An analysis of soft transport policy measures implemented in Sweden to reduce private car use

Margareta Friman · Lina Larhult · Tommy Gärling

Abstract   Evaluations carried out in many countries show that soft policy measures in the form of personalized travel planning reduce private car use and increase travel by public transport. Sweden is a sparsely populated country that poorly supports public transport, a country with long distances, a cold climate, and a high concentration of private cars, which is why soft policy measures implemented in Sweden may be less cost-effective than has been found in other countries. Thirty-two programs using personalized travel planning were analysed with regard to stewardship, geographic area of application, choice of techniques of exerting an influence, and effects on car use and choice of alternative travel modes. None of the evaluations of the documented programs met the method requirements for such evaluations as regards design and effect measurement. Additionally, reporting was substandard as well as non-standard in the way that is desirable in order to enable comparative analyses. With reservations for these short-comings, it is inferred that positive effects on a par with the results in other countries have been obtained in some of the implemented programs. It is however necessary to conduct evaluations which are of higher quality. The requirements which will then have to be applied are defined.

Introduction

There is a growing interest among the general public, politicians, and policy makers regarding issues concerning the environmental effects of motorized transportation (Gärling and Steg 2007). In focus, among other things, are carbon dioxide (CO_2) emissions, which are partly responsible for global warming. In Sweden about a third of carbon dioxide emissions originate from transportation. While other sectors are gradually decreasing their

M. Friman (✉) · L. Larhult
Karlstad University, 651 88 Karlstad, Sweden
e-mail: margareta.friman@kau.se

T. Gärling
University of Gothenburg, Göteborg, Sweden

climate-impacting emissions, those generated by passenger transportation are continuing to rise. Besides emissions of CO_2 and other environmentally harmful substances, increased car use entails other negative consequences such as noise and traffic accidents. Vehicles also take up much space in local environments that impede people's freedom of movement (Greene and Wegener 1997). In the future, cleaner fuels and reduced car use (e.g., fewer and shorter car trips, car-pooling, and switching to other alternatives) will be necessary in order to overcome these environmental problems (Loukopoulos et al. 2008; Steg and Tertoolen 1999). Enhanced and attractive public transport could be one way of reducing private car use. In Sweden the goal of doubling the market share (increasing the number of trips) of public transport by 2020 was adopted in 2007. For public transport's development and continued existence, it is necessary that people choose to use this alternative travel mode and are satisfied with this (Fellesson and Friman 2008).

During recent years, several different types of policy measures have been developed in order to reduce car use. These types of measures are called "travel demand management" (Kitamura et al. 1997; Pas 1995) and are subdivided into "soft" and "hard". Road tolls, congestion charges, and increased fuel prices are examples of hard policy measures. Previous research shows that hard policy measures alone do not lead to reduced car use (Stopher 2004). Hard policy measures that enforce change have often resulted, moreover, in reluctance on the part of the general public and are thus often politically unfeasible (Gärling and Schuitema 2007; Jones 2003).

Cairns et al. (2008) identified and defined 10 different soft policy measures (see Table 1). Besides travel planning and marketing, these are often limited to providing information about the problems of choosing a certain travel mode over others. The first five (different forms of personalized travel planning and information as well as campaigns concerning alternative travel modes) have been the most frequently used to impact upon car use during the last 10 years (Möser and Bamberg 2008). In many cases, several measures have been combined in order to boost the effect.

The present paper focuses on *personalized travel planning* (see Gärling and Fuji 2009; Jones and Sloman 2006, for a more detailed description and analysis of this method). Personalized travel planning can be implemented, and has been implemented, in several different ways often specified under different names and containing different combinations of measures. Others have been implemented in roughly the same way and have then been marketed

Table 1 Different types of soft policy measures (from Cairns et al. 2008)

Types of measures	Aim
1. Travel policy at workplace	Promotes car-pooling between employees
2. Travel policy at school	Choosing other alternatives for school runs
3. Personalized travel planning	Personalized travel information
4. Information and marketing	Increased knowledge via advertising campaigns and simplified ticket availability
5. Campaigns for alternative transport modes	Increasing understanding of problems with certain transport choices
6. Car clubs	Offering cars that are paid for upon actual use
7. Car cooperatives	Reducing the number of car trips through joint ownership
8. Tele-working	Reducing the number of trips by, e.g., offering Internet access
9. Tele-conferencing	Reducing the number of work trips via phone meetings
10. Shopping from home	Reducing the number of purchasing trips via home deliveries

as a *soft policy program*. Commercial such programs include IndiMark (Brög et al. 2009), Personalized Travel Planning (Cairns et al. 2008), and TravelBlending (Ampt 2004; Rose and Ampt 2001, 2003). These are implemented in such a way that an offer is made to a special target group to take part and change their travel habits, after which they accept and receive various forms of personalized information, possibly in combination with motivation-enhancing measures. Besides these three well-known soft policy programs, there are also many others, some of which are simpler in nature while others are even more extensive combinations of measures. Richter et al. (2010b) point out that more research is needed into which types of measures have been implemented, how these have been implemented, and which effects they have had as regards altered travel behaviour in order to be able to reach conclusions regarding what can constitute cost-effective programs.

The purpose of the present paper is to chart soft policy programs of the type personalized travel planning that have been implemented in Sweden. Long distances, a sparse population providing poor support for public transport, a cold climate, and a high incidence of cars, simultaneous to the industry investing in doubling public transport's market share, all make it important to attempt to answer the question of whether or not soft policy programs implemented in Sweden are as cost-effective in reducing car use as in the other countries where these have been implemented. The next two sections deal, in outline, with the implementation and the demonstrated effects of personalized travel planning programs in other countries. With this as a backdrop, an overview of Swedish programs is then presented. As these are of poor quality in international comparison, the paper is concluded by discussing what can be done to improve them.

Personalized travel planning programs in other countries

Personalized travel planning programs in other countries differ in four ways depending on the type of implementation (Fujii and Taniguchi 2006). First, the programs have been implemented at a workplace (targeting work trips), at a school (targeting parents' chauffeuring trips), or in a residential area (targeting all types of trips). The techniques that have been used to change car use have also varied; whether incentives and motivating information (offering free bus tickets; requesting that personalized goals are set; requesting formulation of a personalized travel plan) have been used and whether personalized information has been provided. The third way is how their implementation has proceeded, including choice of the target group, how many times and how the target group has been contacted, and how the evaluation has been carried out. The fourth and last way is the type of communication with the participants. Whether home visits, personal contacts, group meetings, letters, phone calls, emails, or the use of web pages. During the various stages, communication is important. Initially, it is important, by means of good communication, to get as many as possible to participate. During the program, it is important, using good communication tools, to assist during any problems arising, to answer questions, and to maintain the participants' motivation. Post-program, communication efforts are necessary to motivate the participants to maintain their new travel habits.

Demonstrated effects

Effects have primarily been demonstrated for personalized travel plan programs implemented in Australia (Taylor 2007), the UK (Cairns et al. 2008), the rest of Europe (Brög

et al. 2009; Ker 2003), and Japan (Fuji and Taniguchi 2006). A review of the evaluations of these programs shows that car use has fallen, travel by other modes of transport has risen, and that CO_2 emissions have been reduced. No major differences have emerged when comparing projects implemented in Australia, Europe, or Japan. A brief summary follows below. For a summarizing analysis showing that effects can remain after several years, see Richter et al. (2010a).

There has been great interest in the programs conducted in Australia (30–40 % of households stated that they were willing to take part) (see Taylor 2007). Programs initiated early (1996) were able to show 14–23 % reductions in car use (vehicle kilometres of travel). Subsequent projects have resulted in a 10 % reduction in car use. Personal gains by the participants in the form of time, health, and money have also been demonstrated.

In the UK Cairns et al. (2008) report an average reduction of 4–5 % in car use (vehicle kilometres) as a result of implemented programs. Personalized travel planning at work-places resulted in a reduction of 10–30 %, while personalized travel planning in schools resulted in a reduction of 8–15 %. Personalized travel planning in households resulted in a reduction of 7–15 %. Information and the marketing of public transport increased bus travel (patronage increases) by 1–5 %.

The implementation of programs in Germany and Austria showed that the number of public transport trips increased by 10-30 per person per annum compared with the number of trips made by a control group (Ker 2003) while the number of car trips fell by 12 %. The Netherlands and the US have also successfully implemented travel planning at workplaces, with an average fall of 18 % in the number of car trips (Richter et al. 2010a).

Möser and Bamberg (2008) conducted a meta-analysis of the results of 141 programs implemented in various countries. The programs were divided into three categories: travel policy at the workplace, personalized travel planning at school, and personalized travel planning in households. The result showed a fall in the number of car trips by 7 % (from 61 to 54 %). The authors however noted the difficulties of drawing reliable conclusions from statistical results due to the lack of control groups.

Taniguchi et al. (2007) reported a meta-analysis of the results of programs conducted in Japan. The programs were divided into three categories depending on where they had been conducted: residential areas, workplaces, or schools. The meta-analysis was limited, however, to programs conducted in residential areas. It was shown that the number of car trips fell by 7 % and that the number of public transport trips rose by 69 %. Closer analysis of only the programs using a control group showed a fall in the number of car trips by 12 %.

In summary, the implementation of soft policy measures in the form of personalized travel planning generally has had positive effects. Richter et al. (2010b) note, however, that use of different implementations and targets make comparisons difficult, which is why many questions remain as regards how soft policy measures should be implemented in order to be most cost-effective. There is thus a need for more research in order to understand the significance of implementing personalized travel planning programs in different ways and what effects these have.

Personalized travel planning programs implemented in Sweden

No previous summary and analysis has been carried out of personalized travel planning programs implemented in Sweden. This is why the present study was undertaken. More specifically, the aim is to describe Swedish personalized travel planning programs with

regard to which types of measures have been implemented, how these have been implemented, and what effects they have had on changed car use and switching to other modes.

Method

Cairn et al.'s (2008) classification of programs constituted the departure point for a literature search. Various search terms (see Appendix 1) were used when searching the Internet and a relevant database (SARA, see "Discussion" section). Only few reports were however available in the database. Further Internet searches resulted in the identification of relevant web pages (see Appendix 2). Analysis of these made possible to find 50 reports on the implementation of various programs. Closer scrutiny showed that some reports were marred by major shortcomings, for instance that they lacked data because they were only reporting on a proposal for implementing a program or a small-scale pilot study preceding a forthcoming program. For these reasons, 18 reports were weeded out. The remaining 32 reports on implemented programs were used in the following analysis.

The programs selected have been implemented in many different ways. To provide a basis for comparison, a coding form was used which was developed and used in Japan to evaluate and compare various programs (Fujii and Taniguchi 2006). When using the coding form in Sweden, it was translated and partly reworked (see Appendix 3). The coding form contains questions about where the project was conducted (workplace, school, or home), techniques of changing car use, and method of evaluation. The coding form also contains questions about the principal, project duration, implementer, and questions about the outcomes.

Results

Implementation

The personalized travel planning programs were classified according to the type of geographic area where they had been implemented; in a residential area, a built-up area/municipality, a city or county/region (Statistics Sweden 2009). As indicated in Table 2, most of the programs (26 out of 32) have been conducted in a built-up area/municipality. The durations vary between 1 month and 7 years. There have often been different principals. A common combination is a municipality collaborating with the Swedish Road Administration that organise and finance the program. Programs organised by the county council have to a greater degree been health-related.

The programs have been conducted in residential areas, at workplaces, or at schools (see Table 2). The most usual procedure for programs in residential areas is that initial contact is established with people in their homes by letter or phone in order to chart their travel habits. Upon continued participation, some type of free ticket to use public transport is offered. The programs conducted at workplaces involve, for instance, car pools. Examples of programs conducted at schools include competitions to encourage pupils to walk or cycle to school instead of being chauffeured.

Five different types of target groups are shown in Table 2. Most frequently, the target group consists of individuals. Measurements are then made of individuals' changed travel. The target group can also be a multi-person household, in which case the number of cars in the household is taken into account as well as any changes occurring in travel within the

Table 2 Summarizing overview of the personalized travel planning programs in Sweden (the figures are average frequencies)

Geographic area	Residential area	Built-up area/ municipality	City	County/ region
Frequency	1	26	2	3
Project duration in months				
M	5.0	8.6	45.0	5.8
SD		14.4	55.2	5.5
Range		63	78	10.5
Max/min		64.0/1.0	84.0/6.0	12/1.5
Organiser				
Municipality		8	2	1
County council		3		
Government				1
Municipality and government	1	12		1
Municipality and county council		1		
County council and government		1		
Municipality, company, and government		1		
Research object				
Home	1	10	1	
Workplace		7	1	1
School		2		2
Traffic interchange junction		5		
Home and workplace		2		
Target group				
Household	1	4		
Individual		11	1	
Employee		7	1	1
Pupil		2		2
Individuals and employees		2		
Previous travel habits				
Habitual car user	1	18	2	3
Public transport		1		
Car and public transport		1		
Walking and cycling		2		
Car, public transport, walking, and cycling		4		

household. When programs are implemented at workplaces or schools, the target group is employees or pupils.

A majority of the programs have been implemented with the aim of breaking car users' habitual car use and make them switch to public transport, cycling, or walking. Yet, the programs generally lack a clear definition of habitual car use, for instance how many trips have to be undertaken by car in order to be counted as habitual. In Table 2 habitual car

users are limited to programs that have reported that the participants' previous travel habits are dominated by car use. It can be seen that 23 of the programs included habitual car users while 5 focused on people who use a car in combination with, for instance, public transport or a bicycle.

The various techniques used to exert an influence on the participants have been categorised into four different overarching groups (Table 3): requests for a travel plan, incentives, information, and feedback. In the category "requests for a travel plan" two programs have asked the participants themselves to form a plan regarding how to change their travel behaviour. Four programs have used a technique of requesting that change goals are set. Change goals include identifying and defining trips, either by the project leader or by the participants, which are to be changed. The commonest type of requests for travel plan involves using different contracts which are usually pre-drafted by the project leader and which the participants approve at the start of the program. The contracts contain a pledge to complete the program and to replace some or all of the car trips made with trips by bike or public transport.

Incentives are a commonly used technique for getting people to take part in the projects (see Table 3). This can be a matter of receiving a pack containing some bike equipment (e.g. helmet, high-visibility vest, discounts on bike repairs, or a cycle computer). Other incentives include participation in competitions or prize-draws. In order to market various public transport alternatives, and make the participants travel by bus instead of car, various kinds of free tickets are offered. Limited-duration travel passes have been given out to those interested in trying out public transport and free rides have also been offered within an entire municipality or just to certain events (e.g. free buses to hockey or speedway events).

Table 3 Frequency of type and occurrence of techniques (coded for 32 programs.)

Technique	Frequency
Requests for change	
Change plan	2
Change goal	4
Contract	9
Incentives	
Gifts/competitions	16
Free tickets	13
Information	
Motivating information	10
Personalized travel information	7
General travel information	14
Tuition	12
Group meetings	10
Web-tool	11
Personal meeting	14
Feedback	
Feedback about emissions	2
Feedback about calorie consumption	1
Feedback about travel costs	0
Feedback about reduced travel	0

The category "information" (see Table 3) includes what kind of information the participants have been given and how it has been communicated to them. Most frequently, general information is provided about the alternatives to using one's own car, for instance timetable information or information about changed service frequencies in public transport. Providing personalized information is not common. In order to communicate information about the program, environmental impact, or sustainable travel, it is normal to have a personal meeting with the individual participant. This can be a matter of, for instance, a workplace manager recruiting participants by meeting them. Web tools can be used to find a specific travel route, timetable information, car-pool bookings, or car-pooling tools, with one program choosing to allow its participants to share their travel diaries on a web page. Tuition and group meetings are often used at schools and workplaces to maintain, once or a number of times, the motivation to take part or continue with the new habits.

Providing feedback to the participants during or after the programme is unusual (see the category "Feedback" in Table 3). The few projects that have used feedback have reported back calorie consumption and exhaust gas emissions. Thus, there has not been a direct feedback about travel costs or reduced travel.

Various techniques are used depending on the goal of the project (goals can include the marketing of certain travel modes, improved staff health, reduced travel expenses, or improving the environment of a town). Other factors determining which technique(s) are used include budgets, durations, how many people are included, and who the target group is. Table 4 shows the number of programs which have used different combinations of techniques. A program is not listed since information was missing about the implementation. As can be seen, it is common to use many different combinations of techniques. With a few exceptions, however, every program is unique. The most common combination (includes five programs) is that the participants have received general information about how to change their travel, a personalized travel plan, and some kind of free ticket for public transport. Two programs have used a web-tool, as their sole technique, to convey information or make it easier to change car use (a company-car-pool at a municipal administration and the program "the CO_2 challenge" in which people were urged, via e-mail and web pages, to walk or cycle to work for a week). The combination of contracts and incentives has been used in two programs (the participants have entered into contracts to cycle instead of drive on certain days of the week and the incentives have been, for instance, a cycle helmet and a rain suit).

Outcomes

Tables 5, 6, and 7 display the outcomes of the various programs as regards changes in numbers of trips made, in total and per week, and in kilometres travelled, in total and per week. In all cases, this is based on comparisons between measurements before and after. The results are also shown in many different ways, thus making comparison difficult. In several cases no outcomes have been reported.

Table 5 displays the percentage change in the number of trips. Most of the programs have been targeted at people making most of their trips by car. In 7 of these, the reduction in the number of car trips is 22 %. The largest proportion of programs reporting changes in trips as a percentage have aimed at influencing people to choose the bus as an alternative. On average, these have led to an increase in the number of bus trips by 36 %. The highest number is 93 % increase in public transport trips, while the lowest is 2 %. Two programs that aimed at increasing bicycle use report an average increase of 43 % in bicycle trips.

Table 4 Frequency of type and occurrence of combinations of techniques

Combinations of techniques	Frequency
Web tools	2
General travel information, incentives	1
Contracts, incentives	2
General travel information, free tickets	1
Incentives, free tickets	1
Motivating information, feedback about emissions, incentives	1
Personalized travel information, general travel information, free tickets	5
Motivating information, personal meetings, tuition	1
Incentives, web tools, free tickets	1
Motivating information, personal meetings, tuition, group meetings	1
General travel information, incentives group meetings, web tools	1
Motivating information, personalized travel information general travel information, personal meetings, free tickets	1
Change plans, motivating information feedback about emissions, incentives, group meetings	1
Motivating information, incentives, personal meetings, tuition, group meetings	1
General travel information, personal meetings tuition, group meetings, web tools	1
Contracts, incentives, personal meetings, web tools, free tickets	1
Motivating information, general travel information, contracts, incentives, personal meetings, tuition	1
Change targets, contracts, incentives, personal meetings, tuition, group meetings	1
Motivating information, incentives, personal meetings, tuition, group meetings, web tools	1
General travel information, incentives, personal meetings, tuition, group meetings, web tools	1
General travel information, contracts, personal meetings, tuition, web tools, free tickets	1
Change targets, contracts, personal meetings, tuition, group meetings, web tools, free tickets	1
Motivating information, change targets, feedback about calorie consumption, contracts, incentives, personal meetings, tuition, web tools	1
Change plans, motivating information change goals, personalized travel information contracts, incentives, personal meetings tuition, group meetings, free tickets	1
Number of programs	31

Table 5 Mean (M), standard deviation (Sd) and maximum/minimum (max/min) of change in percent trips using various modes of transport

[a] The number of programs for which data were available

	Car	Bus	Cycle
n^a	7	10	2
M	−21.6	36.1	43.0
Sd	20.1	38.4	62.2
Max/min	−1/−60	93/2	87/−1

The upper part of Table 6 shows the change in the total number of trips per week. Two programs have reported a reduction in the number of car trips. The greatest reduction is 141 trips/week. The bus travel in Table 6 includes five programs widely spread. At the most, the total number of bus trips per week increased by 3,076, and at the least by 4 trips. One program reports the total number of changes in trips per week by bicycle (an increase

Table 6 Mean (M), standard deviation (Sd) and maximum/minimum (max/min) of change in number of trips per week (total number and number per person) using various modes of transport

	Car	Bus	Cycle
Change in total number of trips			
n^a	2	5	1
M	117.5	931.4	94
Sd	33.2	1287.8	
Max/min	−94/−141	3076/4	94/94
Change in number of trips per person			
n^a	2	3	1
M	6.64	0.68	6
Sd	0.52	0.89	
Max/min	−6.27/−7	1.7/0.1	6/6

[a] The number of programs for which data were available

Table 7 Mean (M), standard deviation (Sd) and maximum/minimum (max/min) of change in trip distance (km) per week (total and per person) using various modes of transport

	Car	Bus	Cycle	On foot	Carpool car
Change in trip distance in total					
n^a	3	1	2	2	1
M	−2646.67	5045	960.5	1447.5	385
Sd	2181.34		429.21	942.57	
Max/min	−781/−5045	5045	1264/657	2114/781	385
Change in trip distance per person					
n^a	2	1	2	1	1
M	−152	252	30.8	52	9.6
Sd	141.42		40.87		
Max/min	52/−252	252	59.71/.9	52	9.6

[a] The number of programs for which data were available

of 94 trips). The lower part of Table 6 shows how these trips are broken down per person. It was necessary here to exclude programs which did not report the number of participants. Two of the programs showing increased bus usage have not reported the number of participants. Programs reporting increased trips by bike have included 15 people who have on average made six more trips by bike per week.

Table 7 shows programs which have registered how many kilometres the participants have travelled using alternative travel modes. Two programs have reported program durations and the result of the change in terms of kilometres, but not the number of participants. This made it impossible to calculate how large the change was per person. In contrast to Tables 5 and 6, programs reported here have aimed to make participants use a car-pool and walk. On average, those that have promoted walking have reported an increased distance of 1,447 km. The program which also reported the number of participants and the program duration shows that each individual increased his or her walking distance by on average 52 km/week. For programs offering car pools, these cars have been used for travelling 385 km/week, corresponding on average to 9.6 km per person per week.

Discussion

The purpose of the present study was to analyse Swedish personalized travel planning programmes for reducing car trips with the aim of comparing Swedish such programs with those conducted in other countries. The results show that several programs have been conducted in Sweden focusing on changing travel by car. It has been difficult, however, to find documentation of these programs, partly because different principals have implemented the programs and partly because descriptions have not been published in accessible sources or made available in some other way. Of the 50 reports found, 32 contained sufficient information to be analysed. However, the reporting of these varies much in the degree of detail. Only two programs have been documented according to a standardised method including objective, procedure, and results on different levels. The remaining programs have not been documented on the basis of any reported template.

The evaluations of the programs are consistently based on an inadequate evaluation design lacking randomised control groups (Fujii et al. 2009). Only one program has specified that a comparison group has been used; however, how the participants have been selected to this has not been documented. Neither were any comparisons made with the comparison group. Randomized assignments of experimental and control groups are never made. The majority of the programs have recruited, in an uncontrolled manner, as many people as possible who have expressed an interest in participating.

The commonest form of financing and implementation of personalized travel planning programs in Sweden is that a municipality applies for government funds in order to be able to conduct a program. This is then implemented at a workplace, in a residential area, or at a school. Examples include the "CO_2 challenge", "a car-free day", "health pedallers", "walking school buses" or "smart pedestrians", which are all aimed at changing people's car use on the basis of a predetermined concept.

The aim of the analysed programs has been to reduce car travel in favour of public transport or cycling. In the majority of the programs, several techniques have been used. Few have, however, combined the same techniques. A few have been based on the concept of the "smart pedestrian" which has been implemented in the same way in different geographical areas. The "smart pedestrian" combines personalized and general travel information with a free ticket to use public transport. Two programs have used a web-tool as their sole technique to convey information or to facilitate reductions of car use. Via email and a web page, the participants have been urged, for a certain period of time, to cycle or walk to work. There would seem to be a lack of consensus regarding which techniques are effective. It is likely that accumulated knowledge of successful techniques has not been used as a departure point, that is that change goals are set (possibly via contracts), that personalized information is provided, and that the participants are requested to form a plan for change (Richter et al. 2010a, b).

A common technique for changing travel behaviour entails using different types of incentives, for instance some kind of free ticket. Free tickets and gifts are good from a marketing point of view but are in general insufficient to accomplish long-term behavioural changes (Gärling and Fujii 2009). Requesting change goals and plans are more significant for lasting changes (Fujii and Taniguchi 2006). In cases where requests for change have been made, prewritten contracts have primarily been used. Also, personalized information has a larger effect than general information (Brög et al. 2009). However, it has been more usual to provide general than personalized information.

Feedback is also important for lasting behavioural changes (Bamberg et al. 2010; Gärling et al. 2002), but few programs have provided feedback to participants regarding

Table 8 Coding scheme according to SUMO (The Swedish Road Administration 2010)

Background	External factors
	A description of the external prerequisites for the program. These are the same for all users.
	Person-related factors
	Information about the personal situations of various individuals. Enables sorting into different target groups.
Services	Beneficial attainments
	Describes the efforts made during the program, e.g. number of meetings, distributed material, introduction of computer system or decision re. travel policy
	Knowledge
	Number/proportion aware of the program
	Degree of use
	Number/proportion showing interest in and using the program
	Satisfaction
	Measures how satisfied users are with the services offered
Offering	Acceptance
	Number/proportion accepting the offered alternative and who intend to change their behaviour
	Experimental individual behaviour
	Number/proportion trying out a new mode of transport/new behaviour
	Satisfaction with offer
	Shows whether those trying the new alternative are satisfied with it
Effects	Permanent individual travel behaviour
	Number/proportion who have permanently changed their travel mode or other travel behaviour.
	System facts
	Provides an estimation of by how much traffic work, emissions, accidents etc. have decreased due to changed behaviour

outcomes. Hardly any programs have conducted follow-up measurements for analysing long-term effects.

The outcomes of the programs have been difficult to evaluate; not only have these used inadequate evaluation designs, there is also a lack of standardisation of effect measurements. The majority of the programs, however, have reported some kind of measurement of changed travel behaviour. Moreover, in all evaluations, statistical analyses are limited to descriptive measurements. With respect to these reservations, it is concluded that many programs show major effects on travel behaviour during the implementation time, on a par with international results. The largest changes concern a reduction in car travel (number of trips) and an increase in trips by public transport and, to a certain degree, in bicycle trips. Changes in trip distance per week followed the same pattern. A suggestion for future research is to use questionnaires to try to find out from the travellers themselves what they think triggered a change in their travel behaviour. Other positive changes not analysed here include subjective satisfaction, perceived health, and CO_2 emissions.

The choice of techniques used in future Swedish programs and programs implemented in other countries should be theoretically grounded (Bamberg et al. 2010) and evaluations

should use randomised control groups (Fujii et al. 2009) and standardised measurements of the participants' changed travel behaviour as well as that of others in the society concerned (Stopher et al. 2009). Moreover, standardised documentation is recommended in order to enable comparisons. Not until then can accumulated knowledge be obtained which will be of assistance when choosing techniques and ways of implementing similar programs. Being able to conduct statistical meta-analyses (Bamberg and Möser 2007) is also an important requirement, as these allow conclusions about causal effects. A strong recommendation regarding documentation is to use *SUMO* (System for evaluation of mobility projects) (Swedish Road Administration 2010), which is based on the MOST-MET method developed within the EU project MOST (Mobility Management Strategies for the next decades) (Information Society Technologies [IST] 2010) which was conducted between 2000 and 2002. SUMO is a refinement which has been adapted to Swedish conditions. Coding is based on goals, indicators, and results on various levels (see Table 8). The results should, furthermore, be documented and archived in a national database, for instance SARA (Sector Actors' Results of Activities) which is hosted by the Swedish Road Administration and is a tool for evaluating policy measures which, in various ways, impact upon transportation, travel, and road-user behaviour. This can involve "trial traveller projects" (participants in the project refrain for a certain period from using the car and use public transport instead), the procurement of environmentally-effective and safe vehicles, or the introduction of car pools.

Finally, a possible limitation to this study is that the selection of implemented programs is biased since information was obtained from the internet. Different sources (for instance interviews with top managers) may have resulted in another inclusion of programs. Although using a variety of search terms (see Appendix 1), selected keywords may also have affected the outcome.

Appendix 1

Search terms

Car-pool evaluation
Cycling and walking to work evaluation
Cycle challenge evaluation
Cycle school evaluation
Solitary car users
European in town without my car evaluation
European mobility week
Fewer habitual car users evaluation
Change travel habits
Free public transport evaluation
Walk and cycle to school campaign
Walk and cycle to school competition
Hockey buses evaluation
Health en route evaluation
Health pedallers evaluation

Health cyclists evaluation
Sustainable travel evaluation
Public transport projects—380 hits
Environmentally adapt trips to work evaluation
Reduced car trips evaluation
Reduce the number of car trips evaluation
Reduced number of lifts by car
Zero rate for bus transportation evaluation
Parking control
Commute-o-meter
Trial traveller public transport evaluation
Travel coaching
Car-pool evaluation
School routes evaluation
Smart pedestrian evaluation
Company-car-pool evaluation
Congestion charges evaluation
Evaluation public transport projects—119,000 hits
Walking school bus evaluation
Increased travel local buses evaluation
Increased travel by public transport

Appendix 2

Google search for public transport projects

From Lund University, Department of Technology and Society. There is a link to the "Database for results from public transport projects", cannot be accessed, however. See: http://www.tft.lth.se/sv/tpforsk.htm

Plan for public transport projects in Gothenburg, but no evaluation of the results: http://www5.goteborg.se/prod/stadsbyggnad/dalis2.nsf/vyFilArkiv/Skaneg.KRINGEN.planb.U..pdf/$file/Skaneg.KRINGEN.planb.U.pdf

List of implemented projects at various county principals, no links to evaluations http://www.danielson-trafik.se/projekt1.htm

Ongoing Vinnova project *"Samordnad-kollektivtrafik på landsbygd"* [Coordinated rural public transport]

http://www.vinnova.se/misc/VINNOVA-projekt/Projekt—Listhuvud/Samordnad-kollektivtrafik-pa-landsbygd—Del-2/

The TEMP (*Transport Energi Miljö Projekt* [Transport Energy Environment Project]) project in Linköping is a collaboration project between Linköping Municipality, Tekniska Verken i Linköping AB, Swedish Highways Agency, Southeast Region and AB Östgö-taTrafiken. The project focuses on increasing Linköping citizens' knowledge of and familiarity with how their behaviour and choice of energy sources and fuels will affect emissions of greenhouse gases. http://www.linkoping.se/Organisation/ks_forvaltning/verksamhet/Informationskontoret/temp/index.htm

The Climate Municipalities have several ongoing projects; there are links to them here: http://www.klimatkommunerna.infomacms.com/?page=page440c6aecec69c

List of various projects implemented by Östersund Municipality http://www.ostersund.se/kommunalservice/gatortrafik/grontrafik/projektinformation/arkiv.4.1e0f2f6f2dce47f517fff12432.html

Evaluations and summaries from *LundaMaTs* [Lund's Sustainable Transportation System] between 1999 and 2004 (report downloaded)

http://www.lund.se/templates/Page_____371.aspx

List of various environmental programs in transportation (road traffic) within the Swedish Environment Protection Board

http://klimp.naturvardsverket.se/mir/submitQuickSearch.do

Mobility management presents various sustainability projects: http://www.mobilitymanagement.se/Infotek/?tabIndex=4

Trendsetter, an EU project bringing together over 50 sub-projects aimed at contributing towards a sustainable transportation situation in cities, 20 or so of these being implemented in Stockholm:

http://www.trendsetter-europe.org/

Sustainable Mobility Skåne is a regional centre for environmentally-adapted transportation. It works towards reducing the environmental impact of trips and transportation and towards getting more people to choose more sustainable alternatives.

http://www.hmskane.se/

Project database: http://projekt.hmskane.se.space2u.com/prodb/sok.asp

From various local public transport websites

Hallandstrafiken: Implemented *KLIMP* [Climate Investment Programmes] at the end of 2007, a project aimed at reducing emissions of greenhouse gases within Varberg Municipality. Contact details available. http://www.hlt.se/page.asp?lngID=124&lngLangID=1

Uppsala Regional Council: Programme Manager for infrastructure and transportation: Margareta Rönnblom +46 18 182109 or +46 70 577 5700, margareta.ronnblom@region-uppsala.se. Project: *Samordning av färdtjänst och sjukhusresor* [Coordination of mobility services and hospital trips]:

http://www.regionuppsala.se/?pageID=186&projectCategoryID=14&projectID=31

Project: Clarify the owners' view of how public transport in the county can be developed: http://www.regionuppsala.se/?pageID=186&projectCategoryID=14&projectID=105

Skånetrafiken: Various inquiries regarding public transport: http://www.skanetrafiken.se/templates/FileListing.aspx?id=7715&epslanguage=SV

Stockholm Public Transport: Customer surveys: http://www.sl.se/Templates/PageListing.aspx?id=4165

Appendix 3

Coding form

ID no: _____

Background

1. Project name: _____
2. Name of implementer: _____
3. References (title, author, year published):

       _____
       _____
       _____

4. Name of place: _____
4a. Place of implementation: _____
5a. Start of project (yr/mth/dy): _____
5b. End of project (yr/mth/dy): _____
5c. Duration of project: _____
6. Principal organiser: _____

        0 Municipality
        1 County council
        2 Research institute
        3 Government
        4 Company

7. Target:

        0 Home
        1 Workplace
        2 School
        3 Interchange

8. Participants:

        0 Households
        1 Individuals
        2 Employees
        3 Pupils/parents

Evaluation design

<u>Experimental group</u>
9. Previous travel habits:

           0 Habitual car user
           1 Public transport user
           2 Car and public transport
           3 Walking and cycling

10. Number of measurements: _____
10a. Method:
10b. Number of participants:
10c. Response rate first measurement:
10d. Response rate second measurement:
10e. Specify whether more measurements are made.
11. Initial contact via

        0 Email
        1 Letter
        2 Personal contact
        3 Via organisation/association
        4 Other

12. Selection method

        0 Advert
        1 Via acquaintances
        2 Random selection
        3 Other

13. <u>Control group</u>
        0 No, continue to question 18   1 Yes, answer questions 14-17
14. Participants
        0 People without the intention to change their travel habits
        1 People with the intention to change their travel habits. Not using PT today
        2 People with the intention to change their travel habits. Using PT today
        3 Other
15. Number of measurement occasions: _____
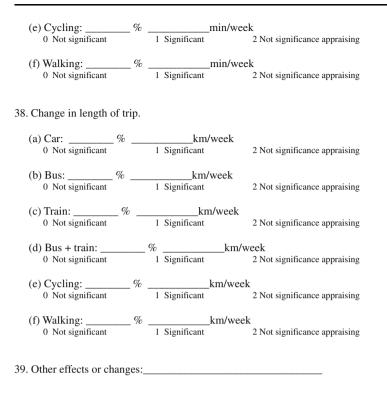   (a) Type of measurement occasion: _____
16. Initial contact via
        0 Email
        1 Letter
        2 Personal contact
        3 Via organisation/association
        4 Other
17. Selection method
        0 Advert
        1 Via acquaintances
        2 Random selection
        3 Other

Type of influence

18. Change plan required from the participants
        0 No   1 Yes
19. Motivating information
        0 Does not exist   1 Exists
    (a). Information about environmental consequences
        0 Does not exist   1 Exists
    (b). Information about health consequences
        0 Does not exist   1 Exists
    (c). Information about impact on accessibility (congestion)
        0 Does not exist   1 Exists

20. Change goal requested from the participants
        0 No   1 Yes   2 Don't know
    (a). Describe what is requested
        _____
21. Personalized travel information provided to the participants
        0 No   1 Yes   2 Don't know
22. General travel information provided to the participants
        0 No   1 Yes   2 Don't know

23. Feedback about travel behaviour, if yes when?_____
    (a). About emissions
        0 No   1 Yes   2 Don't know
    (b). About calorie consumption
        0 No   1 Yes   2 Don't know
    (c). About travel costs
        0 No   1 Yes   2 Don't know
    (d). About reduced travel
        0 No   1 Yes   2 Don't know
24. Persuasion/contract to change travel behaviour
        0 Does not exist   1 Exists
        What?: _____
25. Incentives to change travel
        0 Do not exist   1 Exist
        What?: _____
26. Personal meetings
        0 Do not exist   1 Exist
27. Tuition
        0 Does not exist   1 Exists

28. Group meetings
    0 Do not exist   1 Exist
29. Web tools
    0 Do not exist   1 Exist
30. Free tickets
    0 Do not exist   1 Exist
    Type of free ticket:_____

Response rate

31. Response rate at initial measurement? _____%

32. Response rate at final measurement? _____ %

Specify whether more measurements have been implemented (and how many):_____

Change

33. Change in intention to change travel behaviour: _____ %
  0 Not significant   1 Significant   2 Not significance appraising

34. Change in attitude towards changed travel behaviour: _____ %
  0 Not significant   1 Significant   2 Not significance appraising

35. Change in satisfaction with changed travel behaviour: _____ %
  0 Not significant   1 Significant   2 Not significance appraising

36. Change in number of trips.

 (a) Car: _____ % _____times/week
  0 Not significant   1 Significant   2 Not significance appraising

 (b) Bus: _____ % _____ times/week
  0 Not significant   1 Significant   2 Not significance appraising

 (c) Train: _____ % _____ times/week
  0 Not significant   1 Significant   2 Not significance appraising

 (d) Bus + train: _____ % _____ times/week
  0 Not significant   1 Significant   2 Not significance appraising

 (e) Cycling: _____ % _____ times/week
  0 Not significant   1 Significant   2 Not significance appraising

 (f) Walking: _____ % _____ times/week
  0 Not significant   1 Significant   2 Not significance appraising

37. Change in trip times.

 (a) Car: _____ % _____min/week
  0 Not significant   1 Significant   2 Not significance appraising

 (b) Bus: _____ % _____min/week
  0 Not significant   1 Significant   2 Not significance appraising

 (c) Train
  34a(1) _____ % _____min/week
  0 Not significant   1 Significant   2 Not significance appraising

 (d) Bus + train: _____ % _____min/week
  0 Not significant   1 Significant   2 Not significance appraising

(e) Cycling: _____ % _____min/week
    0 Not significant   1 Significant   2 Not significance appraising

(f) Walking: _____ % _____min/week
    0 Not significant   1 Significant   2 Not significance appraising

38. Change in length of trip.

(a) Car: _____ % _____km/week
    0 Not significant   1 Significant   2 Not significance appraising

(b) Bus: _____ % _____km/week
    0 Not significant   1 Significant   2 Not significance appraising

(c) Train: _____ % _____km/week
    0 Not significant   1 Significant   2 Not significance appraising

(d) Bus + train: _____ % _____km/week
    0 Not significant   1 Significant   2 Not significance appraising

(e) Cycling: _____ % _____km/week
    0 Not significant   1 Significant   2 Not significance appraising

(f) Walking: _____ % _____km/week
    0 Not significant   1 Significant   2 Not significance appraising

39. Other effects or changes:_____

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Author Biographies

Margareta Friman is professor of service research and director of the Service and Market Oriented Transport (SAMOT) Research Group at Karlstad University. Her main research area is consumer psychology.

Lina Larhult is a master student at Karlstad University.

Tommy Gärling is professor emeritus of psychology part-time affiliated with University of Gothenburg and Karlstad University. His main research area is behavioural decision making with applications to economic behaviour, pro-environmental behaviour and travel behaviour.