

The Use and Abuse of Accessibility Measures in UK Passenger Transport Planning

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Abstract

This paper reviews accessibility concepts and illustrates the use and abuse of these within UK practice. No single organisation is responsible for accessibility, but measures of access are used as a shared language to allow passenger transport service providers to communicate effectively with transport users and non transport service providers. The use and abuse of measures is derived from how effectively the indicators are used to support effective communication, or confusion, between people, places and service provision.

Using accessibility measures as the basis for dialogue and action, transport authorities and community partners are increasingly managing the organisational networks to facilitate access for people, adding a stronger human dimension to transport planning, and complementing well established roles managing physical passenger transport networks. The flexibility offered within accessibility planning continues to be abused, and many authorities have yet to find an optimal balance in the range, choice and calculation approach for indicators.

Introduction

Accessibility is a broad and flexible concept. Breadth and flexibility are its main strengths but also the main reasons why it is sometimes perceived to be confusing and sometimes abused in practice. Despite accessibility measures having been used in passenger transport planning for over 30 years, it is only in the last decade that a professional consensus has started to emerge about good practice (Halden 2009).

Accessibility is usually perceived as a secondary responsibility by most government policy departments. Supporting more mobility tends to attract the greatest priority in transport. Similarly in other policy areas the priority is to deliver more and better healthcare, education, employment, and so on. Access to healthcare, education and other services is recognised in policy, and sometimes even in statute, but each sector has lacked the internal capability to deliver a planned approach to improved access. In the UK, two cross sector reviews were particularly influential in helping to raise the priority of accessibility on policy agenda: one on land use planning and transport (Ecotec 1993) and the other on social inclusion and transport (Social Exclusion Unit 2003). The first of these reviews was prompted by the emerging debate on implementing sustainable development concepts across government, and helped to establish accessibility planning requirements within UK policy (Department of the Environment 1995). The second review embedded accessibility planning practice within measurement and management activity, and was prompted by a cross governmental policy shift to take more account of the distribution, geographically and across populations, of government investment and legislation (UK Treasury 2003).

This paper reviews the good practice with particular reference to UK procedures, highlighting some of the pitfalls and continuing challenges. Before discussing the lessons from practice, this paper briefly explores accessibility measuring concepts under three themes:

- What is accessibility in passenger transport?
- How can it be measured?
- Accessibility needs

What is accessibility in passenger transport?

At its simplest level, accessibility is the ease of reaching opportunities or the ease of being reached (Jones 1981). Accessibility is an attribute of people and goods rather than transport modes or service provision and describes integrated systems from a user viewpoint. Sometimes the transport system – e.g. a major railway station – is the destination of interest, but all accessibility measures define “ease of reaching or being reached” in terms of “who”, “where” and “how” (Scottish Executive 2000, Baradaran and Ramjerdi 2007):

- Who or what is being considered. Accessibility is an attribute of people or places.
- Where the opportunities are located - The land uses, activity supply points or resources (including people) that allow people or places to satisfy their needs.
- How factors separate the people and places from the supply points. These can be distance, time, cost, information and other factors which act as deterrents or barriers to access. Connections are broader than transport, and include communication systems that do not involve travel.

Before attempting any definition of accessibility in any practical application, it is important for users to be clear about whether it is the people, places, or connections that are of interest. In passenger transport the focus is often on connections, but increasingly it is common to look at the people and places being served by the transport. When looking at connections, often the focus has been on system capacity, but planning an accessible passenger transport system to maximise travel demand requires very different measurement techniques more related to user experiences of the system.

When considering people, accessibility is “the ease with which any individual or group of people can reach an opportunity or defined set of opportunities”. This is often referred to as origin accessibility. When considering places, accessibility is “the ease with which a given destination can be reached from an origin or set of origins” (SAMP 2005). This is usually referred to as destination accessibility, catchment accessibility or facility accessibility.

Considerable confusion has resulted from inconsistency about what is implicit and what is explicit in each type of measure. Organisations specialising in dealing with people or providing services such as employment agencies, health services, supermarkets, etc. tend to use very simple proxies (such as distance) for “how” and concentrate on the facilities available and the population characteristics within the catchment.

In contrast, passenger transport planning has concentrated in greater depth on the “how” with very little consideration of the “who” and the “what” (Derek Halden Consultancy 1999). People and opportunities have been considered within the planning of improved passenger transport

only to the extent that the characteristics of the people (e.g. physical disability or car ownership) or of the places (e.g. pedestrianised area) affect mobility and the demand for travel. Social and human goals have not been recognised in their own right, but tend to be viewed only when they are statutory or regulated responsibilities (e.g. disability discrimination legislation) or market goals (e.g. travel behaviour which delivers more demand).

The concept of 'mobility' is also often linked to discussions about individual rights and freedoms and continues to be surrounded by controversy (Jones 2009). Mobility is measured either in terms of the characteristics of the travellers: car ownership, physical disabilities, etc. or by the behaviour of these travellers: vehicle kilometres travelled, vehicle occupancy, passenger kilometres, or speed of travel. The main problem with the concept of mobility, and the reason why it has proved to be a controversial aim, is that it is difficult to say whether more or less travel is preferable, and whether more or fewer trips are better. More particularly, despite accessibility being a function of mobility, improved mobility does not always lead to improved accessibility (SAMP 2005).

In contrast, the concept of accessibility is almost always supported provided terminology is used clearly. Hansen (1959) notes that mobility is the potential for movement, whilst accessibility is the potential for interaction. Transport is largely a derived demand arising from the need for interaction rather than the need for movement.

How can it be measured?

The broad measurement framework is usefully defined by "ease of reaching or being reached" and the basic elements of accessibility are people, places and connections. However, there are several practical and conceptual obstacles to a detailed comprehensive definition of accessibility particularly:

- Clarifying if absolutes can be defined (e.g. "ability") and when comparatives are needed (e.g. "ease"). Specifically, what is "reasonable", what is "need", and how much choice is wanted?
- How to segment the population to reflect abilities and perceptions given that these are often specific to individuals or small groups.
- Ensuring a broad enough view of all transport and communications options, which reflects all aspects of modal choice, telecommunications, and quality in terms of speed, cost, prestige, security, comfort and other factors.

All practical measures of accessibility are therefore constrained by policies, goals and objectives. A detailed review of types of accessibility measures is provided elsewhere (Derek Halden Consultancy 2000, SAMP 2005, Geurs et al 2009), and for the purposes of this paper it is important to highlight two common pitfalls in measurement as follows.

Policies for citizens and consumer choices

In all real life situations account must be taken of what choice, if any, the "consumer" can exercise in obtaining the service or reaching the opportunity being considered, and whether the accessibility indicators need to recognise and reflect choice, or if the set of opportunities to be reached can be limited. Some opportunities can be represented simply as either being present or absent e.g. a post office. However most accessibility measures require the opportunities to

be sized, e.g. to consider the number of jobs in a zone, the floorspace of shopping, the capacity of the facility, and other factors.

It is also important to distinguish between opportunities which can be counted as a single set (e.g. General Practitioner health services) and opportunities that meet different needs (e.g. specialist hospital services). Jobs, schools, and other opportunities can often be treated as effective substitutes for one another if they are disaggregated to consider sub-groups or sub-markets e.g. primary schools. For opportunities that cannot be disaggregated into meaningful groups to reflect the choices available, e.g. access to friends and family, aggregation can be the best approach, e.g. considering access to major centres or to the total population.

Travel behaviour and the value of access

Ways of representing separation are multi-dimensional, and the deterrent effect of travel varies according to the trip purpose and people group. The accessibility measures should reflect to a sufficient degree of accuracy all relevant characteristics of access. This can be done in three ways. The connections approach measures the physical, monetary, travel time and other measurable characteristics of the journey. The behavioural approach uses the measurable characteristics of the journey in combination with the traveller responses to these characteristics. Finally the normative approach uses the measurable characteristics in combination with particular standards.

The normative approach is generally based on some non-transport assessment related to the competitiveness of a location or people group or on basic human needs. The behavioural approach seeks to assess the value of these needs as they are expressed through observed behaviour. The relationship with policy also defines the wider accessibility planning process within which each indicator is used as shown through international comparisons (Chapman and Weir 2008).

In the UK the normative approach includes community or social accessibility measures and these are common in policy, e.g. well established distance thresholds over which students are offered free school transport. They usually seek to set standards or targets for improving accessibility e.g. to increase the number of people within 20 minutes walk of a health centre. Although these are often set in the absence of behavioural research (Derek Halden Consultancy 2000) the most useful measures of community need are based on broader research of need to determine what might be realistic accessibility goals.

The behavioural approach has been approached both from the perspective of utility maximisation and social inclusion (e.g. Handy and Niemeier 1997). Various research projects have demonstrated that accessibility could be assigned a value i.e. the monetary "worth" of accessibility for the journey-to-work trip. However the application of such measures in practice is limited, since the advantages of greater objectivity have been outweighed by the disadvantages of lack of transparency (Halden 2002). As discussed below the benefits of planning access have been clearer evidence to support solution focused delivery partnerships.

A comprehensive representation of behaviour which explains all activities and preferences would potentially allow a more accurate analysis of accessibility, including the use of more sophisticated space time measures (Ashiru 2003). However despite considerable research effort

this goal is not likely to be achieved for many years, even with the current step change in investment taking place in simulation models through gaming.

There has therefore been a growth in activity to analyse behaviour from the perspective of social inclusion (Geurs et al 2009). In many situations this offers a more practical and affordable approach to consider the impacts and responses of people to changes in travel time and cost, the impacts of changing land uses, agglomeration effects, trip distribution changes from changes in the competitiveness of locations, perceptions of safety and security effects, travel information, and changes in traveller skills and capabilities. This has been the approach favoured in the UK with the intention that analysis of accessibility in any situation should be appropriate to the decision required. This has not always worked in practice and there has been much confusion amongst practitioners about what comprises an acceptable level of analysis (Derek Halden Consultancy et al 2008). This paper therefore reviews these experiences and proposes a new framework.

Measuring accessibility need

Accessibility need for passenger transport is defined in four main ways (Scottish Executive 2003):

- ***Expressed accessibility*** or revealed accessibility need – A need is revealed by observations of travel behaviour. This does not identify gaps in networks (since if there is a gap then people cannot travel and are not observed travelling) but it helps to benchmark social norms such as how far on average different people groups travel for shopping.
- ***Community accessibility***, social accessibility, or potential accessibility need allows standards of accessibility to be defined in absolute terms based on an assessment of society's expectations of basic needs. Different communities have different needs, and the term "option value" is sometimes used to describe the value a community places on accessibility even though it does not express this through use.
- ***Stated accessibility*** need can be different from community or comparative accessibility and it is important to consider since it affects the implementability of initiatives to improve accessibility and perhaps more importantly people's views often reveal needs which have not been identified or measured using other techniques.
- ***Comparative accessibility*** need looks at the distribution of access opportunities or accessibility gaps by people group and location. Comparative need can be assessed using expressed, community or stated measures and in practice common messages from all three approaches define how to close accessibility gaps to tackle social exclusion. For example Currie (2003) described comparative accessibility in terms of the 'Public Transport Needs Gap' within Hobart, Tasmania.

Passenger transport should offer comprehensive services for users to ensure that all people in society can access the opportunities and services they need, whether or not they have a car. The combination of the expressed and community measures help planners to assess whether or not a scheduled service is viable or whether an on-demand/demand responsive provision would be better value.

Stated and comparative accessibility assessments help to identify the practicality of delivery. Sometimes travel horizons are and comparative assessments reveal that a population is poorly served, even though the population consider their bus services to be good. In these cases the accessibility aims might be to raise expectations of people for greater travel to work and other activities as part of healthy working lives.

Collectively these four measures of need allow passenger transport planners to identify a level of network coverage, and standards of service consistent with the needs of users and potential users.

The uses and abuses of accessibility indicators

Three geographical levels are recognised in UK accessibility planning: site specific or very fine-grained scale neighbourhood; local and community level; and regional and national level. Before looking in detail at the practice within each of these planning levels, it is worth being clear about what is required at each level of planning and the definitions of use and abuse.

National government sets the policy and legislative context and in many cases provides at least a proportion of the funding for others to deliver plans. Some accessibility policies are defined nationally or in statute. Departments for health and education have statutory duties to ensure everyone can access their services. For transport, since 2004 there have been national and regional policies to facilitate accessibility planning by other central government departments and by local authorities. This includes ensuring good evidence is available, a key element of which is the publication of accessibility statistics (Derek Halden Consultancy et al 2008). One way of looking at this is that in the rather than simply being responsible for physical passenger transport networks, the transport authorities are also now responsible for the organisational networks to facilitate access.

The same themes are carried forward locally with local authorities being responsible for community and transport planning to ensure that the accessibility needs of residents in their areas are met. At the level of individual locations, accessibility planning by businesses and other organisations often involves working with local authorities under the context set by the local accessibility planning.

However cross-sector working around accessibility goals is an evolving area of practice and is vulnerable to mis-interpretation and abuse (Mackie 2008). In order to decide what comprises successful practice, we start from the theory above, that the purpose of accessibility planning is to help people, companies and agencies engage constructively to deliver practical solutions that improve access. Mobility has proved to be too controversial an aim under which to build engagement on transport issues, but accessibility measures at least have the potential to be used successfully.

However as a flexible area of delivery there is considerable scope for abuse. The examples below show that although accessibility measures can be used to show an improvement in access, e.g. a fall in travel time, there are many situations where a more thorough approach to analysis would in fact reveal the opposite conclusion, e.g. costs might have gone up by more than the benefits of the reduced travel time. A deliberately narrow analysis, with the aim of tactically misleading others, is a common approach to abuse (e.g. as shown for reporting of

access to employment and markets in SACTRA 1999). However there are also many situations where incomplete or inaccurate analysis still leads to constructive outcomes.

Given that completeness and accuracy are relative, rather than absolute, concepts it follows that use and abuse are often viewed subjectively in terms of fitness for purpose. It was noted when piloting accessibility planning in the UK (Derek Halden Consultancy and University of Westminster 2004) that sometimes inaccurate indicators were as helpful as accurate ones in improving the capabilities of partners to work together; for example if they were effective at stimulating a progressive dialogue that leads to action.

Overall, if the purpose of accessibility planning is to improve access for people to opportunities, then the successful use of measures is best defined by changes in the capabilities of parties to work together to improve access.

National indicators

National indicators of accessibility provide a consistent approach to measurement across the country but are restricted in scope to factors for which consistent data is available covering every part of the country. In recent years national data availability has been growing rapidly and there is scope for national measures to develop further, but to date UK national indicators are limited to consideration of travel time between people and eight destination types.

UK national indicators represent the transport system in detail including each scheduled passenger transport service, and congestion on the road network. In the UK indicators, travel times from local neighbourhoods to eight categories of destination are calculated annually. The results are presented in a wide range of ways so that most users should have an indicator that meets at least some of their needs (Derek Halden Consultancy et al 2008). National government plans some services nationally and others are planned locally. Relevant indicators for any application can be downloaded from UK national statistical data publications. The assumptions and presentation of the indicators are summarised in Tables 1 to 3.

Table 1 – Input Data for UK National Accessibility Indicators

Trip purpose	Destination Data Source	Origin Data Source
Employment	Number of jobs by location from national annual business inquiry	Annual neighbourhood population and car ownership estimates and number of people on Jobseekers Allowance from benefits office
Education – primary schools, secondary schools and further education colleges	School and college locations from national education databases	Census of students of school and college age including
Health services	Ordnance survey hospital and GP location data	Annual neighbourhood population and car ownership estimates
Shopping	Commercial retail locations database	Annual neighbourhood population and car ownership estimates
Town centres	National retail hierarchy planning data	Annual neighbourhood population and car ownership estimates

Table 2 – Calculation Parameters for UK National Accessibility Indicators

Network	Data	Parameters
Public transport/ walk network	Roads and footpaths to define walking network from Ordnance Survey digital network.	Maximum walk distance of 2km to a service or bus stop. Walk speeds of 4.8km/hr.
	Public transport network - NPTDR database of transport services	Minimum journey time that involves boarding a bus 10 minutes. Journey times for 23 half hour time periods calculated with early arrival of up to 30 minutes permitted. Representative time calculated using weighting factors in Appendix B Table B1. No limit on interchanges, but minimum 10 minutes allowed for interchange between arriving and departing services
Cycle network	Road network from ITN	Cyclists are banned from motorways. Cycle speeds are 16km/hr where cycling is permitted and on lanes/footpaths cycle speeds are 4.8km/hr
Car network	Road network from Ordnance Survey digital network	Minimum journey time 5 minutes. Average peak and off peak car travel speeds derived from national road link speeds based on monitoring of vehicle fleets fitted with GPS units. This measured data has been progressively replacing default link speeds by type as the new data has been becoming available since 2009.

Table 3 – Indicator Types in UK National Accessibility Indicators

Component	Description	Approach
Deterrent effect of travel time	Continuous measure	This takes the value of the opportunity and divides it by the exponential of a weighted value of the travel time. Calibration of the weighting parameter is achieved using observed behaviour from the National Travel Survey Data. The indicator is calculating by summing all of the opportunities using as follows $\sum Oe^{-\lambda t}$.
	Threshold measure	Opportunities are published at two travel time thresholds. These thresholds are defined so that the opportunities can be more easily understood by lay users. The thresholds were informed by data from the National Travel Survey Data but based on discussions very approximately
Frequency score	Likelihood of travel time used in the indicators being achieved for trip	Public transport frequencies and road congestion varies throughout the day. Travel times are calculated at half hour intervals and weighted profiles are used in the travel time and frequency analysis. The frequency score is the proportion of the time that the journey time used in the indicators will be achieved.
People and Places	Origin	Destination measures showing catchment populations e.g. number of people in the catchment for hospitals.
	Destination	Origin measures show the choice of destination for all trip types e.g. the number of jobs accessible or the choice of further education colleges accessible.

Since accessibility is a function of both opportunity and transport deterrence, accessibility measures can be expressed in either the units of the opportunity (e.g. number of jobs or people) or the units of the transport deterrence (usually time or generalised cost). Once travel times from each neighbourhood to each popular type of destination have been calculated it is relatively straightforward to manipulate the results into the most useful form for accessibility planning.

The data bank for each year since 2006 includes 156 different indicators each published at neighbourhood, local authority and transport authority level, making 468 different types of indicator. File sizes are also quite large for the neighbourhood indicators with results being shown for over 45,000 neighbourhoods across the country. Faced with such a massive databank many users have found difficulty navigating the national information (Atkins 2007, I&DEA 2010), which when combined with the flexibility available in the use of the measures has resulted in widespread abuse including the following:

- National measures are adopted by local authorities within their local transport plans without questioning whether the assumptions are relevant. National guidance (Department for Transport 2004) encourages local authorities to set locally specific targets where possible.
- Some regional offices of central government departments have required inappropriate local targets to improve accessibility. One example has been regional jobs accessibility measures which instead of being targeted appropriately at parts of relevant local authorities in the region have been applied to all parts of all local authorities in the region.
- Planning decisions have been made for new land use developments without sufficient thought about what indicator might be relevant or useful. In some cases national indicators have been used tactically, to make the case for a development look artificially strong or weak.
- Threshold indicators have been inappropriately used to suggest that no action is needed and that some national “standard” has been achieved (i.e. 99% of people are within 20 minutes) rather than to identify opportunities for improvement.

In order to improve the range of data sets and quality of the data, and to develop improved understanding of the national indicators, each data set has been made available for comment and editing by local stakeholders since 2009. It is intended that within a few years it should be possible for each link in the network, and each origin and destination, to be edited by local communities to identify any accessibility barrier, from security issues such as poor street lighting, to the availability of information at bus stops. In the future it might be possible with effective moderation of this crowd sourced data to publish accessibility data covering a much wider range of factors.

Composite utility based measures have also been calculated but not published. The recommendation of the work was that these indicators could be used to monitor the changing value of accessibility to the citizens of the country (Weibull 1980, Halden 2002).

Despite the problems with the national measures, the availability of this national capability has allowed national policy and planning decisions to take account of accessibility. Using the

national analysis of England, Scotland and Wales based on digital road network data and electronic public transport timetables (Derek Halden Consultancy 2007, Derek Halden Consultancy et al 2008) analysis has been undertaken to support decisions including:

- As part of the liberalisation of the market for pharmacy services, the Department for Health investigated travel times to pharmacies and dispensing GPs for car and non car available trips. This informed an investment programme to support pharmacies, where closures might have otherwise adversely affected accessibility.
- The Legal Services Commission planned travel times to eight categories of legal aid service across England and Wales to ensure that when commissioning services, the providers were located in accessible locations for car and non car available trips.
- When considering rural post office closures across England the department for rural affairs (DEFRA) used travel time data by public transport to rural post offices.
- Travel times to rural services are monitored annually for the State of the Countryside report (CRC 2010) including free cash machines, pubs, post offices, grocers, services included in the core accessibility indicators.
- In order to assist in decisions about the location of courts the Department of Justice used analysis of travel to inform decisions on investment and closures.
- The National Consumer Council used analysis of the locations of cash machines to identify locations where citizens only had a pay per use facility available. They then used this to negotiate with the banks for over 600 additional cash machines to become free to use.

The Department for Transport plays a facilitating role, liaising with these and other departments to ensure that cross governmental accessibility aims are being delivered. There are not only social inclusion benefits from ensuring that non transport departments locate services in accessible locations. If people need to travel further, then there could be significant increases in travel demand. Further research is needed to establish the impacts of these policy decisions but the limited analysis undertaken so far indicates that the changes in planning for free cash machines saved an equivalent of over 500million vehicle km per year. The collective impacts of the above national accessibility planning activities may well be very significant for UK transport.

The indicators are also increasingly used by other organisations to improve the debate on transport policy. For example, a lobby group has used the indicators in their sustainable cities index (Forum for the Future 2008-2010) to show that in some places local access opportunities are rising and in others they are falling.

Local accessibility indicators

Confusion between policy, targets, monitoring and planning has been a major obstacle to better use of local indicators. Whilst accessibility measures can be used to build practical delivery partnerships, a far more common approach has been to set accessibility indicators without any clear set of actions to deliver the policy (Preston and Raje 2007).

There have also been major weaknesses in the accessibility measures themselves used in local planning including:

- Few indicators used in practice have included forecasts of accessibility. Even where land use and transport models are available, it is rare for accessibility indicators to be output from these models.
- Most calculation of local accessibility indicators has considered access to public transport for only one time of day. Given that most of the access problems are in locations with infrequent bus services the indicators calculated are not considered to be useful by many (I&DEA 2010).
- Most authorities use threshold indicators to aid understanding but when applied in policy this leads to anomalies. Thresholds are seldom justified and behavioural thresholds are very different in rural areas from urban areas. Also travel horizons and other capabilities of travellers vary across the country. Managing the trade offs between transparency and robust analysis continues to be a developing skill for accessibility planners generally (Straatemeier 2008).
- There are few examples of a comprehensive treatment of barriers to access being considered as recommended in the guidance for local transport plans (Department for Transport 2004). Such wider considerations are generally only made for individual sites as discussed below and shown in Table 4.
- Although Public Transport Accessibility Levels (PTALs) (Kerrigan and Bull 1992) can be used successfully to rank locations by the walk time to different categories of bus route, they have mistakenly been used as a proxy for access to services (David Simmonds Consultancy et al 1998).

In many authorities there are targets to increase the % of households within x minutes of a service such as GP, but only a few have set out clear policies on how to influence the priorities of non transport partners to affect sensitive parameters such as the location of the services. It is difficult to provide viable public transport to serve poorly located services so influencing location choice is very important. Encouraging accessible location choices has become more difficult in the UK in recent years, with growing cost and funding pressures on organisations and a narrowing of accountability within management structures (Social Exclusion Unit 2003). National organisations like post offices or banks can reduce internal costs by servicing the population from fewer sites, since transport costs are generally external to their operations. Given the much greater impact of destination location changes on accessibility, than from public transport investment, usually enhanced passenger transport services cannot then be afforded or delivered to compensate for these changes (Derek Halden Consultancy and University of Westminster 2004).

Table 4 – PT Accessibility Measures in Travel Plans for Sites

Category	Factor
Time factors	Walk time, cycle time, drive time, wait time Journey times and scheduling of services by time of day including evening, and day of the week including weekend. Time budgets available to each population group for each trip type
Cost factors	Public transport fares Affordability for the people concerned
Reliability	Uncertainty about journey times Uncertainty about journey quality e.g. availability of a seat
Security/ safety	Real and perceived safety accessing PT Risk of traffic injury Risk of assault/abduction Confidence in safety of travelling environment
Quality	Comfort of waiting areas and vehicles Attractiveness of walking routes to access PT Assistance and helpfulness of staff Support services when travelling e.g. catering Privacy and experience when accessing PT Independence and need for assistance
Comfort/stress	Shelter when waiting for public transport Shelter from weather/exposure to wind on walking routes Effort required to access public transport
Information and booking	Information availability from which to plan journey Information about walking and cycling routes Information about parking at or near the stop/station Time spent planning and booking journey Availability of information during journey
Complementary factors and lifestyle	Ability to socialise when travelling to stops and stations Legal and insurance protection (tends to be lower for walkers than those travelling in vehicles) Time budget limits for travel Need to carry goods/accompanied by children Non transport costs e.g. clothing, equipment, umbrella Health factors such as air quality and calories used when walking

Local transport authorities have often resorted to a campaigning role using anecdotal accessibility evidence (e.g. such as the impact of a closure on a person or place), rather than using their statutory accessibility planning function with relevant accessibility measurement, to pre-empt potential problems, and secure both transport and non transport facilities needed to maintain accessibility (Department for Transport 2004).

A minority of local authorities that have been more proactive have demonstrated multiple benefits in sustainable local economies, reduced emissions from transport, social inclusion and increased transport investment (Nottinghamshire Council 2010, Cairns et al 2010).

Perhaps the most successful area of local accessibility planning has been investment in public transport information, but few authorities have used or abused measures of accessibility

information in order to make their plans. They have instead relied on closing some of the most obvious gaps in passenger transport information systems including developing investment plans with accessibility planning partners in health services (patient travel information services), education authorities and employment agencies (e.g. workwise schemes). Increasingly ICT substitutes and complements travel options in providing access for people to opportunities and many transport professionals have found that accessibility planning has proved to be an appropriate policy framework within which to deliver informed traveller and e-working and shopping programmes.

Probably the most common abuse has been in the handling of land use planning applications. For example the developer of an out of town superstore will present accessibility indicators which suggest an improvement in access based on the presence of the additional facility. However a forecast of the consequences of the development might show that due to competition all of the other stores in the area would close leading to an overall fall in accessibility. The accessibility indicator used by the developer might be accurate, but it would have been abused in practice.

Site specific indicators

By far the widest and most effective use of accessibility measures have been in planning access to particular local facilities or sites. Generally very simple measures are used including:

- Walk/cycle times to a local shop, health centre or other facility
- Number of people within the catchment for a site such as 10 minutes travel time of a proposed supermarket.
- The ratio of car travel time to PT travel time.

As with local planning more generally, forecasting and feedback loops into land use change have generally been lacking.

Success in influencing location decisions for major planning applications such as for new hospitals is widely reported (Atkins 2009) but there are still many more planning decisions made without effective consideration of accessibility (Halden 2009).

Table 4 summarises the main accessibility indicators used in travel plans for particular locations. These are largely stated indicators based on surveys (e.g. employees affected by a travel plan).

Although these measures are presented separately it should be noted that eliminating one barrier will not improve access if other barriers remain, so a change in any one measure should not be assumed to necessarily be an improvement in accessibility. When using accessibility measures for any site it is usually necessary to look separately at the factors by people group. For access to public transport to be improved, all relevant barriers for the people group being considered need to be overcome. However, people's needs do not easily fit within narrow management structures, so making progress depends on the ability to source funding from multiple sectors to tackle all of the barriers. This can present significant practical barriers for delivery since most funding is managed within narrower programmes.

Good practice planning passenger transport accessibility

One area where some success has been achieved in cross sectoral planning of access improvements has been planning end to end journeys for customers including safe routes to passenger transport. Not only is partnership working necessary for delivery, but the range of solutions covers, engineering, marketing, security, information and many other issues (Rye 2002). The progress which has been made on safe routes (Derek Halden Consultancy 2008) has involved joint working amongst: train operating companies and track authorities, British transport police and local police, transport authorities and PTEs, roads authorities, bus operators, rail passengers representative groups, special interest and campaign groups, social enterprises able to facilitate volunteers for delivery and national authorities.

Compared with the planning of other end to end journeys such as safe routes to school or safe routes to other facilities such as hospitals, there has been less community involvement in safe routes to passenger transport. Safe routes to bus stops is still developing as a concept, but safe routes to stations is well established as a means of identifying all of the barriers faced by travellers and identifying how to tackle them.

Checklists of accessibility indicators can be used to measure factors such as: signing of paths, pedestrian crossings, removal of hazards within the immediate vicinity of the stop, creation of the necessary protected access space, surface treatment including drainage, shelters, seating, lighting, visual information, tactile paving, raised kerbs, passenger information, crossings across carriageways to reflect pedestrian desire lines, pedestrian guard rails, real time passenger information, and emergency public telephones.

Evening and weekend public transport networks not only have different service patterns but have different constraints for ensuring accessible end to end journeys. Barriers can be quite different for seven time periods which each need to be considered separately: weekday commuting, weekday other, weekday evening, Saturday daytime, Saturday evening, Sunday daytime, and late night services.

A new framework for accessibility measures

It was highlighted above that there are four types of accessibility need: expressed, stated, community and comparative. Current policy includes all of these in some way, but a more coherent framework is needed to improve clarity to the use and applicability of each measure.

Table 5 outlines a possible framework to describe some of the most important trip purposes, and draw together the accessibility measures that have been applied at some level in UK practice. The national analysis tends to be restricted to community and comparative measures of travel time, but most of the other measures have been applied for individual sites or policy evaluations covering local areas. All levels of analysis would benefit from reporting within a more comprehensive framework.

It should be recognised that:

- There are no absolute standards of access that can be defined, but it is reasonable for any population experiencing accessibility problems to expect improvements.
- Setting absolute standards of access under any category can lead to greater exclusion than setting relative standards (Orr 2005).

- Expectations of society move on, so perceptions change and generally rise particularly for some sections of the community.
- Low income groups make trips on a similar frequency as for high income groups so frequency of travel is a good indicator of need across all groups of society.
- Lower income groups spend more time than higher income groups travelling for shopping and personal business (the largely market based services), but spend less time travelling to work and education. Low income groups spend less time travelling for sport and leisure activities

The very large potential number of people groups and ways that they access the transport network for each trip purpose can become unmanageable. A successful approach to segment the population appropriately needs a clear focus on practical deliverables. There might be hundreds of problems, but there are probably only a handful of solutions needed to tackle all of the problems. By successfully identifying the most important barriers for a single user group and trip purpose and delivering improvements to overcome these barriers, there is then a platform to move forward and tackle the next problem of another group.

Conclusions

Measuring accessibility is intended to provide greater transparency about a key transport goal which has often been ignored in passenger transport planning. However the plethora of potential measures can be perceived as confusing. This paper explains that the uses and abuses of accessibility measures reveal a clearer typology of measures which may help to overcome past difficulties. There is therefore growing international interest in the lessons learned from early adopters of accessibility measures (Tennoy 2007, Chapman and Weir 2008).

Perhaps the clearest overall conclusion of this review is that planning transport using accessibility measures offers the potential for a new dimension in problem solving (Jones 2009). With the growing challenges of sustainable development, complexities in transport and electronic networks, and fast changing lifestyle choices, accessibility measures offer a new more flexible range of tools for planning and managing passenger transport.

The level of detail at which accessibility measures are used depends on the application. For individual locations, all relevant accessibility factors need to be considered for robust decisions, but at a national level a narrower treatment using only social and comparative travel time measures can be sufficient. Local authorities look both ways towards the national frameworks, and also towards the needs of individual locations, and have yet to find an optimal balance in the range, choice and calculation approach for each indicator.

The policy context is constantly changing in most countries, including the UK, and the prominence given to accessibility goals will vary over time. The future role of accessibility measures depends on their ability to improve the capabilities of those involved in making accessibility improvements, so that passenger transport provision fits better with the needs of citizens and consumers.

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