Using GIS to implement mobility management in the planning process

Workshop 2a: The links between policy fields

Jessica ter Schure
Trivector Traffic AB, Sweden
jessica.terschure@trivector.se

It is today difficult to find suitable mobility management measures that can be used in the spatial planning process. One solution to this problem is to use GIS, geographical information systems. GIS gives you the opportunity to analyse large amounts of otherwise perhaps inaccessible data and to present data and results in a way that planners, politicians and the public easily can interpret and grasp. The results can thus be very important in the planning process.

The connection between GIS and mobility management can be viewed from two different angles; 1) Using GIS to analyse bicycle and public transport access is in itself a mobility management activity, as it helps planners at a very early stage to promote these transport modes; 2) GIS can present otherwise inaccessible maps and figures to politicians and decision-makers and thus help them think in terms of mobility management in the planning process.

Introduction

An official definition – collected from the EU-project MOMENTUM – states that mobility management is a demand-oriented approach that affects private and goods transports by:

- encouraging greater use of sustainable transport modes
- improving sustainable accessibility for all people and organisations
- increasing the efficiency of use of transport and land use infrastructure
- reducing traffic (growth) by limiting the number, length and need of motorised vehicle trips

GIS can be used in the fulfilment of all four statements. Maps and figures of different planning strategies can encourage the use of sustainable transport modes. GIS can be used to analyse and illustrate accessibility for different target groups. Results from GIS can have an impact on land use infrastructure and indirectly affect traffic growth. In the following text we will briefly go through some methods that can be used to promote mobility management in the planning process.

Trivector has used GIS to measure accessibility in several different ways, mainly on a local level. Accessibility is a very important concept in the process towards a sustainable society. It is of great significance that children can reach their schools without being driven by car by their parents; that disabled can get to the bus stop and further on to the city centre or their

jobs; that people without a car or driver license can get around with public transport or by walking or cycling. These are only a few reasons why accessibility is of such importance.
The Swedish government has over the last few years also realised the importance of accessibility; hence it is one of five major transport political goals. Nevertheless, it has been difficult to measure accessibility in an adequate way – some of the indicators used are so over-simplified that they can be misguiding, others are so complex that they are difficult to understand. These problems have made it difficult for politicians to grasp the importance of accessibility.

Trivector has over the last few years tested three methods to measure accessibility. This presentation will briefly go through some of the results from these projects where the methods have been used. Trivector uses GIS as a main tool for all three methods:

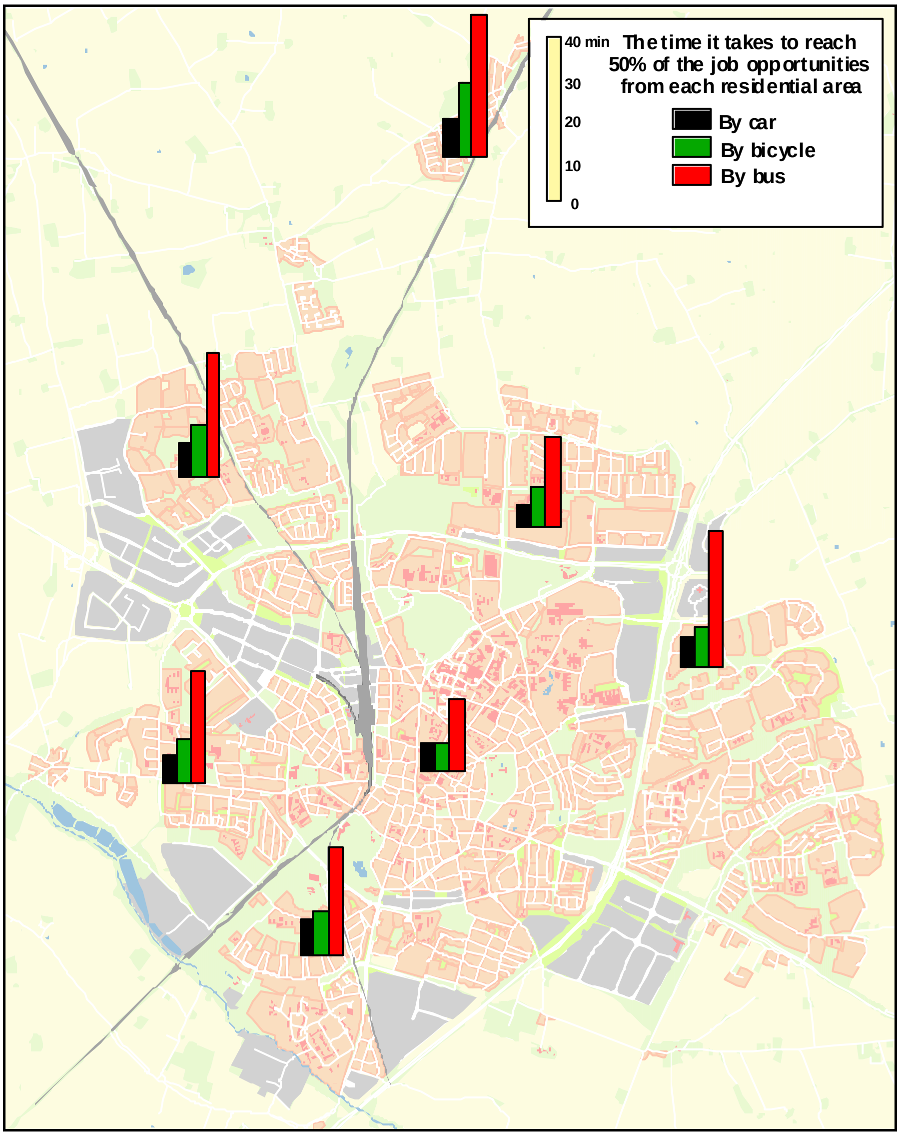
1. Accessibility measured as travel ratios between car, bicycle and bus, mainly from home to work. Tested on the cities of Växjö, Västerås, Lund and Trollhättan.
2. Accessibility measured according to the Dutch ABC-policy, which enables planners to locate "the right business in the right place". Tested on Malmö.
3. Accessibility measured according to Mats Reneland at Chalmers Technical University and the Swedish Road Administration. The entire pedestrian and bicycle networks are mapped in field with regards to more than 60 attributes and digitized in a GIS. The complete network can then be used to evaluate different accessibility indicators. Tested on Luleå.

Accessibility measured as travel ratios

Accessibility can be measured with travel ratios for car, bus and bicycle. These travel ratios are usually the ratio between bus and car, but in this case we have also looked at the ratio between bicycle and car. The travel ratio between bus and car should be lower than 2, which means that the bus trip should not take longer than twice the car trip between two places. If the ratio is more than 2, it is thought that the bus is not really competitive to the car.

An example of the results from Lund is shown in the figure below. Each set of three columns represent the time it takes to travel from each residential area, by car (left column), bicycle (centre column) and bus (right column), to 50 % of the job opportunities in the city. As you can see, driving by car is in most cases the most accessible transport mode, although biking in several cases is very competitive. Taking the bus is the least accessible transport mode.

When discussing the findings with the City of Lund, one of the things they mentioned was that one could compare the results of today with a follow-up in a few years to investigate whether there have been any improvements for instance in travel time by bus, which most probably would result in more people travelling by public transport. Other maps and results were more useful when interpreting how to improve land-use mixture, suitable locations for further concentration of housing and businesses etc.

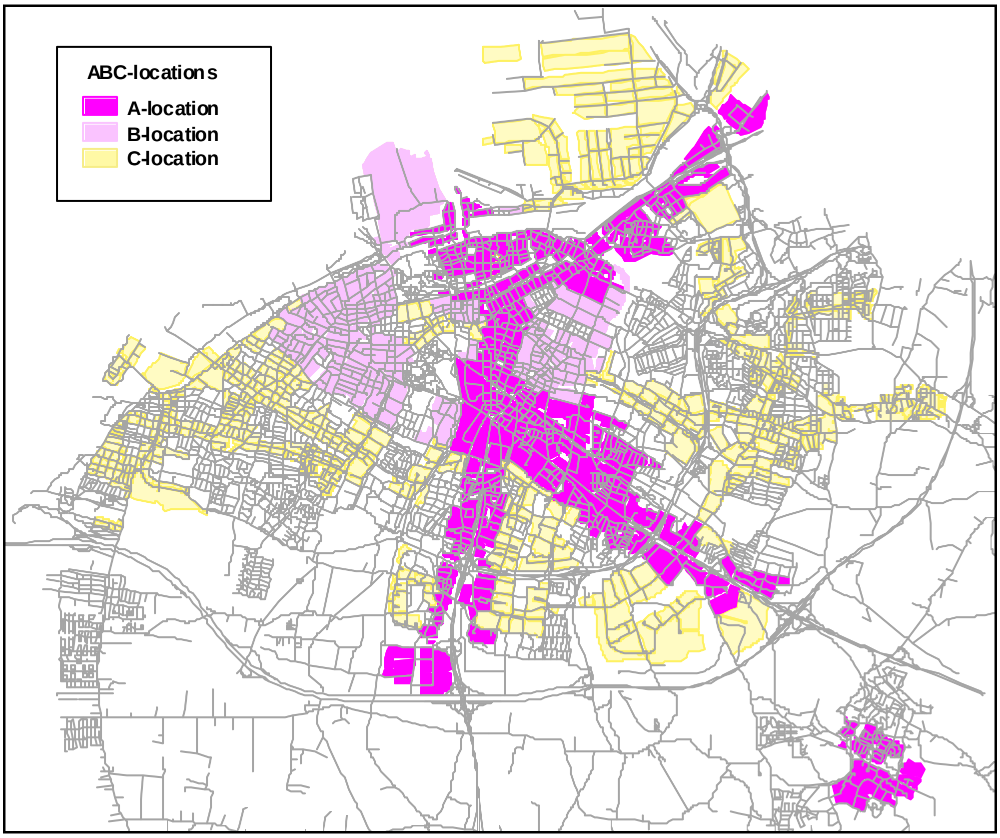


Accessibility measured with the Dutch ABC-policy

The Dutch ABC-policy has been used in the Netherlands during the entire 1990's and is based on accessibility profiles for different types of companies and organisations. When a company moves or is established its transport profile is matched with different districts' accessibility profiles. By doing so, the right business is located in the right place. In A-locations businesses with a relatively large number of personnel and visitors should be placed. These locations are provided with the best public transport possibilities and well-developed walking and cycling access. In C-locations businesses with few personnel and visitors covering large areas should be placed (e.g. industries and warehouses). These businesses are usually car and truck dependent and can therefore be located close to highways near major transport axes. B-locations are in between A- and C-locations.

The ABC-policy has been applied on Malmö with its 260 000 inhabitants. The city has been divided into zones depending on each district's characteristics as an A-, B- or C-location.

Public transport accessibility has been used as a basis when dividing the city into the three zones. In the figure below the three zones are identified.



Results can be presented both visually and in percentages. The table below shows how job opportunities in different labour and visitor intensive businesses are distributed in the three zones.

Business sector	**Zone A**	**Zone B**	**Zone C**	**Outside A-C**
Commerce	37%	9%	39%	15%
Education	44%	21%	18%	17%
Financial	59%	9%	22%	10%
Hospitals etc.	53%	9%	23%	15%
Public	77%	9%	11%	3%
In total	**54%**	**11%**	**23%**	**12%**

The planners in Malmö that we have been in contact with regarding the results believe that the material clearly shows the relationship between location of activities/housing and public transport and that it is evident which densely built-up areas that are outside the A-zone. One of the benefits with the results is that it focuses on public transport issues and what can be done to improve the possibilities to travel with public transport.

Accessibility measured by surveying an entire city's pedestrian and cycling network

Trivector Traffic has during 2002-2003 investigated how accessible Luleå's pedestrian and cycling network is for different target groups. The information was collected with a pocket pc in field and then put into a geographic information system with large analysis potential.

The research project is being carried out on behalf of the Swedish Road Administration, and the method used is developed by Mats Reneland, Chalmers Technical University, in cooperation with the Swedish Road Administration. The cities that have been surveyed within the project are Alingsås, Helsingborg, Säffle, Trelleborg, Umeå samt Luleå. These cities are of quite different character and are located all over Sweden.

In the five first mentioned cities the pedestrian and cycling networks were surveyed with paper maps, but in Luleå – where Trivector Traffic was doing the survey – the method was further developed: The paper maps were exchanged with a pocket pc equipped with GIS software and a GPS. By doing so, several operations could be carried out at the same time. Instead of first surveying, then digitizing and finally adding attributes to the GIS at home, all three steps could be carried out simultaneously. In total about a hundred attributes were chosen between for each road segment. Examples of attributes are road type, width, type of pavement, lighting, type of crossing and obstacles.

Two of the project employees who carried out the survey in Luleå also used the paper map method in a couple of districts of the city. They agree that the pocket pc both speeds up and simplifies the survey, especially if it is wet and cold outside. In addition, the risk of forgetting to add some of the attributes is reduced, since the surveyor must fill in a digital form for each road segment.

After the entire network has been digitized and completed the GIS has been used to investigate the network's accessibility regarding safe school paths for children, and safe routes to nearest public transport stop or grocery store for people with impaired vision or disabled people. Another task has been to investigate safe pedestrian paths for people walking home when it is dark outside. These investigations and resulting maps will be a good resource for a city who wants to improve the pedestrian and bicycle network.

Conclusions

GIS and mobility management are mainly indirectly related to each other. GIS is for instance not a suitable tool to investigate the effects of different mobility management activities. Instead, it can be used by planners and decision-makers to gather information on current and future bicycle and public transport projects, and thus encouraging the use of sustainable transport modes. GIS is also an excellent tool when improving sustainable accessibility for different target groups. Hence, GIS can help to introduce the mobility management philosophy in a very early stage of the planning process, and indirectly affect travel behaviour.

The three methods briefly explained above have both advantages and disadvantages. The Dutch ABC-policy has for instance had a long history in the Netherlands and has had a large effect on planning in other European countries. However, only one third of all new Dutch businesses have been located according to the ABC-policy during the 1990's when the policy was in use. The main reason is believed to be that the authorities preferred economic investments and employment instead of locating businesses in the most sustainable place. This is one of the largest obstacles when implementing mobility management in the planning process. The results of GIS analyses must be communicated not only with planners, but also with politicians and decision-makers for changes to occur. When accessibility with sustainable transport modes is illustrated in maps and figures, mobility management thinking comes more naturally.