A METHOD TO CREATE A GIS NETWORK OF FOOTPATHS AND CYCLEWAYS
-Accessibility analyses for children, women and the elderly under assumed conditions with regard to traffic safety and security

Mats RENELAND
Associate Professor
Department of City & Mobility
School of Architecture
Chalmers University of Technology
SE.412 96 Göteborg
Sweden
E-mail: mats@arch.chalmers.se

Abstract: The paper summarizes a project (Reneland, 2000) financed by the Swedish National Road Administration (Vägverket), and which is part of the sustainable development and the Swedish traffic safety programme "Vision Zero".

In the project a GIS method has been developed to analyse different users' accessibility to various facilities in factual footpath and cycleway networks. The focus is on the standard setting user groups (children, the elderly and the disabled) in Swedish traffic policy, and on women and their assumed demands concerning safety, security and attractiveness.

Examples of how to use the method:
- Safe route to school for children.
- Safe and secure route for women to and from bus stops.
- Convenient and safe route to food stores for the elderly.

The method has been found to be a most useful tool when performing detailed accessibility analyses, and thus it can be used in the planning process, for evaluations and for safety management of existing areas. At the same time the method highlights the need for operational knowledge about the relationship between street design and the safety and security of the citizen.

Perform your own analyses at: http://www.tillganglighet.com

Keywords: GIS, accessibility, footpaths, cycleways, safety.

1. BACKGROUND

The new Swedish traffic policy states that transportation solutions should be sustainable from an ecological, economic, social and cultural point of view. Among other things, this means good accessibility under conditions of traffic safety for all users everywhere (prop 1997/98:56, p 11). In accordance with this new policy, the Swedish National Road Administration has been given wider responsibility by the government. Previously their main task was the planning, building and maintenance of the national road network. At present, apart from these tasks, they are also responsible for the development of knowledge about public transportation, walking and cycling, although many of these tasks are also the responsibilities of different local authorities. The work of the Swedish National Road Administration with regard to the national transport policy goals includes focusing on accessibility, safe traffic and a sound environment. They have noted a need for developments within the following fields:

- Public transportation accessibility to facilities of importance.
- Pedestrian and cyclist separation from car traffic with respect to street environment and function.
- Accessibility for the disabled.
- Walking accessibility for the elderly to facilities of importance (home – food store).
- Accessibility for children to schools and recreational activities.

2. AIMS

This project aims to develop a GIS (Geographical Information Systems) method for accessibility analyses for footpaths and cycleways. Attention should be paid to the needs of different user groups when it comes to network qualities and destinations.

3. THE STANDARD SETTING USER GROUPS

In the new Swedish transport policy children, the elderly and disabled persons are the standard setting groups. Backing up this situation is the assumption that footpath and cycleway standards for these vulnerable user groups also will constitute a good standard for other people with adult behaviour in traffic, good physical mobility, strong hearts etc.

Within the short project time there were no possibilities of carefully examining user groups' behaviour and values in relationship to footpath and cycleway qualities, and from the perspective of traffic safety and security. In the field studies a survey of qualities normally used to define traffic safety was made. From these qualities, the link attributes to the footpath and cycleway network were formed. Therefore, it is important to look upon the link attributes as examples of attributes with importance for traffic safety, and not as facts tested in research contexts. On the other hand, the method is of more general use.

The traffic safety perspective predominates when children and the elderly are in focus. To this, I have added the perspective of security, highlighted by women refusing to use footpaths in parks after dark. Very often women, and also an increasing number of men, choose a dangerous pattern of behaviour with regard to traffic safety, before a pattern of behaviour with a low degree of security e.g. crossing streets where there are no pedestrian crossings instead of using a subway, which they perceive as being dangerous.

3.1 Children

The user group "children" may be divided into several sub-groups according to gender and age, which have different demands on the footpath and cycleway network qualities, on activity area and on means of transportation. Swedish local authorities have for a long time given high priority to child traffic safety. Since the middle of the 1960s we have built dwelling areas free from private cars (Statens Planverk, 1968).

In this study, the ambition has been to focus on those children who on their own use the footpath and cycleway network to go to and from school or recreational activities in the vicinity of their homes, and who do not have sufficient maturity (wide-angle vision, ability to react etc.) to cope with the traffic environment. I have chosen to regard this group as pupils 7-12 years of age. Probably these children are the most frequent users of the footpath and cycleway network as they go to and from school almost every day, they visit friends and recreational activities and through training attempt to gain control over their bodies and the possibilities offered by the environment.

The traffic environment should be designed in such a way that allows children to behave in an unsafe manner, which children do, without running into dangerous situations. The following footpath and cycleway qualities are considered to be of importance for the user group "Children":

- Separation from car traffic.
- Design of crossings with car traffic.
- Car traffic speed.
- Number of lanes to cross.

3.2 The elderly and physically disabled

Just over one million Swedes consider themselves to have limited ability with regard to movement, and some 220 000 are using some means of assistance like wheel chairs, walking frames or walking sticks (SCB, 1999). In this project, attention has only been paid to those disabled when it comes to ability to move. The main reason for this was to keep the data base within reasonable limits. This means that the user groups "Elderly" and "Disabled" more or less have the same demands regarding footpath and cycleway qualities.

87% of men and 75% of women in the 25-64 age group have a driving license and access to a car. In the age group 65-84 the corresponding percentage figures are 76% and 34%. In spite of this, old people do not walk, cycle or use public transportation more than people on average (Krantz, 1999). Reduction in hearing, sight and physical fitness may be an explanation to the fact that old age people do not travel as much as the population on average. Of course this can lead to declining physical fitness and social isolation. The following footpath and cycleway qualities are considered to be of importance for the user group "Elderly":

- Paving material.
- Lighting.
- Inclination and steps.
- Railings across a footpath or cycleway to prevent the use of mopeds.
- Pavement and footpath width of importance for wheel chair users, prams etc.
- Bevelled kerbs at crossings to make it easier for wheel chair users etc.
- Railings along footpaths with strong inclination.
- Benches for resting.
- Design of crossings.
- Number of lanes to cross.

3.3 Women

Women use public transportation for a higher percentage of their trips (12%) than men (8%) and therefore they are to a higher degree obliged to use footpaths and cycleways (Krantz, 1999). Many women also work in nursing institutions which involves night-work, and therefore there are reasons to believe that women are frequent users of footpaths and cycleways after dark. At the same time we know from the media that many women are afraid to walk alone after dark. The following footpath and cycleway qualities are considered to be of importance for the user group "Women":

- Good lighting.
- No trees and shrubbery, where a person can hide.
- Short distance to dwelling-houses.

4. METHODS

4.1 The inventory (field studies)

The above mentioned user group specified footpath and cycleway qualities formed the base for the field survey formula. After a test survey the formula was slightly changed to adapt to the conditions in Alingsås. Among other things, "half pavement" was introduced as a type of footpath, and I found out that footpaths and cycleways were separated only by painted lines. All kerbs were bevelled at crossings, and very often footpaths and cycleways passed over a turning space at the end of a street.

Apart from the survey formula, we used 1:1 000 scale maps in A3 format, and each participant covered one quarter of the town area walking and writing down observations directly on the maps.

4.2 The digitilization

The digitilization work was carried out with the GIS programme Arc/Info using a digital map of Alingsås as a background. A single line was drawn between the two lines surrounding pavements and footpaths and cycleways. This means that the centre lines were drawn with a deviation of less than two metres from the factual position when it comes to footpaths and cycleways, and one metre for pavements. Almost all footpaths, cycleways and pavements wider than 0.5 metre were drawn up. Altogether the network measured 197 km. As can be seen in figure 1, the links of this network reached almost all entrances to buildings.

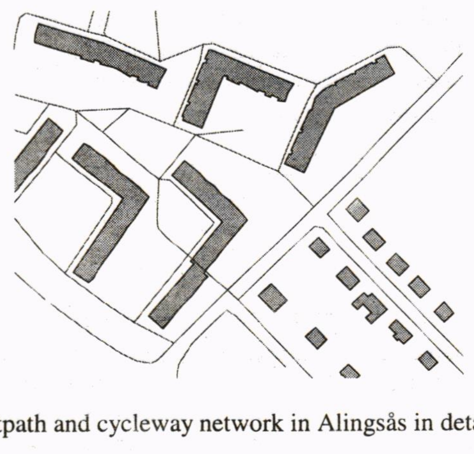

Figure 1 The footpath and cycleway network in Alingsås in detail. Scale 1:4 000.

4.3 Link attributes

Once the network was completed, different values of eleven link attributes were added (see Appendix). One of them is "Type of way" with six different classifications: half pavements (0.5 – 1 m), pavements (>1 m), footpaths and cycleways with car traffic with special permission (cemeteries, goods delivery etc.), footpaths, footpaths and cycleways (mopeds not allowed) and footpaths and cycleways (mopeds allowed). The other link attributes are: "Type of crossing", "Number of lanes to cross", "Paving", "Benches", "Shrubbery", "Lighting", "Inclination", "Steps", "Railing" and "Distance to dwelling-houses".

Two of the attributes were created for the whole network using GIS programmes: Inclination and Distance to dwelling-houses. All the other attributes were assigned to the links one by one manually.

Proving attribute classification means that the original network, which only has nodes where two or more links are joined, is divided into a number of short links which are different with respect to attribute classification. For example, a footpath link may have "asphalt" as a "Paving" attribute on one part and "gravel" on another.

5. EXAMPLES OF ANALYSES

5.1 Children's safe routes to and from school

In Alingsås there are seven schools for 7-12 year olds. Their locations and catchment areas may be seen in figure 2. As criteria for a safe school route for 7-12 year olds, the Swedish National Road Administration suggested that children should not walk on pavements along streets, and that crossings with car traffic should be on different levels, with traffic lights or designed as zebra crossings with speed reduction measures. The crossing type "via turning space" was also accepted as a good safety standard. In the GIS programme, ArcViewGIS, a sub-set of the network was selected with the following two criteria:

- "Type of way" >1. Links classified as "Half pavement" and "Pavement" were dropped.
- "Type of crossing" <6. Crossings classified as "Zebra crossing", "Railway crossing with warning light" and "Crossing sign but no zebra stripes" were dropped.

To these two criteria, another must be added to make the analyses useful: The sub-set network must reach one of the seven schools. Using the schools as origins for analyses in the ArcView extension Network Analyst, it is possible to create the continuous sub-set networks from the schools. The links which fulfilled the first two criteria but not the third one, are dropped. As can be seen in figure 2, only four of the seven schools have a safe network leading to each respective school. Around one of the schools, the sub-set network covers almost the whole of the catchment area.

The next question is: How many of the 7-12 year olds within the catchment area are able to reach their school in a safe manner? To be able to answer this question, it is necessary to analyse how many 7-12 year old children are to be found near the safe sub-set network. The word "near" is crucial. In this study it was found that a distance of 30 metres on both sides of the footpaths and cycleways seemed to include houses with direct access to the network, and exclude those located on the other side of a street in relationship to the network. This may of course be carried out by drawing a polygon around the network adapted to the specific land

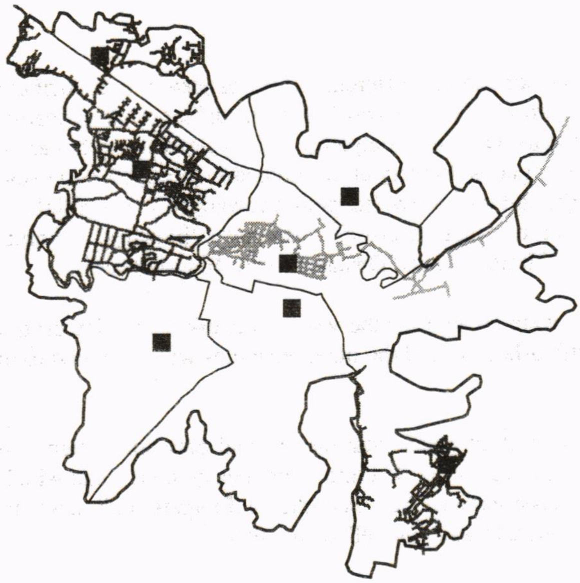

Figure 2 Schools for 7-12 year olds, catchment areas and the safe footpath and cycleway network reaching each school in Alingsås 1995. Scale 1:50 000.

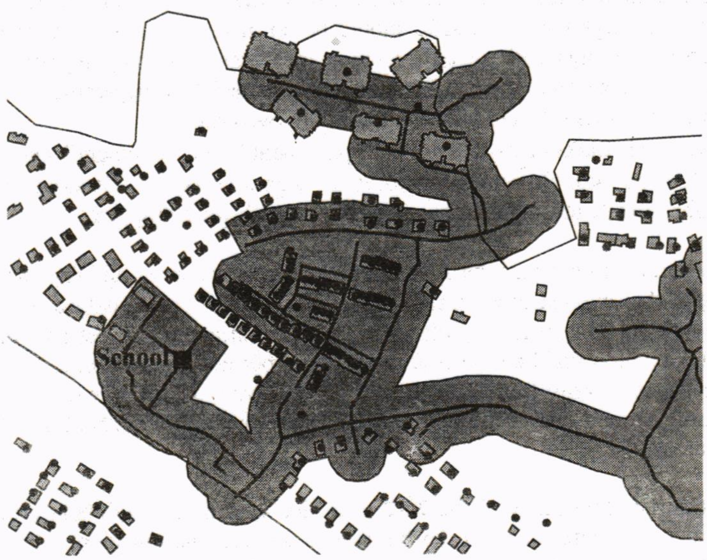

Figure 3. School, real estate coordinates (points), dwellings (light grey), 30 metre buffer zone (dark grey) and safe footpath and cycleway network to the Kvarnbacken school in Alingås, 1995.

use situation (streets, houses and footpath and cycleway network). To develop a more general method, I decided to use the buffer function in the GIS programmes in spite of that creating some small errors due to the fact that population information is stored in the coordinates for each unit of real estate.

From figure 3, one can see that the 30 metre buffer zone encompasses those real estate coordinates in the vicinity of the safe network to and from the school. It is also obvious that the children living in the single-family houses north east of the school have to make a wide detour when following the safe route to school. Those children will have much to gain by an unsafe pattern of behaviour such as crossing the street between their homes and the school whether or not there is a safe crossing. The polygons created by buffering the safe network may then be intersected with the population information on the real estate coordinates. From the population within the buffer zone polygon, the 7-12 age group may be summarised and presented as in table 1.

The differences between the schools are great when it comes to the percentage of the 7-12 year olds with a safe route to school. Three of seven schools, Nolby, Lendal and Kullingsberg, cannot be reached in a safe manner at all. However there are of course some safe subnets within these catchment areas, but they do not reach as far as the school. Noltorp is a district planned for pedestrians and cyclists, which may be observed from the 30 metre buffer zone covering almost all of the school catchment area (figure 4). The Afzelii school, situated in the town centre, has very few 7-12 year olds in its neighbourhood, and the footpath and cycleway to the north east serves mainly the industrial area situated there.

Table 1. 7-12 year olds within school catchment areas, and within 30 metres from the safe footpath and cycleway network.

School catchment areas	Length of the safe route to school	7-12 year olds within:			Metres safe footpath per "captured" 7-12 year old
		School catchment area	30 m from the safe route to school		
			Number	Percentage	
Noltorp	31 800 m	320	246	77%	129 m
Kvarnbacken	5 537 m	193	96	50%	58 m
Ängabo	10 014 m	318	116	36%	86 m
Afzelii	14 568 m	116	13	11%	1 121 m
Lendahl	0	243	0	0%	
Kullingsberg	0	204	0	0%	
Nolby	0	180	0	0%	

5.2 To measure directness

As was seen from figure 3, there was a great discrepancy in length between the safe route for the children living north of the school, and the direct but unsafe way to the school. This is an example of a common situation, and an explanation as to why subways and other safe crossings are not utilised in the manner traffic planners expected when the footpaths and cycleways were planned. Directness is one aspect of the attraction of a footpath and cycleway network. To be able to measure directness, an application to the ArcViewGIS had to be developed. This application calculates directness from a unit of real estate as the quotient between

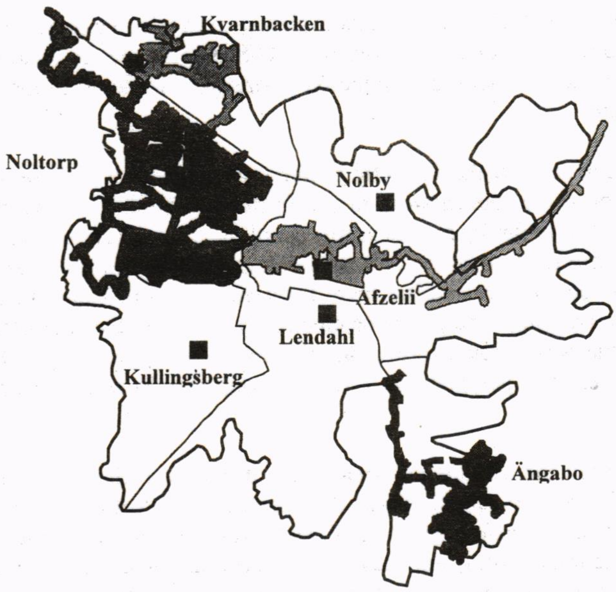

Figure 4. School names, school catchment areas and 30 metre buffer zones around the safe footpaths and cycleways to each school in Alingsås. Scale 1:50 000.

the distance in the factual network and the distance as the crow flies. As can be seen from figure 5, the children in the far eastern part of the catchment area have very little to gain from choosing another way to school other than the safe one.

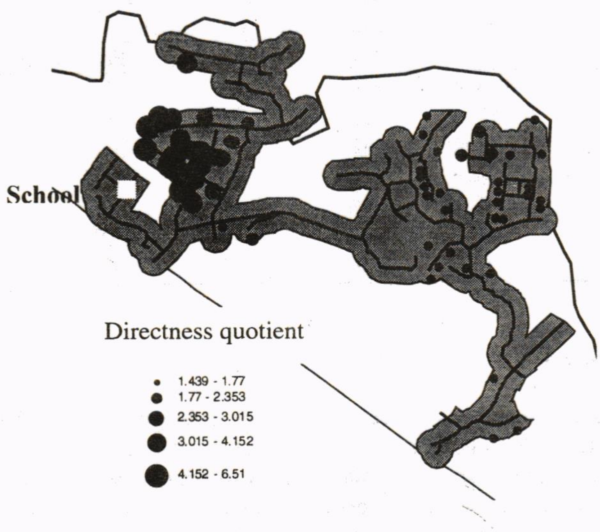

Figure 5. The safe and continuous network to the Kvarnbacken school (white) and units of real estate, within a 30 metre buffer zone, and with 7-12 year old inhabitants, on the basis of the directness quotient.

5.3 Secure footpaths for women after dark

Along all the cycleways in Alingsås there are also footpaths. In this example, the network is studied from the perspective of women walking when it is dark. The chosen network attributes make it possible to perform some analyses with respect to security. To select the sub-net "Secure footpaths for women after dark" the attribute "Shrubbery" = 0 (no shrubbery or pedestrian and cyclist subways), the attribute "Lighting" < 2 (lighting) and the attribute "Distance to dwelling-houses" = 0 (< 25 metres) are used.

A large proportion (59%) of the footpath and cycleway network in Alingsås has these qualities. But there are some discontinuances, which can make use difficult. This can be seen in figure 6, where women commuters coming to the railway station (1) would find it difficult to use the secure and well ramified network in the northern part of Alingås, as they would have to pass through a park (2) and two cemeteries (3). To the south the pedestrian network is cut off by an industrial area (4), and the main link to the south has subways under both the railway and the motorway and is situated in a park along a small river (5). Women can be said to be trapped at the railway station after dark.

In figure 7 the continuous secure network for women from bus stops in Alingsås has been buffered with a 30 metre zone. 51% of the women over 16 in Alingsås can go to and from the bus stops in a secure manner after dark.

Figure 6. The secure (light grey) and insecure (black) pedestrian network around the railway station in Alingsås . Scale 1:13 000.

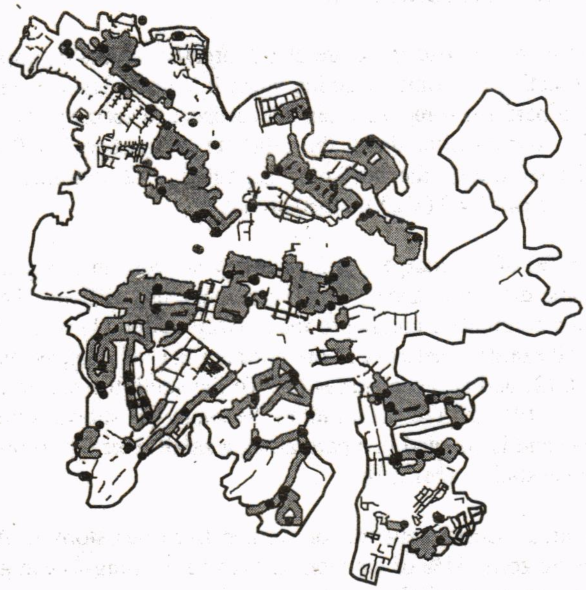

Figure 7. 30 metre buffer zone (grey) around safe and secure footpaths to and from bus stops in Alingsås, 1995. Scale 1:50 000.

5.4 Convenient and safe route to the chemist's shop for the elderly

When it comes to old age persons and those with impaired mobility it is a question of both traffic safety and convenience. To create a sub-pedestrian network with these qualities one may select the following:
Attribute "Type of way" < 0, because the half pavement is impossible to use for those bound to wheel chairs or those walking with a walking frame.
Attribute "Type of crossing" < 6, which means the same traffic safety criteria as for children.
Attribute "Number of lanes to cross" < 4, which means that old age persons should not have to cross more than 2 lanes as some of them move with a low average speed.
Attribute "Paving" = 0, because it is difficult to use a wheel chair, or a walking frame with a gravel surface, and paving-stones can cause old age persons to stumble and fall.
Attribute "Inclination" < 8, because it is impossible to manage a wheel chair by oneself when the inclination is greater than 8%.
Attribute "Railing" = 0, which means that there should be no railing across the footpath, as railings are difficult to pass by when using a wheel chair or a walking frame.

Under these assumed conditions about traffic safety and convenience for old age persons a sub-network can be created and used for analyses about accessibility, for example to chemist's shops. There are only two chemists in Alingsås, one in the town centre and one in the north-west district of Noltorp, which we have already found has the largest footpath and cycleway network in Alingsås (figure 8). Under the assumed conditions, it is impossible to reach the chemists in the town centre. But nevertheless 12% of the inhabitants over 65 are able to reach a chemist's in a safe and convenient manner unassisted. They all live in the north-west district Noltorp.

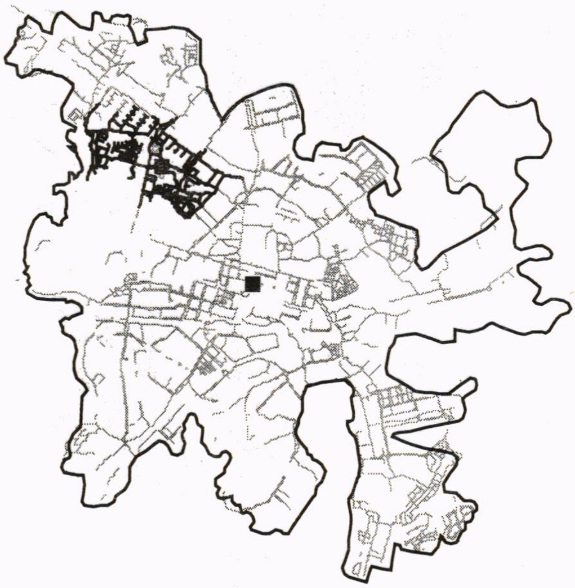

Figure 8. The safe, convenient and continuous pedestrian network to chemist's shops for the elderly in Alingsås. Scale 1:50 000.

Under the same assumed conditions, the old age persons' network to food stores may be analysed. From figure 9, we can see that the five smallest sub-networks only offer access to one food store. The old age persons living within 30 metres from the two largest ones have a choice between two or three different food stores. Using a safe and convenient pedestrian network, 31% of the inhabitants over 65 in Alingås have access to a food store. From table 2, we can see that a majority will have to walk between 400 and 800 metres to go to a food store.

Table 2. Number and percentage of inhabitants over 65 within 30 metres from a safe and convenient pedestrian network to food stores according to distance.

Distance to food store	Number of inhabitants over 65 within 30 m from network	Percentage of inhabitants over 65 i Alingsås
0 - 400 m	360	9%
400 - 800 m	751	17%
800 - 1200 m	206	5%
1200 - 1690 m	41	1%
Total	1358	31%

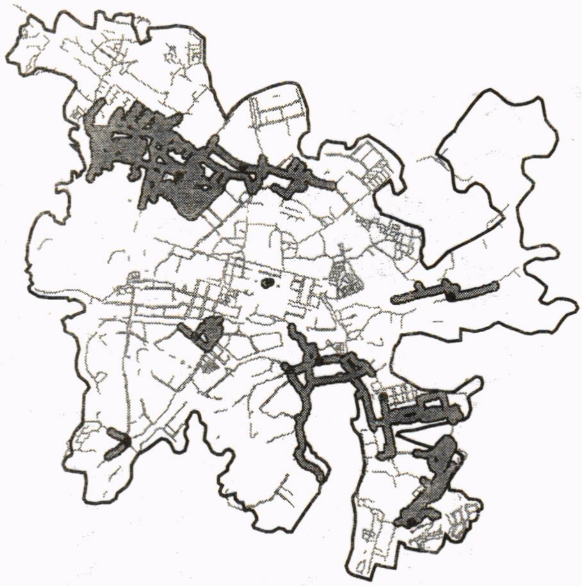

Figure 9. 30 metre buffer zone (grey) around safe and convenient footpaths to food stores in Alingsås, 1995. Scale 1:50 000.

6. FINDINGS

6.1 The usefulness of the method

I believe most readers will consider this method to be a useful one, as well as a method which makes analyses not possible with other methods possible. Therefore, the implementation of the method in Swedish local authorities would be a question of costs, as the benefits are obvious. Every town and village has their own characteristics which will influence the costs. The costs in terms of time shown in table 3 are calculated from Alingsås, a small town with a very widespread footpath and cycleway network. Therefore, it is possible that a similar GIS network in another town could be created in a shorter time. On the other hand, the time necessary to transform elevation data to inclination link attribute can differ due to the type of elevation data available in the local authority in question. The time it takes to perform analyses is excluded as it is on the whole a question of lay-out work.

Table 3. Costs (hours per 10 000 residents) per sub-operation to create a GIS footpath and cycleway network.

Sub-operations	Hours per 10 000 residents in the town
Survey	25
Digitilization work	20
Creation of attributes	25
From elevation data to link inclination	10
Total	80

Most towns in Sweden have digital maps suitable for the digitilization. If not, there is a possibility of using GPS-technology (Geographical Position Systems) in combination with a portable computer to perform both the survey, digitilization work and attribute setting simultaneously in field. Although this method sounds cost efficient, our experience is that the method described in this paper is more efficient.

6.2 Research issues

A method may be effective and make a lot of different types of analyses possible, but it will still be useless if there is no good scientifically based knowledge about the relationships between qualities in the traffic environment and traffic safety, security and convenience. The link attribute chosen for the GIS footpath and cycleway network must be useful, and so must the classification of each attribute. For example, most research findings do not relate to different user groups. In Sweden, identifying children, the elderly and impaired individuals as standard setting user groups means that new research projects must be initialised.

On the other hand, using the GIS-technology means that good precision is necessary when describing the traffic environment. It is not sufficient with the attitude "A wheel chair user cannot manage a steep inclination". Instead you must choose a specific inclination percentage. When it comes to traffic safety, it is more complicated as accidents occur very seldom. It is also very difficult to separate the importance of the different characteristics of the accident situation from one another.

Some examples of research issues raised from this project can be mentioned as follows:

- Is the safe footpath and cycleway network also the attractive one? Are there any differences between children, the elderly, pedestrians and cyclists in this respect?
- Is the secure footpath and cycleway network also the safe one? Are there any differences between children, the elderly, women, pedestrians and cyclists in this respect?
- Is a pavement less safe than a separated footpath? Are there any differences between children, the elderly and impaired individuals?
- Are there any differences in safety between a footpath separated from a cycleway by a painted line and one separated by kerbstones? Are there any differences between children, the elderly, pedestrians and cyclists in this respect?
- Are there differences in safety between cycleways allowing mopeds and those that do not? In the latter case this means mopeds have to use streets among the cars. Are there any differences between pedestrians, cyclists and moped users in this respect?
- Are there any differences in safety for children, the elderly, cyclists and wheel chair users at a crossing with traffic lights?
- What is the relationship between traffic safety and the quantity and speed of cars, pedestrians and cyclists at zebra crossings?
- Are there any differences in traffic safety between crossing two lanes with traffic in two directions, and crossing three lanes with traffic in one direction? Are there any differences between children, the elderly, pedestrians, wheel chair users and cyclists in this respect?

6.3 The policy for sustainable development and traffic safety demands new methods and new knowledge.

The Swedish government has pointed out the necessity of the increased use of walking and cycling, and the decreased use of cars (Prop. 1996/97:137, Prop. 1997/98:56, Prop.

1997/98:145). The Swedish National Road Administration has recently published a national strategy for increased safe cycle traffic as a background to regional cycle programmes to be implemented in local planning (Vägverket 2000).

To achieve the goals for sustainable development and the traffic safety programme "Vision Zero" as well as to focus on the new standard setting user groups, large investments will be made by the Swedish National Road Administration and local authorities to improve the traffic environment. In this process it is important that investments are directed in such a way that will benefit the accessibility of the standard setting groups under conditions of traffic safety, security and convenience. The attractiveness of walking and cycling must be improved to make a modal change from driving cars possible. As 70 – 80% of the urban car trips are shorter than 4 kilometres (Vägverket 2000), it is obvious that the best prerequisites for modal change are to be found in urban areas.

In his studies about the paradigms of town planning and traffic planning, Anders Hagson, at the Department of City & Mobility, has found important shortcomings in the empirical foundation for the traffic safety guidelines of today (Hagson 2000). The most urgent need today is to create an extensive and detailed basis of empirical knowledge about traffic safety measurements and their effects for different user groups.

REFERENCES

Litterature

Hagson A. (2000) **Stads- och trafikplaneringen paradigm – om behov av nya principer och samverkande åtgärder för en bättre stadsmiljö.** Rapport 2000:4, Tema Stad & Trafik, Chalmers, Göteborg.

Krantz L-G. (1999) **Rörlighetens mångfald och förändring –Befolkningens dagliga resande i Sverige 1978 och 1996.** Meddelanden från Göteborgs Universitets geografiska institutioner, serie B nr 95, Handelshögskolan vid Göteborgs universitet, Göteborg.

Proposition 1996/97:137 **Nollvisionen och det trafiksäkra samhället.**

Proposition 1997/98:56 **Transportpolitik för en hållbar utveckling**.

Proposition 1997/98:145 **Svenska miljömål. Miljöpolitik för ett hållbart Sverige.**

Reneland M. (2000) **GIS-metod för kartering och analys av gång- och cykelvägnät – tillgänglighetsanalyser för barn, kvinnor och äldre under antagna villkor beträffande säkerhet och trygghet**. Rapport 2000:7, Tema Stad & Trafik, Chalmers, Göteborg.

SCB (1999) **Svenskarnas resor 1998 Riks-RVU resultatrapport för 1998**. Statistiska Centralbyrån, Stockholm.

Statens Planverk (1968) **SCAFT 1968: Riktlinjer för stadsplanering med hänsyn till trafiksäkerhet**. Publikation nr 5, Statens Planverk, Stockholm.

Vägverket (2000) **Mer cykeltrafik på säkrare vägar – Nationell strategi för ökad och säker cykeltrafik**. Publikation 2000:8, Vägverket, Borlänge.

Other references

Printed map for Alingsås, Jalab Prod.

Digital map for the town of Alingsås, Metria, Alingsås commune.

School catchment areas, Alingsås commune.

Population statistics (gender and age) 1995 on real estate coordinates, Statistics Sweden.

ArcInfo, version 7.2.

ArcViewGIS version 3.2.

Applications to ArcViewGIS	Spatial Analyst Network Analyst 3D Analyst Grid Tools
Application to ArcViewGIS	Analysis Extension, Swegis

APPENDIX

Attributes used for the GIS footpath and cycleway network in Alingsås

Attribute	**Classification**
Type of way	0 = half pavement (50 – 99cm) 1 = pavement (100 – cm) 2 = only cars with special permission 3 = footpath 4 = footpath and cycleway, mopeds are not allowed 5 = footpath and cycleway, mopeds allowed
Type of crossing	0 = no crossing 1 = subway 2 = footbridge 3 = traffic light 4 = via turning space 5 = zebra crossing with speed reducing measures 6 = zebra crossing 7 = railway crossing with lights 8 = crossing sign but no zebra stripes
Number of lanes to cross	0 = none 1 = one lane, one direction 2 = two lanes, one direction 3 = two lanes, two directions 4 = three lanes, one direction

	5 = three lanes, two directions
Paving	0 = asphalt 1 = gravel 2 = paving-stones
Bench	0 = no bench 1 = bench
Shrubbery	0 = no shrubbery 1 = shrubbery
Lighting	0 = special lighting 1 = only street lighting 2 = no lighting at all
Inclination	0 = no inclination 1 = 1% inclination 2 = 2% inclination ...
Steps	0 = no steps 1 = steps
Railing	0 = no railing 1 = railing across footpath or cycleway
Distance to dwelling-houses	0 = distance < 25 metres 1 = distance 25 – 50 metres 2 = distance > 50 metres