus network following deregulation, in order to identify gaps in the network that might need additional support, to monitor the impact of service changes and to identify those services which were most valuable in meeting travel needs. SONATA uses a mix of social indicators and local surveys to assess travel needs. SONATA allocates total travel needs to specific journey purposes based on percentages derived from travel survey data. Different social groups have different needs in terms of types of journey purpose they need to make. Minimum access criteria are established for each journey purpose, for example, for the journey to work a Monday to Friday service with frequent departures before 9.00am is likely to be required. SONATA then determines for each location (or zone) whether the services go to appropriate destinations and whether those services meet the minimum criteria for time and frequency. This establishes for each social group whether their travel needs are met, unmet or partially met (services go to appropriate destinations, at appropriate times but are of insufficient frequency). Lincolnshire used the model to identify unmet transport needs across the county. However, they found that the model was too coarse to be used as a planning tool at the micro-level (Wixey et al, 2004).

City of Edinburgh Council (Halden, 2002) used accessibility analysis to measure the effect of road user charging on accessibility for both car and non-car users for different journey purposes and times of day. The model used 49 zones covering Edinburgh, the Lothians, and central Fife to produce a number of opportunity and value based measures. The results were used to assess the level of transport investment needed to maximise the benefits from the scheme to all sectors of society.

Transport for London have developed their own accessibility model, CAPITAL (Calculator for Public Transport Accessibility in London). As the name suggests it measures accessibility by public transport, taking into account walk access time, waiting time, in-vehicle time and interchange time. Walk access times are calculated along the road network (London Transport, 1999). This is an approach adopted by a number of accessibility models due to the lack of easily-available quality data on the footpath networks. The other most common approach used is to base walk times on Euclidean distance. This

approach has been adopted in the Accessibility Mapping Package (AMP) developed for West Yorkshire Public Transport Executive (WYPTE). AMP calculates the accessibility to opportunities using the bus network. Accessibility is based on single-leg trips only, and other public transport modes, in particular rail, are excluded; there are plans to incorporate these features in the future (Wixey et al, 2004). Both Transport for London and WYPTE are currently investigating with the University of Westminster ways in which their models can be adapted and improved to better represent the travel and activity needs of specific socially disadvantaged groups.

To date there are very few examples of models being used within local authorities which measure network accessibility by a variety of modes (public and private, motorised and non-motorised), taking into account the differing circumstances and needs of individuals. There are even fewer examples of these models being used to assess the effects of transport policy.

Accession

Accession, as mentioned above, is the accessibility planning software commissioned by the DfT from MVA and Citilabs. The programme covers accessibility by a variety of modes, including public transport (fixed and flexible routing services), car, walking and cycling (Citilabs and MVA, 2004). Journey time, cost and distance, or generalised cost assessments can be made. Though the extent to which it can do this depends very much on the quality of data available. The walk access/egress to/from the public transport network can be a function of straight-line distances or network distances (DfT, 2004b). The tool concentrates on movements along the road network (Thomas, 2004), thus handles pedestrian accessibility, i.e. due to things such as an inability to cross roads poorly. However, it should be noted that this is probably limitation of the data available rather than a limitation of the software. As well as network accessibility measures, accession can also undertake local accessibility analysis (e.g. PTALs) and calculate composite accessibility functions such as Hansen measures (see Hansen, 1959) (DfT, 2004b). The accessibility measures can be calculated for particular days of the week and times of day, for particular modes and for selected routes (i.e. those serviced by low floor buses).

Data sources for accessibility planning

As part of their role in providing Local Authorities with the tools and guidance needed to carry out Accessibility Planning as part of the Local Transport Plan process, DfT have assessed the availability of relevant data sources. These sources are listed in the document "Data Sources for Informing Accessibility Planning" (published on the accessibility planning web-site http://www.dft.gov.uk/stellent/groups/dft_localtrans/documents/page/dft_localtrans_025923.hcsp Dft,2004). The list below draws extensively from this document but also adds some other potentially useful sources that were not included.

The data required for accessibility planning and modelling can be loosely grouped into three categories – data on people, data on amenities and facilities, and data on transport infrastructure and operations.

Data on People:

- Census 2001 – population by age, sex, economic activity, cars/vans per household, long-term illness, disability. The data is available at the ward level and much of it is available for super output areas and output areas.
- Other sources of data on people could include social services (e.g. registered disabled, low income), the local education authority (e.g. children receiving school meals) the electoral register, local support groups, and commercial databases such as Experian. Although some of these sources could prove problematic either because they are confidential and/or because they are based on a poor sample.

Data on Facilities and Amenities:

- NeSS (Neighbourhood Statistics web site) run by ONS – this database contains the Census 2001 data but also some other important data sets. These include NHS doctor's surgeries (with opening hours); dentist's surgeries, pharmacies prescribing NHS prescriptions; schools, nurseries and further education colleges (excluding private establishments); and data on access to employment taken from the NOMIS database.
- The NHS and/or Primary Health Care Trusts should be able to provide information on Hospitals.
- PLASC (Pupil Level Annual School Census) provides information on pupils of school age and those in further education (excluding those in private schools). This data is available through the DfES or the Local Education Authority.
- Interdepartmental Business Register (IDBR) - the IDBR is a list of businesses, compiled from VAT, PAYE and other records. The data is viewed as confidential so access to this data may be difficult to obtain. Smaller companies may be missing from the register. An alternative is the valuation office data base currently managed by the Bartlett Graduate School at UCL. The IDBR could provide information on the number of employees at different locations. However, these are listed at the headquarters address not at the branch where they are employed.
- EXPERIAN GOAD retail database – this database lists shops and amenities in town centres and is being expanded to include out-of-town retail centres. Smaller retail centres such as district centres and shops not part of a centre are not currently included in the database.
- Business Directories – data from business directories such as the yellow pages can be purchased. The comprehensiveness and quality of the databases varies considerably depending on the purpose for which they were collated. Some Local Authorities compile and manage their own lists.

- Local Authorities may hold lists of facilities such as childcare, libraries, leisure and community centres.

Data on Transport:

- DVLA data – data on the number of vehicles registered by postcode.
- NaPTAN (National Public Transport Accessibility Network) – this database gives the locations of bus stops, railway stations and other access points for public transport.
- Traveline – for public transport routes and timetables.
- OSCAR – the Ordnance Survey geographic database for road networks. Note: this is gradually being phased out to be replaced with the ITN data. Both OSCAR and ITN concentrate on the road network, representing roads using centre lines for modelling purposes. This data may need to be supplemented for walk and cycle networks.
- Data on the location of drop kerbs, crossing points, barriers, bollards, etc. is not held in a central location. A few local authorities may hold this data in CAD or GIS systems.

A problem that would need to be given serious consideration in the development of any accessibility analysis tool is the lack of national data sets of the pedestrian and cycling networks.

Concluding remarks

Any tool developed to aid local authorities in the accessibility planning process would need to meet the requirements as set out in the accessibility planning guidance. In particular such a tool would need to be able to produce the indicators specified by the Government in the guidance, unless local authorities are prepared to use two separate tools.

Accession seems to provide all the tools necessary for local authorities to be able to carry out the mapping audits required as part of the accessibility planning process. However, it does not seem as if it is particularly geared towards helping local authorities with the third stage of the process – option appraisal. An accessibility analysis tool could be developed which helped local authorities to:

- a) Identify the full range of potential solutions available for tackling a particular problem;
- b) Model the positive and negative and wider impacts of each option;
- c) Help identify potential barriers to implementation of each option; and
- d) Assess the value for money of each option.

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