Database Suite for Calculation of UK Accessibility Statistics (ACCALC)

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Background

In 1992 when planning an integrated land use and transport strategy for east central Scotland it was identified that modelling tools for accessibility were very limited. Consultants MVA had done some land use transport policy interaction modelling work under JATES (Joint Authorities Transport and Environmental Studies) but it was clear that further work was needed to identify how accessibility analysis could be made more practical to land use and transport planners.

The conceptual foundations of ACCALC were developed to solve this problem. DHC founder Derek Halden (whilst working for the UK Transport Research Laboratory) undertook a review of accessibility modelling techniques to identify how better information could be made available to land use and transport planners to help them plan changes. Out of this review came various papers which showed that accessibility change was perhaps the most important parameter to focus on when planning land use and transport e.g. “managing uncertainty in transport policy development” (Halden, 1996) and “transport and economic development around Inverness” (TRL, 2003).

By 1996 the opposition Labour party had picked up on the accessibility theme as the paradigm shift they wanted to make in transport policy and when they were elected in 1997 the accessibility goal was included in transport and land use policy. DHC was appointed to design the first the Scottish approach to implementing this approach in 1998 and subsequently DHC was also appointed to lead the development of accessibility planning policy in England in 2002 (DHC et al, 2004).

In 1999 version 1 of the ACCALC model was issued on CD to all local authorities in Scotland with Planning Advice note 57 – Planning and Transport. In 2005 this model was substantially upgraded when DHC was appointed to calculate the core accessibility indicators for England and Wales. Since 2005 ACCALC has been used annually to update the CAI which are neighbourhood level indicators (approximately 1000 houses) and cover mainland UK.

Conceptual framework and theoretical underpinnings

The basic concepts in ACCALC are that it is a relational database helping planners to manage large and complex data sets and to output meaningful accessibility indicators (DfT 2011). Version 1 allowed users to upload spatially referenced data on land uses, spatially referenced data on locations from which trips are generated and tables showing the deterrents affecting travel between each origin and destination location. Functions are provided to automate the calculation of a variety of common accessibility indicators formulations.

By far the most widespread application of the model is using travel time data between origins and destination. These are calculated from the digital road and public transport network using a hierarchy of related sparse matrices to represent the journey times between any two points. The matrices are populated using observed travel speeds/costs on each road/footpath link and scheduled journey times/costs from public transport timetables. On some links other barriers are added. For example certain public transport services are not available to people due to physical barriers to using services such as no lifts at rail stations for people who cannot use stairs. Some links have time penalties added due to known difficulties using them such as reliability or quality factors.

By aggregating the travel times or costs between nodes for each mobility groups within the database, the journey times/costs between any two points can be output. The model algorithms search for better journey times or costs until convergence is achieved relevant for the user group being considered and the range of barriers (time, cost, quality, information, etc being considered).

A key part of the model is to guide users when formulating useful indicators: “which population group are you considering, what type of land use are they trying to reach, what barriers to access are being considered?”

Default parameters are included to represent the deterrent effect of travel allowing trip opportunities to be combined in Hansen, Logsum, and other opportunity and value measures. These are based on observed behaviour but can be overwritten by a user who wishes to use their own parameters based on local survey data (e.g. the deterrent effect of safety factors is greater in Middlesborough than Inverness so understanding locally relevant factors like not being willing to travel on a bus after 6pm if over 60 is important) (UoW, 2004).

Operational aspects

ACCALC version 1 in 1999 was based on Microsoft Access 97 but became obsolete when this software was not commonly available on people's computers after about 2002. Active users maintained a separate copy of Access 1997 (including at the UK universities which used it for training students).

A revised version has never been publicly issued and instead government uses a MS SQL server version of ACCALC to calculate and publish 468 different accessibility indicators annually in Excel spreadsheets. This means that local authorities generally do not need to do their own analysis. If they are looking at a land use plan or transport change they can read off and compare indicators or commission additional analysis.

Building the matrices takes many hours of computation even on high specification servers. However once built, ACCALC uses these matrices as look up tables for any policy question to be analysed so that questions can be answered in real time e.g. when working on a project or policy. A high level of technical expertise is needed to run the analysis but it is hoped to provide a web based user front end so that anyone can use the tools free of charge. To create a user interface suitable for non-technical people will require significant investment so each year DfT defer it till the next year.

In general users concentrate on travel time analysis since the data is more readily available. However analysis of travel costs is also common. Users have not commonly used the model for other factors.

Travel times and costs vary throughout the day and the journey times and costs used in any analysis need to be weighted to match the probability of users wanting to make a trip at each time of day. For example there might be regular bus services on a route between 9am and 5pm but these would be of little use for people wanting to make a journey to a night club. Analysis typically measures 23 journey times across a 24 hour period and two cost periods – peak and off peak.

Data has become much more freely available over the last two years with the opendata government initiative. However data on commercial facilities like shops and theatres can still be quite expensive to purchase.

Relevance for planning practice

National planning policy guidance suggests that as a minimum in a planning application comparisons should be made between the car available and non car available trip times. If the ratio of non car available to car available time exceeds 2.5 then the location would only be suitable for certain types of development and if it exceeds 10 then the location is considered to be car dependent. Although planning guidance requires these checks it is still common practice in the UK not to present the accessibility information with planning applications. Common practice is to make vague statements about accessibility issues not being a problem.

Part of the reason for this is that government puts out far too much guidance and much of it is rarely read. DfT considered a major training and information programme about accessibility planning in 2004 but did not go ahead, instead undertaking some small scale information sessions "within-reach".

In transport planning the Scottish Government require four different types of accessibility measure to be reported for all transport appraisals: stated, expressed, social and comparative (STAG 2003). The social measures can use the core national indicators and deterrence parameters are published in Scottish Transport Appraisal Guidance to let people use look up tables to calculate simple indicators. DfT are considering similar approaches for UK appraisal but the NATA refresh is taking many years.

Strengths and limitations

The main limitation of the model is that it does not yet incorporate user data as standard but plans are being put in place to address this using data from http://www.fixmytransport.com/, http://www.fixmystreet.com/ and the Loop (www.theloopuk.co.uk). This means that there is little calibration of indicators to show that this is actually how people view the opportunities that have to reach services and facilities.

At a practical level accessibility indicators need to become as integrated and easy to use as other key information affecting decision making like cost. The Auditor General in Scotland recently concluded in a recent

review of local government that if there was only one type of indicator local authorities could monitor it should be accessibility, since accessibility was the most useful way to demonstrate the opportunities available to citizens for health, education, work, leisure, etc.

The barriers to making these changes happen are not technical but relate to changing culture and attitudes of professionals who work in narrow areas and are not focused enough at the needs of the people they serve. Uses of the indicators has therefore been common by campaign groups showing how and why people's needs are not being met and it may take many years to support service providers to become more citizen/consumer focused.

See http://www.dft.gov.uk/statistics/releases/accessibility-2010 for further details.

References

Department for Transport, 2011. Accessibility Statistics Guidance. Last Revised September 2011. http://assets.dft.gov.uk/statistics/series/accessibility/accessibility-statistics-guidance.pdf (Accessed 5 March 2012).

Department of the Environment, 1995. Policy and Procedure Guidance: A Guide to Better Practice – Reducing the Need to Travel Through Land Use and Transport Planning, PPG 13, HMSO, London, UK.

Derek Halden Consultancy, University of Westminster, 2004. Developing and Piloting Accessibility Planning. Final report for DfT. London. http://www.dhc1.co.uk/projects/accessibility_developing.pdf (Accessed 5 March 2012)

Forum for the Future, 2010. The Sustainable Cities Index 2010. London: http://www.forumforthefuture.org/sites/default/files/images/Forum/Projects/Sustainable_Cities_Index/Sustainable_Cities_Index_2010_FINAL_15-10-10.pdf (Accessed 5 March 2012)

Halden, D. 2003. Accessibility Analysis Concepts and their Application to Transport Policy, Programme and Project Evaluation. In Transport Projects, Programmes and Policies: Evaluation Needs and Capabilities. Ashgate. Edited by Mackie and Pearman.

Halden 1996. Managing Uncertainty in Transport Policy Development. Proceedings of the Institution of Civil Engineers.

Scottish Executive 2000. Accessibility and a Criterion in Policy and Project Development. Final Report.

Scottish Executive 2002. National Planning Guidance Note 17.

Scottish Executive 2002. Planning Advice Note 57.

Scottish Executive, 2005. Evaluating the School Travel Co-ordinator Initiative. Edinburgh http://www.scotland.gov.uk/Resource/Doc/69582/0018066.pdf (Accessed 5 March 2012)

TRL 2003. A Review of Transport and Economic Development Changes Around Inverness. TRL Crowthorne. UK

University of Westminster, 2004. Accessibility Planning and Crime Reduction. Report for Department for Transport. London. http://www.dft.gov.uk/pgr/regional/ltp/accessibility/developing/research/ssibilityplanningandcrim3612.pdf (Accessed 5th March 2012)

Figures

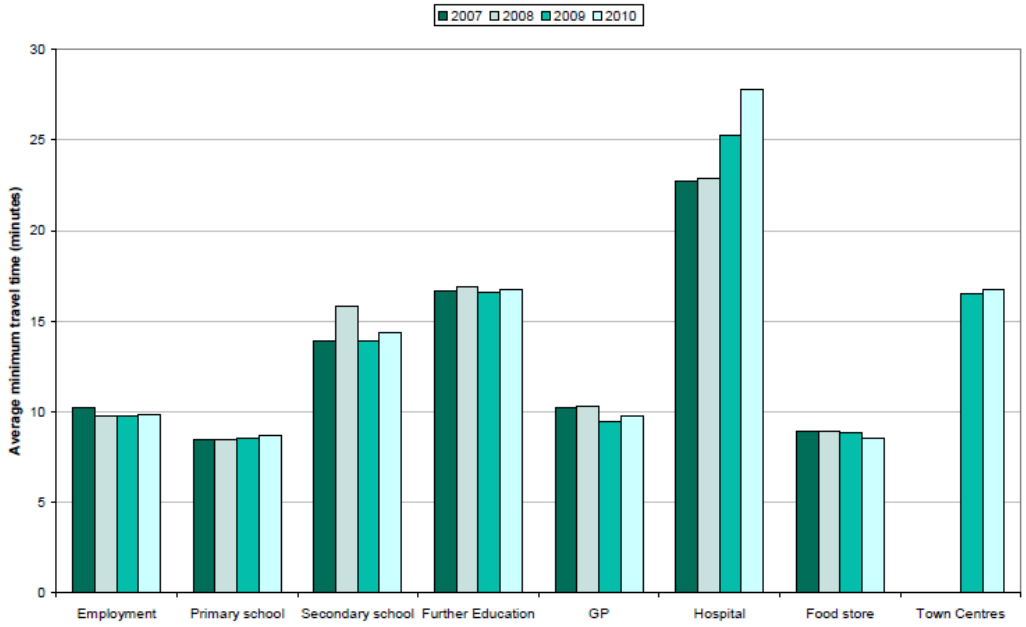

Figure 1 Average minimum travel time to reach the nearest key service by public transport/waking, England, 2007 to 2010

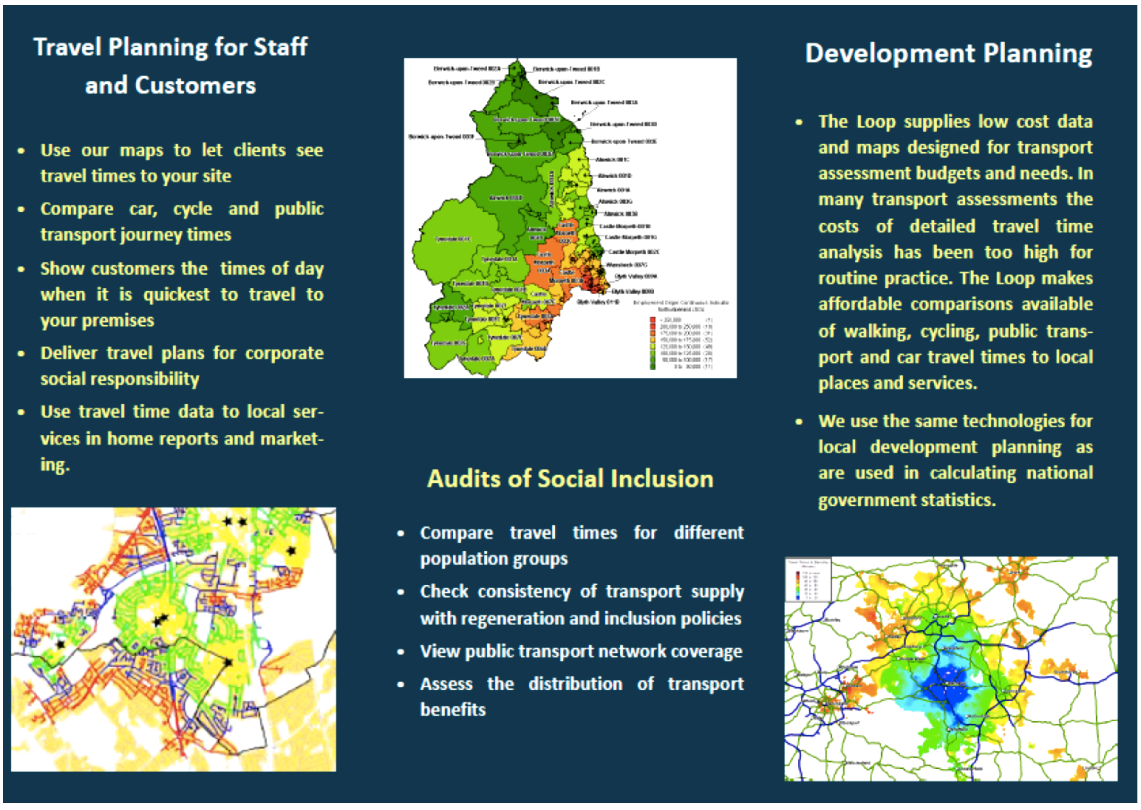

Figure 2 Uses of ACCALC