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Review of Evaluations of Soft Transport Policy Measures

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Abstract

In order to abate problems resulting from increased car use, hard transport policy measures have been introduced such as improvements of infrastructure for and management of public transport services, increased costs for car use, and prohibition or rationing of car use. These measures often meet with public disapproval, are politically infeasible, and may alone be insufficient. As a consequence, alternative soft transport policy measures have been developed to motivate individuals to voluntarily reduce car use. The paper reviews evaluations of the effectiveness of such measures implemented in Australia, Austria, Germany, Japan, Netherlands, Sweden, UK, and USA. The review shows that in general soft transport policy measures are effective. Yet, the variety of the results makes it difficult to infer why the measures are effective. Additional research needs to focus on this question.

Keywords: Soft transport policy measures, car use, sustainable travel

1. Introduction

The negative consequences of private car use are increasingly being recognized, in particular the link between polluting emissions and global warming (Gärling & Steg, 2007). Given the increasing number of cars in the last decades, there are also other concerns including noise, congestion, traffic accidents, and encroachment on land (Greene & Wegener, 1997). In addition, the reduction in the number of rail and bus passengers leads to worse public transport services (Fujii & Taniguchi, 2006). Another concern is that the reduction in the number of rail and bus passengers leads to worse public transport services (Fujii & Taniguchi, 2006). While car producers are

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successfully developing clean car technology, some of the negative consequences will only be eliminated by reducing current car use or at least stopping further increase (Steg & Tertoolen, 1999).

For some time a multitude of policy measures to reduce car use have been available to transport planners, commonly referred to as "travel demand management" (TDM) (Kitamura, Fujii, & Pas, 1997; Pas, 1995). These are divided into "hard" and "soft" measures. Hard measures include, for instance, improvements of infrastructure for and management of public transport services, increased costs for car use, and prohibition or rationing of car use. These measures may not alone be effective in achieving car-use reduction (Stopher, 2004), and some are difficult to implement because of public opposition or political infeasibility (Gärling & Schuitema, 2007; Jones, 2003). Soft transport policy measures (Gärling & Fujii, 2009; Jones & Sloman, 2006; Rose & Ampt, 2003; Taniguchi, Suzuki, & Fujii, 2007; Taylor, 2007; Taylor & Ampt, 2003), also referred to as voluntary change measures (Loukopoulos, 2007), psychological and behavioural strategies (Fujii & Taniguchi, 2006), or mobility management tools (Cairns et al., 2008), aim at motivating individuals to voluntarily switch their car travel to more sustainable travel modes. These measures target reducing car use as well as improving more sustainable modes by providing customized information, incentives, and customized feedback (Cairns et al., 2008; Taniguchi et al., 2007; Thøgersen, 2007, 2009). Taylor (2007) notes that soft transport policy measures generally offer more of the "carrot" than other TDM measures, for which the "stick" is more dominant.

The aim of this paper is to review evaluations of the effectiveness of soft transport policy measures. In the next section classification issues are addressed. Thereafter, in the following section the results of evaluations will be described of programs implemented in Japan, Australia, UK, and some other countries. The review is based on several narrative reviews. Recent meta-analyses that provide quantitative syntheses of the evaluations will also be reviewed.

2. Classification

Soft transport policy measures to reduce car use take different shapes. An extensive list by Cairns et al. (2008) includes the following ten types: *Workplace travel plans* which are measures primarily aimed at encouraging and enabling employees to travel to work more sustainably; *School travel plans* which is introduced at schools to encourage and enable children to travel more sustainably; *Personalized travel planning* where individuals are

offered personalized information to encourage and enable them to travel more sustainably; *Public transport information and marketing* which includes advertising campaigns, the provision of accessible information and simplified ticketing schemes; *Travel awareness campaigns* which involve a wide range of media aimed at improving general public awareness; *Car clubs* where individuals are encouraged to join a club that gives them access to a number of cars parked in their neighborhood, where they pay when they use the cars; *Car sharing schemes* (car pooling/ride sharing) where individuals are encouraged to share their private vehicles; *Teleworking* where employers encourage employees to work from home; *Teleconferencing* where telecommunications are used to facilitate contacts that would otherwise have involved business travel, and; *Home shopping* where customers pace orders electronically to purchase goods which are subsequently delivered to them. Möser and Bamberg (2008) noted that the first five types are the most frequently implemented in the last decade.

In Japan mobility management is usually referred to as travel feedback programs (TFP). To classify TFPs, Fujii and Taniguchi (2006) used four parameters (see Table 1), location, technique to change travel, procedure, and communication media. There are many similarities to the list provided by Cairns et al. (2008) with overlapping contents basically applying to the first five types.

Table 1
Parameters for Classifying Travel Feedback Programs (TFPs)
(Adapted from Fujii & Taniguchi, 2006)

Location	TFPs can be implemented in three basic settings: workplaces, schools, and residential areas. Most measures are examples of the latter type and target all daily car use. Workplace and school travel programs typically target commuting.
Techniques to change travel	Techniques differ in three main ways based on the following issues: ▪ Do they motivate travel behaviour change? ▪ Do they request a plan for changing travel behaviour? ▪ Do they provide customized information?
Procedure	Single step requiring, for instance, only the request to form a behavioural plan for how to change travel behaviour; multistep requiring several contacts
Communication media	Face-to-face communication, household visit, group briefing, regular mail, telephone, e-mail, internet web-site

3. Review

Although there is a growing interest in car-use reduction worldwide, to date the most comprehensive implementations of soft transport policy measures that have been evaluated exist in Australia, UK, and Japan. Evaluated soft transport policy measures in other countries are infrequent and sometimes small-scale. Some have only been published in native languages or lack methodical information or scientific evidence for the results.

3.1. Australia

Soft transport policy measures implemented in Australia are known as "voluntary travel behaviour change" (VTBC) programs. A definition is given by Ampt (2004): "…change that occurs, when individuals make choices for personal reward without a top-down mechanism, regulation of any sort or a feeling of external compulsion". Taylor (2007) claims that currently 30-40% of Australian households may at least consider involvement in a VTBC program. Most of the state capital cities in Australia already have significant programs running, broadly aimed at the implementation of more sustainable travel behavior and transport systems.

As detailed in Cairns et al. (2004), VTBC programs in Australia started with two early trials of TravelBlending in Sydney and Adelaide (Rose & Ampt, 2001). The results of these studies showed changes in attitude and awareness of the use of private cars and its associated environmental consequences as well as changes in travel behavior (e.g. using public transport instead of car, organizing car-pooling). The maintenance of these changes was confirmed six months later in a follow-up survey (Ampt & Rooney, 1999). The program in Adelaide was later integrated in the LivingNeighbourhoods program which was conducted in the inner Adelaide suburb of Dulwich in 1998. This large-scale program targeted about 900 households and was supposed to change travel behavior through a partnership between the community and the providers of services and goods as well as all levels of government. Everyone could do their share to improve quality of life and sustainability through small changes, for instance increased bus travel, provision of public transport information to new residents, and better quality footpaths (Taylor & Ampt, 2003). The impact on car driver trips among people who fully participated in the program was a 10% reduction. As another result, participants claimed to have gained personal benefits with respect to time, health, and money. Ampt

(2001) therefore concluded that changes in travel behavior may have wider consequences.

In 1997 there was also an implementation of another soft transport policy measure, referred to as the IndiMark program (Brög, Erl, & Mense, 2002; Brög, Erl, Ker, Ryle, & Wall, 2009). It took place in South Perth and targeted 383 households. The number of car driver trips were reduced by 10% (from 60% to 54%) and vehicle kilometers travelled by 14%. Public transport trips increased by 21% (from 6% to 7%), walking trips by 16% (from 12% to 14%), and cycling trips by 91% (from 2% to 4%). The total number of trips remained the same and changes in mode share proved to be stable one year after the initial survey (James, Brög, Erl, & Funke, 1999). The use of local stores and services increased such as that there was two kilometers less travel per person per day although four minutes increase in travel time. The program was subsequently extended to other Perth suburbs.

Another implementation of the IndiMark program was launched in the Grange district of inner northern Brisbane (Marinelli & Roth, 2002) as part of "TravelSmart", a broader program to preserve the environment and increase quality of life. The study targeted a random sample of over 1,000 households with half of them being offered to take part in the IndiMark program and the other half being a control group. Among actively participating households, car trips decreased by 10%, while cycling trips increased by 6%, and public-transport trips by 33%. The authors ascribed the difference to the fact that Granges' hilly topography made cycling less attractive, as well as to the better developed public transport.

Subsequently, even larger programs have been launched. From February to May 2000, an IndiMark program was conducted in South Perth (Brög et al., 2002, 2009) targeting more than 15,000 households or about 35,000 people. It was again accompanied by the comprehensive "TravelSmart" community and awareness program, wherein the state government combined marketing, education and participatory processes to influence individuals' travel choices. The results were a 14% reduction in car trips, a 9% increase in car sharing, a 35% increase in walking trips, a 61% increase in cycling trips, and a 17% increase in public-transport trips. The total number of trips remained the same. Evaluations one and two years after the initial implementation showed that the changes in modal shift remained.

Ker (2003) reported still another large-scale IndiMark in a suburb of Perth, the Town of Cambridge, and targeting 9,400 households. It resulted in 13% increase in public transport trips, 11% in walking trips, 67% in cycling trips, and a 7% reduction in car trips both as driver and as passenger.

In 2004, the National Travel Behaviour Change Program (NTBCP) was launched in Australia, running under the Greenhouse Gas Abatement Program (GGAP), which aims to reduce Australia's net greenhouse gas emissions (Australian Government, 2008b). Besides aiming to achieve a substantial cut in greenhouse gas emissions of up to 1,23 million tons of CO2 equivalents over the period 2008-2012 (Australian Government, 2008a), the NTBCP has also other economic, environmental and social policy goals and performance indicators. With co-funding from the GGAP, TravelSmart was delivered to a target population of 218,500 households across the Perth metropolitan area. Household visits were made to identify barriers to travel changes, and a free public transport ticket was provided. The outcomes in 2008 were (Australian Government, 2008b) 203 million fewer car kilometres, 64,900 tonnes CO2 reduction, $33 million reduction in car running costs, and increased community participation in physical activities. Surveys of comparison group were conducted periodically throughout the program period showing an annual average increase in vehicle kilometers of 1.3% per person.

3.2. United Kingdom

In Cairns et al. (2008), seven previous reviews were used to estimate the overall effect of different soft transport policy measures on traffic levels. The lowest estimates were obtained when assumed that there would be little momentum for soft transport policy measures, when the impacts of specific factors were averaged over 24-hours national traffic flow, and when caveats were made about induced traffic. The highest estimates emerged as a result of assuming the simultaneous implementation of many different, consistent measures (including supporting hard transport policy measures) and when results were expressed as a proportion of the traffic levels in specific locations, by journey purpose, or by time of day.

In re-analyzing the data from the previous reviews, it was estimated that, with lower intensity application and with no complementary hard transport policy measures, soft transport policy measures could reduce traffic levels by 4-5% at the national level. With higher intensity application and supportive hard measures, the estimated potential for soft measures was to reduce traffic levels by 10-15% as a national average and by 15-20% in favorable local conditions. Under specific circumstances figures higher than this could be achieved.

Cairns et al. (2008) developed two scenarios regarding what effect soft transport policy measures would have on traffic levels in UK in about ten

years. In the "low intensity" scenario, the present rate of expenditure and level of commitment to these measures were assumed. The "high intensity" scenario constitutes a projection based on a substantial expansion of the activity, commitment and resources. The scenarios suggested a potential for soft transport policy measures to reduce national traffic levels by about 11% with reductions of up to 21% of peak urban traffic (see Table 2). The authors stressed the fact that these predictions are not a forecast for 2014, because no allowance was made for other conditions that would change (demography, income, economic growth, road user charges, and induced traffic). Compared to the previously mentioned results from other studies, the high intensity estimate of 11% is conservative.

Table 2
Potential Impacts of Soft Transport Policy Measures on Future Traffic Levels in UK (Adapted from Cairns et al., 2008)

		High-intensity scenario	Low-intensity scenario
Urban areas	Overall	14%	3%
	Peak hours	21%	5%
Non-urban areas	Overall	8%	2%
	Peak hours	14%	3%
Nationally	Overall	11%	2-3%
	Peak hours	17%	4%

3.3. Japan

The results of several TFPs conducted in Japan showed that CO2 emissions were reduced by about 19% and car use by about 18% while the use of public transport increased by about 50% (Fujii & Taniguchi, 2006). In a comparison between Japan and the EU countries, Taniguchi et al. (2007) focused on personalized travel planning in the UK with effects reported in residential areas (seven cases), workplaces (six), and schools (two). The UK results were sometimes projected across the whole target population which is of practical value, yet made it difficult to directly compare them with the Japanese results reported for sample participants. Some comparable Japanese results indicated

an average 12.1% car-use reduction in residential TFPs when compared to a control or comparison group. This was not largely different from the UK results with 7-15% reduction.

The proportion of participants in Japanese TFPs has not always been well-assessed or documented. Taniguchi et al. (2007) used the assumptions made by Cairns et al. (2004) for the UK and concluded that with a participant rate of 15-30% the effect of residential TFPs for the whole target population would be 2.9-5.8% reduction of car trips which is close to the UK estimates. With a participant rate of 50% or more, a reduction of at least 9.6% could be achieved.

The Japanese TFPs are small-scale experiments (recruiting 130-200 participants) conducted by transport researchers. This is an important difference to the European or Australian programs where consulting companies and policy makers have a stronger involvement. It is still justified to take the Japanese results into account because they are based on methodologically sound evaluations that are adequately reported.

Table 3
Results for Large-Scale IndiMark Programs in Germany and Austria
(Adapted from Ker, 2003)

City	Target population	Percent increase in public transport trips per person per year, relative to changes in control group
Nürnberg	4,940	30
Wiesbaden	4,632	23
Hannover-Südstadt	40,990	37
Baunatal	6,918	31
Kassel	13,012	10
Stuttgart-Freiburg	5,330	12
Vellmar	5,655	19
Linz (Austria)	15,141	17
Salzburg (Austria)	5,500	25

3.4. Other countries

Ker (2003) reported large-scale implementations of IndiMark in seven German cities and two Austrian cities targeting more than 100,000 people. Table 3 shows that in each city an increase in public-transport trips relative to control groups was achieved.

Another large-scale implementation of IndiMark took place in Viernheim, Germany targeting about 31,000 residents as part of the EU project "TAPESTRY" (Travel Awareness Publicity and Education Supporting a Sustainable Transport Strategy in Europe). This project was reported to have resulted in relative decreases of 12% in car trips as driver and 10% as passenger. Walking and cycling trips increased by 7% and 10%, respectively, and public-transport trips by 29% (EU tapestry, 2003).

In Göteborg, Sweden a large-scale implementation of IndiMark was launched (Brög et al., 2002, 2009). A reduction of car trips as driver by 14% and as passenger by 7% was achieved. Transit and walking trips increased by 4%, and cycling trips increased by 45%. Total number of trips remained the same.

Cairns et al. (2008) cited studies from the Netherlands and USA where the average reduction in car driver trips for work travel plans was 17.8%. This number is close to the 18% reduction in the UK.

3.5. Meta-Analyses

The fact that similar results are obtained in several countries, in four different continents, is strong evidence for soft transport policy measures being effective. Yet, analyses also need to make direct comparisons between evaluation studies to be able to address the question of why the measures work. Meta-analysis (e.g. Lipsey & Wilson, 2001) is a quantitative approach to research synthesis that can be used to this end.

Bamberg and Möser (2007) applied meta-analysis to the data from two narrative reviews by Cairns et al. (2004) which is a comprehensive data base of empirical evidence available on soft transport policy measures implemented in the UK. The conclusions from the meta-analysis yielded some differences. For instance, whereas it was concluded from the narrative review that organizational and site characteristics were negligible, the meta-analysis showed a strong impact of these factors (e.g. work travel plans implemented in public organizations, places with mainly female staff, and sites with poor or average cycling access obtained the strongest effect sizes). The meta-analysis

did not show that parking was a central access factor, whereas Cairns et al. (2004) concluded it was.

Möser and Bamberg (2008) further noted that there was a strong heterogeneity of the effect size distributions, indicating that there are important moderating factors. This highlighted the need for a theory-driven search of factors causing variability of soft transport policy measures (Bamberg, Fujii, Friman & Gärling, 2010; Richter, Friman, & Gärling, 2010). In case of school travel plans there was a moderating effect of the publication source and school size. The larger the school was, the weaker was the reported effect size. Even though 71% of the effect size variance was explained, the heterogeneity statistic was still significant. For work travel plans, data source, study year, and before sample were checked as potential moderators but none was statistically significant.

Taniguchi et al. (2007) conducted a meta-analysis of the effectiveness of TFPs in Japan (see Table 4) reported before December 2005 and containing data up until 2003. Since there was not enough data for school and workplace travel plans, the meta-analysis was confined to TFPs implemented in residential areas. For these TFPs a 7.3% reduction in car trips and a 68.6% increase in public-transport trips were found. Measurements of mediating psychological factors showed a 10.4% increase in intentions to reduce car use and a 7.5% increase in intentions to use public transport more often. If only TFPs with control or comparison groups were included in the meta-analysis, the reduction of car trips was 12.1% and the increase in public-transport trips 38.6%.

Table 4
Meta-Analysis Results
(Adapted from Möser & Bamberg, 2008)

Type	Effect size	Results
Work travel plan	0.24	Proportion of employees not reaching their work place by car before intervention (35%) and after (47%)
School travel plan	0.08	Pupils not coming to school by car before intervention (60%) and after (64%)
Personalized travel planning/ travel awareness campaigns/ public transport marketing	0.11	Proportion of trips not conducted by car before intervention (34%) and after (39%)

4. Summary and Conclusions

The results of the present review show that soft transport policy measures have a variety of positive outcomes. Yet, this variety makes it hard to digest the results, inferring their theoretical and practical implications. Due to differences in style and completeness of reporting, it is often difficult to find associated research work. In addition, the potentially useful but not thoroughly reported large-scale implementations by private consulting companies are not always accessible to researchers. In Japan, where researchers are highly involved in the implementation, evaluation and development of soft transport policy measures, conditions are experimental and well-controlled but remain small-scale.

Although the results reviewed underscore the effectiveness of soft transport policy measures in general, several gaps of knowledge exist, thus suggesting that more research is needed. Richter et al. (2010) discuss such knowledge gaps with the aim of identifying research needs related to the implementation of soft transport policy measures, in particular research addressing the question of why soft transport policy measures are effective. Such research should be guided by theories (Bamberg et al., 2010) and focus on the evaluation of the cost-effectiveness of single techniques as well as combinations of these techniques that are components of soft transport policy measures, that is motivational support, plan formation, and customized information (Fujii & Taniguchi, 2006; see also Table 1). Further research is also needed to clarify what factors account for the existence (or occasionally nonexistence) of long-term effects, and how and why the simultaneous implementation of hard transport policy measures would increase the effectiveness of soft transport policy measures and vice versa.

The issue of methodically weak evaluation designs is also raised by the review. Fujii, Bamberg, Friman, and Gärling (2009) argue that only post-test designs with control groups is adequate for making causal inferences. Bamberg and Möser (2007) reported that all primary studies included in their meta-analysis used weak quasi-experimental treatment group pre-post-test designs without control groups, which fail to eliminate threats to the validity of causal inferences (Shadish, Cook, & Campbell, 2002). In fact, there appears to be consensus among researchers concerning what is best practice in evaluating soft policy measures (Taylor, 2007). An independent agent should be in charge of the evaluations; effects should be measured for the program participants, for the target population as a whole, and for untreated randomized control groups. To accomplish this, random samples from the target population should be recruited to the experimental and control groups

before participants assigned to the experimental group(s) commit themselves to participate in the program. In this way, biases in selection would be possible to detect. Effect measures should include trip rates, vehicle kilometres travelled, travel time by transport modes, and choice of travel mode (public transport, walking, cycling, or car as driver or passenger).
On the basis of the present review, a useful idea is believed to be, as Taniguchi et al. (2007) suggest, to develop a platform to exchange practical and political information with respect to soft transport policy measures all over the world. Such a platform would allow cross-country comparisons which are highly needed. A case in point is that Bamberg and Möser (2007) noted that the results of implementations are often not reported in publicly available sources. For their meta-analysis, they attempted without success to receive more detailed information from consulting companies. In addition, further meta-analyses of the large number of empirical studies already available on soft transport policy measures are welcomed. To date no comprehensive such analysis is available.

5. A Final Note

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