YORKSHIRE & HUMBER ACCESSIBILITY CRITERIA

GENERAL GUIDANCE ON MEASURING ACCESSIBILITY

Final Report - April 2005

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1. INTRODUCTION

Contents Of This Document

The aim of this document is to explain in a straightforward way the role and application of accessibility methodologies, criteria and standards. It is a user manual for more general use and has been designed to be more easily understood by those less experienced in the theory and methodology of accessibility planning.

This document aims to provide greater clarity and awareness about the availability and dissemination of data, and on how the information obtained can be used to influence and achieve public transport improvements.

Sections of this document were originally written in 2002-03. Since then, the Department for Transport have issued Guidance on Accessibility Planning in Local Transport Plans. Where relevant, sections of the original text have been modified to take into account the DfT's guidance, while retaining a focus that is specific to land use planning needs and issues in the Yorkshire & Humber region.

Sections of the original document have also been updated or modified where necessary, to take into account changes that have occurred since, or which are expected to occur. Some of the terminology has also been modified so that it corresponds with the terminology used by the DfT.

Two related documents have also been produced in association with this exercise:

- *Technical Guidance On The Use Of The Criteria Tables*, which provides clear and detailed guidance on the use of public transport accessibility criteria as presented in tables 7.1 and 7.2 of the revised RPG for the Yorkshire & Humber region.

- A report on the DfT's Accessibility measuring software *Accession*, which analyses its strengths and weaknesses for use in measuring accessibility for land use planning purposes in the Yorkshire & Humber region.

Chapter 1 Introduces this document, and sets it in context

Chapter 2 Describes accessibility methodologies and techniques

Chapter 3 Discusses issues relating to accessibility

Definitions

According to the DfT, **Accessibility** is the ease with which an individual can access services and facilities that he or she needs or desires. It also describes the catchment characteristics of a given location. A range of factors impact upon accessibility. These include:

- travel time;
- cost of travel;
- location of facilities and services;
- method and timing of service delivery;
- fear of crime;
- knowledge of available travel and service choices; and
- travel horizons.

Accessibility indicators are used to quantify accessibility and assess the ease with which a given population, population segment or community can access one or more services from a residential or other location using one or more modes of transport.

Criteria: refers to the **factors** by which accessibility is judged. An example of criteria could be *maximum walk access distanc*e, or *the minimum frequency of bus services*. The factors would simply be *walk access distance* or *frequency of bus services*.

Standards: are what the criteria are judged against. For example, the acceptable standard for *maximum walk access distance* will vary depending on what accessibility is being measured for – the maximum acceptable distance for access to a bus stop may be 400m, and for access to a rail station 800m.

Methodology/Method: is a system of ways of assessing the criteria – for example, the PTALs (Public Transport Accessibility Levels) methodology, which looks at walk access to the public transport network, and the frequencies of public transport services available.

Measure: is the unit or level, for example the actual walk time to the bus stop expressed in metres.

Tool: is any device employed to assist with the process of measuring public transport accessibility – for example, a Geographic Information System (GIS).

Indicators: are data used to measure accessibility – for example, census information such as the population or the number of unemployed people.

Facility: a destination that people want to get to. The Social Exclusion Unit report *Making The Connections* identified four key facility types that accessibility should be measured for – health facilities (hospitals, GPs) education facilities (primary and secondary schools, further education establishments), jobs, and food shopping.

Catchment: an area served by a destination. The destination can be anything from a facility to a railway station or bus stop.

Travel Horizons: The maximum distance/furthest location people are willing to travel to from their home.

What the DfT's Guidance on Accessibility Planning Means for Planning in the Yorkshire & Humber Region

Although the DfT's *Guidance on Accessibility Planning in Local Transport Plans* is primarily aimed at transport practitioners and on assisting them to produce accessibility strategies for the next round of LTPs in 2005, it is clear that this attempt at a more systematic approach for identifying and tackling the barriers that people face in accessing jobs and key services is also core to the work that land use planners have been doing and will be expected to do in the future.

Accessibility planning encourages transport practitioners to work in partnership with other local delivery agents, particularly those in the land use planning, health care, education and welfare to work sectors, and stresses that accessibility planning is not just about improving transport but about ensuring that jobs and services are delivered where and when they are needed.

Clearly, this has great relevance to land use planning authorities preparing development plans, as it relates directly to the measurement of the ease of getting to and from different land uses by sustainable travel modes.

Links between Accessibility Criteria, Transport Assessments, Travel Plans and Parking Standards

There are close links between these three subject areas and accessibility analysis, and a signficant amount of overlap between them. Anyone with experience of this type of work will already possess many of the skills required for accessibility analysis.

Transport Assessments (formerly Traffic Impact Assessments) may be thought of as detailed versions of Accessibility Analysis. They are used to identify movement issues associated with major trip-generating development proposals, and are often an essential prerequisite for the award of a planning consent.

As well as covering micro-accessibility matters such as pedestrian and cycle-friendly access on and around the site, and the provision of infrastructure such as bus shelters and ramps for the disabled, they include a significiant amount of more general analysis on the accessibility of non-car users to the site.

Travel Plans (formerly Green Travel Plans) are location-specific strategies for improving access by non-car modes. They include a significant amount of analysis on the accessibility of staff and visitors, although up until now such work has not been explicitly referred to as 'accessibility analysis'.

Parking Standards are closely related to accessibility, and maximum parking standards are often set as the result of an accessibility analysis of a particular location. For example, if the location is in the city centre and has a very high level of accessibility by public transport, the site may have a correspondingly low maximum level of allowable parking. For more detail refer to Planning Policy Guidance Note 13 (PPG13) and the specific parking standards in the Yorkshire & Humber Regional Spatial Strategy (RSS).

2. TYPES OF ACCESSIBILITY MEASURE

Introduction

There are several different ways of considering accessibility for public transport, which affect the types of methodologies which can be used. These include:

- Accessibility from a location to public transport services (e.g. PTALs)
- Accessibility using the public transport system to activities and opportunities such as jobs, education etc. (Destination and Origin Accessibility)
- Comparison of accessibility by different modes (e.g. Accessibility Ratios)

Accessibility methodologies can differ in what they try to measure, and care is required when choosing which methodology to use, and the way in which it is used. Remember also that accessibility methodologies are only indicators, and that none can fully express the detail of 'ease of reaching an activity at a distant location'.

It is important to remember that accessibility works in two directions - accessibility of residents **to** facilities (the number of work, retail, leisure etc opportunities available to householders), and the accessibility **of** facilities to people (the number of people with access to one or more facilities).

Types Of Measure

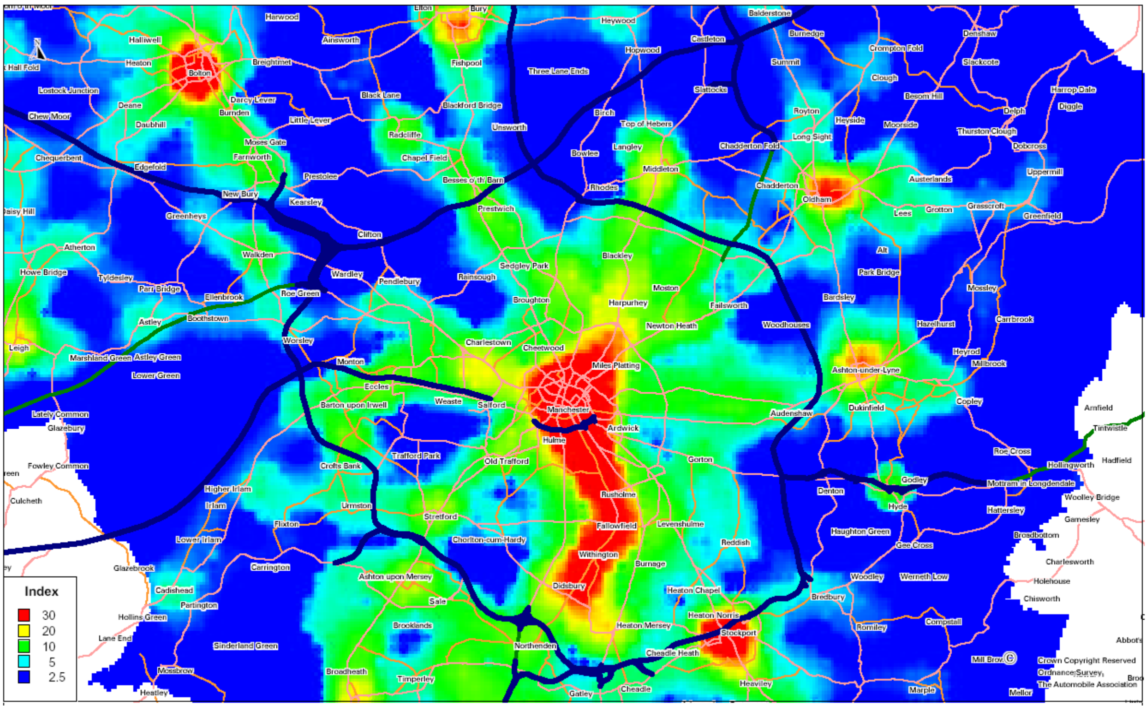
- Access Measure
- Threshold Measure
- Continuous Measure
- Composite Measure
- Comparative Measure
- Qualitative Measure

Access Measure

- One of the simplest forms of accessibility measure
- Assess the ease of access to the public transport network
- Doesn't include time, distance or cost
- Example – calculate number of people living more than 400m from a bus service
- Example – PTALs Index

This type of measures shows how easy or hard it is to reach the public transport network, and the frequency of services that are to be found once you get there. At the simplest level, the walk time to a public transport station or stop, combined with the frequency of service found there, will give an indication of public transport accessibility.

Access measures don't say anything about *where* services are going. The measure assumes that once you are on the network, it will be easy to get around it. This of course assumes that the public transport network is of a sufficient density to make it easy to interchange and just 'turn up and go'. Outside London or city centres this can be quite an unrealistic expectation.



This method is not generally recommended for use in Yorkshire & Humber region, as service frequencies may vary significantly even within the same district. In addition, the vast majority of the area is served by much lower public transport frequencies and therefore one the main principles of such measures - that the wait time is presumed to be half the average headway – is not valid.

Access Measures may, however, be useful for rapidly working out general levels of accessibility across the entire region, before carrying out more detailed analysis of accessibility at the local level.

Threshold Measure

- The most commonly used accessibility measure
- Easily understood
- Include multi-modal travel
- Include door-to-door journey time from origin to destination

The Threshold Measure is the most commonly used type of measure. The term 'threshold' refers to bands of travel time – for example people within 15 minutes of a location, people within 15-30 minutes of a location, and so on.

Origin Accessibility

For individual developments in areas where the public transport network is not dense, it can be relatively simple to measure accessibility from origins (i.e. housing) to opportunities, since there are a limited number of public transport routes, and travel times can be relatively easily calculated on an individual level. The following shows practical ways of measuring accessibility to opportunities by the public transport system, from one point:

Isochrones of journey times

for mapping isochrones manually from one point:

- An estimate is required of the walk time to usable bus routes from the origin, the network time to other destinations, and the egress walk time from the destination stop.
- Drawing the bus network on a map can help in this process, and recording times between timed locations from the timetable.
- At its simplest, the output will be the number or range of opportunities that can be reached within a certain time limit - for example it may be possible to access one town centre and three smaller service centres from a housing site or location within 45 minutes.

Where public transport networks are coded into a route based database with geocoding the process can be simplified by automation, although factors such as walk and wait time may need to be considered in different ways to that used by the developers of such networks.

Destination Accessibility

Measuring the accessibility of populations to opportunities using the public transport system is similar to the previous methodology, except that the output will be expressed in terms of the population within a certain time limit of an opportunity, rather than the number of opportunities within a certain time limit of an origin point. The following shows practical ways of measuring the accessibility of the population to an opportunity by the public transport system:

Isochrones of journey times

For mapping isochrones to one point:

- An estimate is required of the walk time from usable bus routes to the destination, the network time to other origins, and the access time from those origins to the public transport service.

- At its simplest, the output will be the size of the population that can reach an opportunity within a certain time limit, for example it may be possible for 10,000 people to reach a hospital within 45 minutes.

Where public transport networks are coded into a route based database with geocoding the process can be simplified by automation, although factors such as walk and wait time may need to be considered in different ways to that used by the developers of such networks.

TABLE 2.1 POPULATIONS WITHIN ISOCHRONES FROM A POINT, BY PUBLIC TRANSPORT

Time	Population
5 mins	0
10 mins	0
15 mins	2500
30 mins	12500

Suitability

Isochrone-based measures tend to be more easily understood as they are expressed in *units* (usually time) and are also split into simple *categories* (usually 0-15 minutes, 15-30 minutes, etc).

Unit measures are easily understandable by the general public and non-specialists as they express accessibility levels in terms of the number of people, number of facilities, and journey times – all things that people can easily relate to.

Presenting these units in categories further simplifies the analysis and makes it even easier to understand – for example, *there are 12,000 people within 0-30 minutes of the location, and another 17,000 people within 30-60 minutes of the location*.

If the intended audience is not familiar with accessibility measuring techniques, you may want to limit the types of measures you use to unit and category types.

Continuous Measure

- Most robust form of accessibility measure
- Indicate level of attractiveness of origin in terms of access to services
- Include characteristics of travel - door-to-door time, distance, cost or generalised cost
- Include characteristics of destination - e.g. number of jobs available there
- Include deterrence function – e.g. destination 5km away less attractive than one 500m away

The Continuous Measure differs from the threshold measure in that it gives a constantly changing measure of accessibility. It is a more complex measure, and takes into account factors such as the level of attractiveness of a destination, and travel cost. In order to include these factors, accessibility is expressed as generalised time or cost rather than just time.

Opportunity Measures and Value measures

Opportunity Measures weight the numbers of people who can reach a facility according to the relative ease of doing so. In this way, the further a person is from the proposed development the less 'opportunity' it provides them. For instance a facility within 5 minutes might get a score of "1", while one 30 minutes away might get a score of "0.2". Such calculations are added together to give a single index of accessibility.

In value measures, the usefulness of the 'attractor' (destination, or facility) is included. For example:

- Floorspace for shops may be used instead of one shop being a 'unit' of attraction;
- Access to public transport services might be weighted by the usefulness of the service according to the service frequency, or the size of place that it serves. The walking time to a bus stop might be weighted by the frequency, and the population of the largest town or city to which it goes.

Using weighted 'attractions' can add greatly to the sensitivity of measures, but, by the same token, the way in which attractiveness is measured can influence the outcome significantly, and the transparency of the measure to scrutiny is reduced.

The use of opportunity and value measures, when combined with (usually existing) zoning systems and a transport model, can represent a very cost-effective way of measuring accessibility – for example, using an Excel spreadsheet containing transport modelling zones and journey time data, combined with data on opportunities and their value, to calculate an index score for each zone, based on the number of opportunities available and the ease or difficulty of reaching those opportunities.

Similar spreadsheet models can be set up by anyone with access to transport modelling zones and data. Initially, however, this can be a laborious process both in terms of setting up the spreadsheet and the steep learning curve that first-time users will face. As there is no graphical (mapping) interface, such applications may not feel user-friendly. The advantages are that users will already be familiar with spreadsheets, and the use of newer technologies such as GIS in the process is marginal, typically only being employed to produce the final output zonal map.

Suitability

Expressing accessibility levels as an index allows the use of factors such as service reliability, perception of safety etc to be included in the accessibility analysis, as factors contributing to the overall score. The index may be purely numerical (for example, PTALs) or it may be generalised time or cost, which can be slightly easier for people to understand.

Composite Measure

- Using two or more measures in combination
- Most robust when produced from continuous measures
- Identifying locations and areas with the greatest combination of accessibility problems
- Not sensitive enough to highlight changes in accessibility over short timescales

A composite measure is actually a combination of two or more measures.

A good example of a composite measure (although not directly related to accessibility) is the Index of Multiple Deprivation – which is actually made up of a number of ‘domains’, or sub-indicators, such as Income Deprivation, Health Deprivation, and so on. They are added together and given different weights, to form a composite measure.

A typical accessibility composite measure could combine accessibility to work, accessibility to health facilities, accessibility to education, and accessibility to food shopping, to form one overall index of accessibility. This type of index is useful as it gives an overall picture of accessibility for a study area, and can highlight areas that may suffer from a number of different accessibility problems. Those areas identified would then require further, more detailed, analysis to find out the exact nature of the problems.

This type of measure is most robust when produced from continuous measures. Due to their generalising nature, they are not sensitive enough to highlight changes in accessibility over short timescales.

This type of measure would be of most benefit in Yorkshire & Humber when used across an entire authority (or across the entire region), to give an idea of which areas are particularly suffering from multiple accessibility problems, and how areas compare to each other in this respect.

Comparative Measure

- Used to compare accessibility of different population groups
- Usually expressed as accessibility ratios
- Used for targeted accessibility analysis
- Care is required when analysing the outputs

Comparative measures are typically used to compare the accessibility of a certain at-risk sub-group of the population – for example, the long term unemployed - to the population as a whole. In this way, it is possible to identify hotspots where particular groups of the population suffer from poor accessibility when compared to the overall population.

They can also be used to compare the accessibility of the entire population and the accessibility of' 'at risk' sectors of society - for example, a comparison of the accessibility of the whole population to a location, and the accessibility of those who are long term unemployed. If an area has poor accessibility to jobs, and that area also has a high percentage of people who are unemployed, then the comparative accessibility ratio will be very high (i.e. worse accessibility).

Accessibility Ratios

Comparative measures are usually expressed as an accessibility ratio of some kind – for example, a ratio of the number of people that can access a location in half an hour by car versus those can access it by public transport. Or, a ratio of the percentage of long term unemployed people with poor accessibility versus the percentage of the overall population with poor accessibility.

There is potential for using accessibility ratios as a basis for helping to determine developer contributions towards transport improvements in planning obligations. The following points are of relevance:

- Accessibility ratios would allow for a system whereby it could be made clear that developments in locations that are not easily accessible by public transport, walking and cycling would expect to have to contribute more to local transport improvements through the Planning Conditions and Planning Agreements systems.

- The measures used would have to be very simple and transparent (with the number of people within 20 or 30 minutes travel time being the most obvious).
- It would be necessary for the Local Authority to carry out a study of accessibility in their area to be able to compare sites in their locality.
- Accessibility ratios could only be used as a guideline, in conjunction with other variables as are currently used, and as a basis for discussion between the developer and the Local Planning Authority.

Accessibility ratios can be extremely useful, but can also be misleading if used in the wrong way. It is vital that like is compared with like, and this means:

- The accessibility indicators used for comparison must be of the same type. There is no meaning in comparing an isochrone for one mode with a different weighted measure for another.
- Using the same indicator, the parameters used must always be the same, or used with consistency. There is little point in comparing the populations within a twenty minute bus ride with those within a thirty minute car drive, even though it may be felt that a thirty minute bus ride 'equates' to a twenty minute car journey. If the whole public transport journey, including walk access and egress times can be calculated, then in this case a 30 minute ‘whole’ public transport journey could legitimately be compared with a 30 minute car journey.
- Using the same indicators, the parameters chosen should reflect travel behaviour in a meaningful way – for example, there is little point in comparing three hour travel times for access to supermarkets.

RATIO OF CAR VS NON-CAR ACCESSIBILITY - TYPICAL VALUES

Type of area	Ratio of accessibility by those with access to car/ those without access to car
City centre	1.5
Town centre	2.5
Edge of town centre	4
Out of town	6
Rural/ remote	>10

Qualitative Measure

- Allow for capturing individual perceptions about aspects of transport
- Based on surveys
- Survey results may be mapped, depending on sample size
- Used to understand issues not covered by existing data sources

Qualitative surveys allow for aspects such as the fear of crime, travel horizons, awareness of the availability of travel information, and individual perceptions about the quality of services and transport to be captured.

These factors can usually be mapped (unless the sample size is small, in which case they should be presented in tabular or graph form).

3. ISSUES RELATING TO ACCESSIBILITY

Introduction

This chapter provides a reference to the most common issues arising when measuring accessibility. The aim is to raise awareness amongst practitioners of the different factors that should be taken into account when measuring accessibility. The chapter includes advice on:

- Measuring accessibility in urban and rural areas
- Socially Excluded Populations
- Cross-border linkages
- Facility type
- Journey Quality

Measuring Accessibility in Urban and Rural Areas

Urban Areas

As a guide, in urban areas any public transport service with a ‘turn up and go frequency’ (one bus at least every 10-15 minutes) is thought of as offering a good level of service. In addition, when multiple services operate down a corridor, frequencies may be summed to give a total frequency for the corridor.

This assumes that most passengers will have a choice of a number of different buses to take them to and from their destination. When the service headway falls below the 30 minutes mark, the level of access is usually deemed poor in urban areas. Again, this depends to a large extent on the type of area and purpose. For example, people would be willing to travel further and wait longer to travel to a large general hospital than they would to travel to a sporting facility. The presence of a good quality interchange facility such as a bus station or major rail-bus interchange also has a significant effect on accessibility levels.

Rural Areas

In rural areas the issue is normally not *how often* a service runs, but rather *does it run at all, and will it get me there and back?* Services may run so infrequently that simply looking at the frequency is no longer a valid approach; instead, the timing of services for different purposes becomes crucial and issues such as the time gap between inbound and outbound services are of paramount importance. For example, a service running once a day, leaving at 8.30am for the nearest town and returning at 6pm may represent a “good” level of service for those wishing to use it to go to work, but represents a “poor” level of service for those wishing to do their shopping (as it returns too late), or visit the hospital.

Practical ways of measuring accessibility taking the timing of infrequent services into account include a *simple analysis of service levels.* Accessibility in rural areas can be approximated by measuring access to the network, so long as strict criteria are used for defining what is a 'useful' service. If a 'once a week' service is counted as being as useful as an hourly service the measure will not be helpful.

One approach is to score services according to their frequency, using weekday and weekend frequencies *‘less than daily’*, *‘daily’* etc as scores, adding these together and describing levels of access as *'below subsistence'*, *'subsistence'* etc. Those using such measures for analysis for rural areas should make it clear that the public transport services may only be of use for certain activities, such as shopping, due to the likely times and places served, and would not necessarily imply accessibility for work or other journeys. The steps to be followed are:

a. Define those locations that will be used as the basis for the analysis. These may be parishes, but would more usefully be settlements within parishes, if this is possible.
b. Define the times of day for which services should be analysed. These might be Monday to Friday pre AM peak, AM peak, inter-peak, PM peak, evening, Saturday day, Saturday evening, and Sunday.
c. Define the level of service criteria for what will be regarded as reaching qualitative thresholds such as "subsistence" level or "good" services.
d. Record the numbers of services in each time period, filtering out those that do not serve a significant centre.
e. Use criteria defined in 'c' above to categorise settlements, and map the results.

Socially Excluded Populations

When carrying out accessibility analysis where the output is expressed in terms of the number of people (or households) with good or bad accessibility to a facility, this output will usually be the *total* population within reach of one or more opportunities. However, there will be many occasions when the analysis needs to be concentrated on specific sub-groups of the population – for example the elderly, or deprived households. This will be particularly important when informing policy decisions where social exclusion is an important factor.

Such forms of analysis form the backbone of the DfT's Guidance on Accessibility Planning in Local Transport Plans (2004), which stem from the Social Exclusion Unit's report *Making The Connections* (2003), which recommends analysing the accessibility of deprived populations to health, education, jobs and food shopping.

In such cases, the methodologies that can be used are exactly the same as those described earlier. However the data used to create output population catchments will need to relate to specific groups of the population rather than the whole population – for example, the number of low income households with access to employment.

Assumptions used in the methodologies will also need to be modified to reflect the travel behaviours and needs of particular groups of the population – for example, older people are less likely to walk as far to access public transport services.

This type of analysis can be used to analyse if a particular sub-group of the population has better or worse access to a destination than the population as a whole. Many sources of such data exist, the most obvious being the Census.

Cross Border Linkages

Accessibility analysis should not end at the local authority border. Populations living at the edge of an authority area regularly access facilities in neighbouring authorities, and it is important that any analysis takes this into account.

The scale of cross-border linkages will vary depending on the type and size of facility being accessed. For example, access to local services may only need to include those local services a mile or two across the border, while access to hospitals or major shopping facilities may need to include hospitals up to an hour or two journey time away.

Facility Types

Certain types of facilities may have specific characteristics that may make it difficult to measure their accessibility. The most obvious example of this would be access to hospitals: people travelling to a hospital may be staff members, visitors, outpatients, inpatients, or emergencies. Travel characteristics can vary enormously between each group, especially with regard to using public transport. For example, emergency and inpatients are unlikely to use public transport at all!

Another example is school travel. Pupils will often travel to school using transport provided by the school. Such forms of transport are not normally included in public transport databases. Other examples include facility types where a significant amount of shiftwork, flexible working or night work occurs, for example factories.

Some facilities may have specialisms which mean that their catchment will be much wider than usual – for example, a specialist cancer treatment centre or further education specialising in the arts.

Accessibility analysis is bound to be difficult in such circumstances. Practitioners should be aware of the limitations of any accessibility analysis they carry out. It may not be sensible to measure the accessibility of the whole population to such facilities if only a small percentage of them are within scope of public transport.

Journey Quality

While isochrones are useful, they cannot show the way in which the quality of the journey affects the perceived ease of journey making. Many factors affect the quality of different modes of travel which are important:

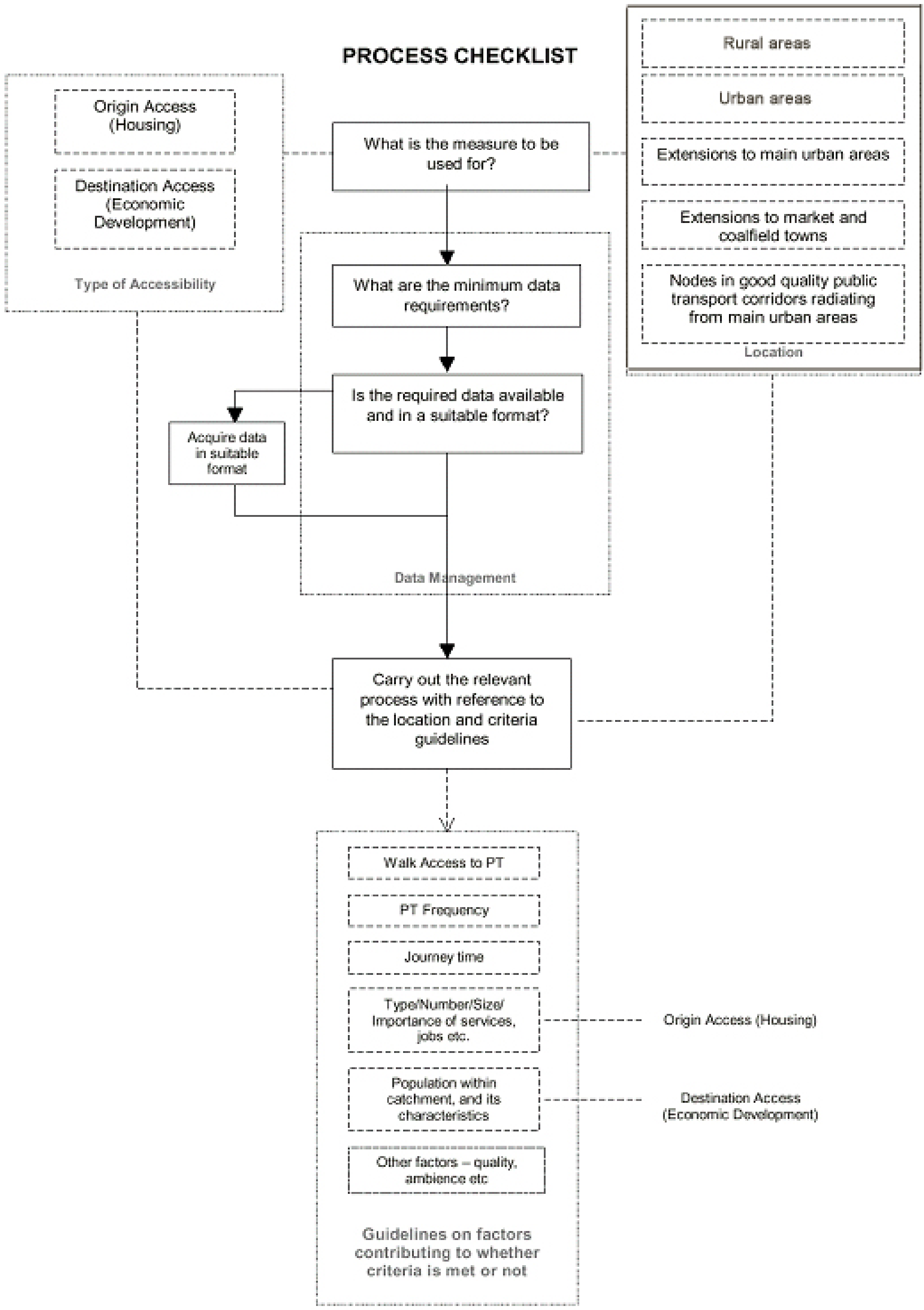
- For walking and cycling to and from the public transport network, the experience can have a major effect. Hills, poor surface quality, inconvenient crossing points, and feelings of insecurity and personal danger are among the factors that can play a large role in determining pedestrian activity, and affect accessibility.
- The cost of travel may be important.
- The frequency of service may be important. An infrequent service will have a very different 'utility' to the user depending on whether someone plans to leave just in time to catch the service, or whether they perceive the journey time as starting from when they would have liked to have left.
- Reliability of service is a also a key issue (with, for some purposes, people needing to leave a 'safety margin' in their journey planning so they do not miss the service).
- Other factors such as the need to interchange during a journey can add time, cost, and uncertainty to the perceived journey time. Interchange is unlikely to occur between buses (except at major bus stations such as those found in city centres such as Leeds and Sheffield), and bus-rail interchange can be problematic at railway stations where there is poor integration between modes in terms of location of stops and timing of services.
- The time taken accessing and egressing public transport is a particularly important barrier. According to Institution of Highways & Transportation (IHT) guidelines, the maximum

walking distance to a rail station should be 800m, and the maximum distance to a stop should not exceed 400 m and preferably be no more than 300 m. These distances are quoted for guidance, and should not be followed slavishly if that would lead to complex or indirect routes. For more guidance on these issues, please refer to "*Planning for Public Transport in Development*" (IHT, 1999).

- For wheelchair users and the visually impaired, such guideline distances decrease significantly. *"Inclusive Mobility",* published by the Department of Transport (DoT), recommends maximum distances of 150m without a rest for wheelchair users and the visually impaired, 100m for the mobility impaired without a walking aid, and 50m for the mobility impaired using a stick (DoT, 2002).

Economists describe the incorporation of these other factors in accessibility indicators as 'generalised cost' since they help measure the 'effort' involved in accessing the development. Applying such weightings in practice requires attaching a time penalty to links in the network, or at fixed points in an area (e.g. interchange points).

A1. APPENDIX A: PROCESS CHECKLIST FOR ACCESSIBILITY ANALYSIS



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