Jochen Richter, Margareta Friman & Tommy Gärling

Soft transport policy measures 1

Results of implementations
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Abstract
To abate problems resulting from increased car use, hard transport policy measures have been introduced. Such measures often meet public disapproval, are politically infeasible, and may alone be insufficient. As a consequence, alternative soft transport policy measures have been proposed. These measures are designed to motivate individuals to voluntarily reduce car use. This paper reviews implementations of soft transport policy measures in Japan, Australia, UK, and several other countries. The review underscores the effectiveness of soft transport policy measures in general and points to a variety of positive outcomes. Yet, the variety in the results makes it hard to infer why the measures are effective. Several gaps of knowledge are also identified. A companion paper will discuss these and identify research needs.
1. Introduction

The problems associated with car use have increasingly been recognized. Although the main focus is on the problem of CO$_2$ emissions, as this is strongly linked to global warming, there are also other issues (Gärling and Steg, 2007). Given the increasing number of cars in the last decades, these include noise, congestion and time loss, traffic accidents, and encroachment on land (Greene and Wegener, 1997). Another issue is the reduction in number of rail and bus users, possibly leading to discontinued rail and bus services (Fujii and Taniguchi, 2006). While car companies are working on electric and fuel cell powered cars, one has to acknowledge that some of these problems cannot be tackled by cleaner vehicle technology but only if the total level of car use is reduced or at least further increase is abated (Steg and Tertoolen, 1999). Since despite several attempts the problems persist, the topic of car-use reduction stays on the agenda.

In the last years there have been a multitude of policy measures to reduce car use, commonly known as “travel demand management” (TDM) (Kitamura et al., 1997; Pas, 1995). These strategies can be divided into “hard” and “soft” transport policy measures. Hard transport policy measures, sometimes also referred to as coercive are the “older branch” of TDM and include physical improvements of infrastructure, increased cost for car use, for example through congestion charging, or control of road space. Although these measures are sometimes necessary, they are difficult to implement because of public opposition and political infeasibility (Gärling and Schuitema, 2007). Soft transport policy measures, sometimes also referred to as non-coercive (Loukopoulos, 2007), psychological and behavioural strategies (Fujii and Taniguchi, 2006), smarter choice measures or mobility management tools (Cairns et al., 2008), are designed to motivate individuals to voluntarily change their travel behaviour to more sustainable transport modes. These imply reducing single occupancy car use and increasing more benign and efficient options by providing detailed travel information on public transport, the use of incentives, customized feedback about travel behaviour as well as marketing techniques focusing on personal travel behaviour (Taniguchi et al., 2006; Cairns et al., 2008). Taylor (2007) notes that soft transport policy measures generally offer more of the “carrot” than other TDM measures for which the “stick” is perceived as more dominant.

The aim of this paper is to review the results of implementations of soft transport policy measures. In a forthcoming paper (Richter et al., 2008) needs for additional research will be identified and discussed. The next section will address classification issues. Two frequently implemented soft transport policy measures are then described. In the following section, actual implementations will be reviewed. Although there is a growing interest in the topic of car-use reduction worldwide, the most comprehensive results of implementations of soft transport policy measures to date come from Japan, Australia, and UK. Certain results from other countries are mentioned, although soft policy measures implemented in other countries are often single or pilot studies, sometimes with very small intervention groups. Some studies have only been published in native languages or lack methodical information or scientific evidence for the results. Recent meta-analyses as well as differences and commonalities of various approaches will also be discussed.
1.1 Classification

Soft transport policy measures to reduce car use can take very different shapes. An extensive list by Cairns et al. (2008) includes ten types of measures (Table 1).

<table>
<thead>
<tr>
<th>Type of measure</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Workplace travel plan</td>
<td>Targets primarily commuters to travel to work more sustainably</td>
</tr>
<tr>
<td>2. School travel plan</td>
<td>Targets children and their parents to organise the way to school more sustainable</td>
</tr>
<tr>
<td>3. Personalised travel planning</td>
<td>Encourages people through customized information to travel more sustainably</td>
</tr>
<tr>
<td>4. Public transport information and marketing</td>
<td>Advertising campaigns and simplified ticket schemes</td>
</tr>
<tr>
<td>5. Travel awareness campaign</td>
<td>Increases awareness of problems resulting from transport choice</td>
</tr>
<tr>
<td>6. Car club</td>
<td>Offers shared vehicles that have to be paid only when used</td>
</tr>
<tr>
<td>7. Car sharing / Car pooling</td>
<td>Where individuals share their private car for particular journeys</td>
</tr>
<tr>
<td>8. Teleworking</td>
<td>Working from home through remote working practices</td>
</tr>
<tr>
<td>9. Teleconferencing</td>
<td>Replaces business travel</td>
</tr>
<tr>
<td>10. Home shopping</td>
<td>Purchased goods are directly delivered to the customers’ homes</td>
</tr>
</tbody>
</table>

Source: Adapted from Cairns et al. (2008)

For a detailed description, see Cairns et al. (2004). Möser and Bamberg (2008) noted that the first five intervention types are the most frequently implemented and evaluated in the last decade.

In Japan mobility management mostly goes under the name of travel feedback programs (TFP). To classify these frequently implemented programs, Fujii and Taniguchi (2006) used four parameters (Table 2). There are many similarities to the list provided by Cairns et al. (2008) with overlapping contents basically applying to the first five intervention types. This supports the view of Möser and Bamberg (2008). For a broader and comparative view on mobility management tools beyond UK it seems currently adequate to focus on these five intervention types with regard to the parameters above.

How does a specific mobility management program look like? Two initiatives are the IndiMark concept and the TravelBlending concept. Both of them aim at increasing activities associated with environmentally friendly transport while decreasing car travel. They have frequently been implemented in Australia, often within the context of even larger programs to encourage environmentally friendly behaviour. The programs work closely with individuals and households to help them understand the available alternatives, rather than using a mass marketing approach (Ker, 2003). Yet, they are different approaches.
Table 2: Parameters to classify travel feedback programs (TFPs)

<table>
<thead>
<tr>
<th>Location</th>
<th>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.</th>
</tr>
</thead>
</table>
| Techniques for changing travel behaviour | 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 | Simple “single step” TFPs, e.g. just the request to formulate a behavioural plan for how to change travel behaviour; IndiMark involves two or three contacts; TravelBlending involves four contacts |
| Communication media | Face-to-face communication / household visit / group briefing, regular mail, telephone, e-mail, internet web-site |

Source: Adapted from Fujii and Taniguchi (2006)

The IndiMark concept (derived from the term “individualised marketing”) has been developed by the consultant company “Socialdata” (Brög and Schädler, 1999). In its main objective to change travel behaviour, mode choice is used as a basic measure. Mode can be non-motorised (cycle, walk) or motorised private transport (car, motorbike) or public transport. All households and/or persons in a defined area are first contacted by mail or telephone. Then, the households are classified into three groups: Group “I” consists of households who are interested, Group “R” consists of households with at least one regular public transport user, and Group “N” consists of households who are not interested at all. Further contact is only established with Groups I and R. Brög (2000) argues that this segmentation allows concentrating available resources to the most promising households, where an increased use of public transport is likely to be obtained. Group R is then confirmed and rewarded for its behaviour and is distinguished into “R with” and “R without” requests for information. Any requests for information will be fulfilled. Group I is directly approached in order to stimulate motivation about travel behaviour and possible use of public transport. They are later provided with a customized information package. Selected persons from Group I receive further contact (phone calls, home visits), if possible from employees of the public transport company. They again give advice and hand over test tickets so “system experience” can be gained at no expense. In the last phase an evaluation study is usually conducted to measure effects on mobility behaviour and attitudes. According to Brög and Schädler (1999), a pre-post-test-design with a control group is used, in which the results of the target group are compared against the control group that did not take part. The IndiMark concept was tested in the “Switching to public transport” project together with the International Association of Public Transport (UITP). It was applied in 13 European countries with 42 transport companies and a total of about 12,000 participants. According to Brög (2000), car use decreased and the share of public transport increased in addition to positive changes in attitudes. Later applications of IndiMark were done at even larger scales (cf. section 2).

The TravelBlending concept was initially developed for Australia’s largest motoring membership organisation by Monash University and Steer Davies Gleave, a transport consultant company based in the UK. Its primary aim was to reduce pollution caused by car travel in Sydney prior to the 2000 Olympics (Rose and Ampt, 2003). The term “TravelBlending” is derived from the way individuals can reduce car use by blending modes (e.g. sometimes walk, cycle or use public transport), blending...
activities (e.g. doing things in the same place or trip chaining) and/or blend over time (e.g. making sustainable changes on a regular basis). Since TravelBlending focuses more on awareness and efficient use of cars than on modal shifts, its impact on increased use of public transport is lower (Ker, 2003). The precepts of the concept are to provide people with an understandable, overall goal (e.g. to improve the quality of life in their city by reducing the use of the car), to let them measure their existing travel behaviour, to provide them with personalised advice on how to change their behaviour, and to provide a reinforcing environment (e.g. family, work, or school situation) (Rose and Ampt, 2001; Taylor and Ampt, 2003). All people in participating households complete travel diaries in two separate weeks. The whole program takes nine weeks. Four kits with materials are used to assist in the recording and collection of data. The first kit contains the initial contact letter, materials to introduce the participant to the TravelBlending tool and a travel diary which participants will need to complete to track their travel for one week. The second kit delivers customized feedback on the travel diary. Feedback information contains travel patterns and the emissions produced along with suggestions explaining how small changes in travel behaviour could reduce vehicle use and how to benefit from this. The third kit contains the second round of materials and is offered four weeks after the first kit is completed. It is designed for participants to track their travel for the second week, therefore contains the second travel diary. Both diaries together enable a comparison of travel behaviour. The last kit gives feedback to show in a comparative summary the changes participants may or may not have made. It also contains further personalised suggestions on how a continuous benefit from small changes is possible. A pilot study of TravelBlending was conducted in Sydney, Australia in 1996. A larger trial was initiated as a follow-up in Adelaide, Australia and achieved reductions in car driver kilometres and car driver trips (cf. section 2.2). By now the program has been implemented in various cities at different scales (Rose and Ampt, 2003).

Both IndiMark and TravelBlending are examples of how soft policy measures may look like. There are other programs as well, for instance Personalised Travel Planning in London. Certain travel feedback programs are designed much simpler, for instance, including only a request to form a plan on how to change travel behaviour. It is important to note that there is no blueprint for “the” soft transport policy measure and a closer look at available research work is crucial.

2. Review of results of implementations

2.1 Japan

The most common mobility management tools in Japan are travel feedback programs (TFP), which give feedback (e.g. CO₂ emissions caused by car use) and feedforward information (e.g. timetables for public transport) to participants (Fujii et al., in press). The first TFP was implemented in 1999, followed by several others from 2000 until today.

In a review of the literature on TFPs in Japan, Fujii and Taniguchi (2006) found quite encouraging results. CO₂ emissions were reduced by about 19% and car use by about 18% while the use of public transport increased by about 50%. All in all, Taniguchi et al. (2006) conclude that TFPs seem to be the most effective mobility management method (in contrast to for instance workshops) in terms of aggregate level effects such as regional transportation mode shares, CO₂ emission reductions, or number of public transport passengers. According to the authors the most likely
reason is that TFPs can potentially target all households or individuals in a specific area or organisation, given a sufficient budget. Fujii and Taniguchi (2006) further conclude that their most important finding is that TFPs are effective soft policy measures for promoting travel behaviour change in a “non Western country”, and the effects did not differ from effects found in Western countries. Taniguchi et al. (2006) point out the fact that Japanese TFPs are small-scale experiments conducted by transport researchers rather than large-scale transport policies. This “Japanese approach” with high involvement of researchers is different from the European or Australian approaches with consultant companies and policy makers having a stronger involvement. Despite that, it is still justified to include the Japanese results into considerations. With respect to the current mobility management situation in Japan, Taniguchi et al. (2006) ask for the implementation of large-scale projects (as in Australia or the UK) with an elaborated framework and enough funds. According to Fujii (2008, personal communication) soft transport policy measures in Japan now start to become large-scale, but no results are published yet.

2.2 Australia

Mobility management initiatives in Australia are known as “voluntary travel behaviour change” (VTBC). According to Taylor (2007), VTBC is seen as an important new tool. A thorough definition can be found in 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”. A number of Australian households seem to be interested in reducing their car dependency, find and adopt more sustainable transport habits. Taylor (2007) claims that currently 30-40% of Australian households may at least consider involvement in a VTBC program. While Japanese researchers have to be more convincing in order to get policy makers to implement large-scale mobility management programs, most of the state capital cities in Australia already have significant initiatives running, broadly aimed at the search for more sustainable travel behaviour and transport systems.

VTBC programs in Australia started with two early trials of TravelBlending in Sydney and Adelaide (Rose and Ampt, 2001). The Sydney pilot started in 1996 with a small sample of 46 individuals and 27 vehicles from 13 households involved. The results showed encouraging changes in attitude and awareness of the use of motor vehicle and its associated environmental consequences as well as changes in behaviour (e.g. using public transport instead of car, organising car pool systems) which participants attributed to the program. Qualitative feedback was used to further improve the program. The Adelaide trial was initiated as a consequence of the results of the Sydney pilot and targeted a sample of 96 households. The results were again promising. For the overall sample car driver trips were reduced by about 14% (23%), car driver kilometres by about 11% (21%), and total hours in car by 19% (26%). Numbers in brackets indicate reduction among people who actively participated in the program. The maintenance of these changes was checked and confirmed six months later in a follow-up survey (Ampt and Rooney, 1999). Due to the success of the pilot the program was integrated in the LivingNeighbourhoods project which was conducted in the inner Adelaide suburb of Dulwich in 1998. This large-scale project targeted about 900 households and was supposed to change travel behaviour through a partnership between the community and the providers of services and goods as well as all levels of government. Everyone could do his or her share to improve quality of life and sustainability through small changes, for instance increased bus frequencies,
provision of public transport information to new residents and better quality footpaths (Taylor and Ampt, 2003). The impact on car driver trips among people who fully participated in the program and thus completed both travel diaries was a 10% reduction. As another result, participants in the Dulwich project claimed to have gained personal benefits with respect to time, health, and money. Ampt (2001) therefore assumed that changes in travel behaviour may have wider ramifications.

In 1997 there was also an implementation of another mobility management measure, the IndiMark program. It took place in South Perth and targeted 383 households (Brög et al., 2002). According to the basic idea of the IndiMark concept (cf. section 1.3), people were asked if they were interested in switching from car to other modes and 36% answered in the affirmative. As a result the number of car driver trips and vehicle kilometres travelled could be reduced by 10% (from 60% to 54%) respectively 14%, while public transport trips increased by 21% (from 6% to 7%) and walking and cycling by 16% (from 12% to 14%) respectively 91% (from 2% to 4%). Total number of trips remained the same and changes in mode share proved to be stable one year after the initial survey (James et al., 1999). The use of local shops and services increased and there was two kilometres less travel per person per day but four minutes additional travel time. After the success in South Perth, trials were extended to other Perth suburbs.

Another pilot study with the IndiMark program was conducted in the Grange district of inner northern Brisbane (Marinelli and Roth, 2002) as part of the “TravelSmart” initiative, a more complex program to preserve environment and increase quality of life. It 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, private vehicle trips decreased by 10%, while cycling trips increased by 6%, and public-transport use by 33%. The authors ascribed the differences to South Perth to Granges’ hilly topography that made cycling less attractive as well as to the better developed public transport.

As has become evident, pilot implementations of various soft policy measures have been successful in reducing car use and increasing use of environmentally friendly travel options in Australia. Subsequently, larger applications have taken place. From February to May 2000, a large-scale IndiMark program was conducted in South Perth (Brög et al., 2002) with more than 15,000 households or about 35,000 people targeted. It was again accompanied by the comprehensive “TravelSmart” community and awareness program wherein the State Government combined marketing, education and participation processes to influence individuals’ travel choices (Brög, 2000). Results were a 14% reduction in car trips, a 9% increase in car sharing, a 35% increase in walking, a 61% increase in cycling and a 17% increase in public-transport use. The total number of trips remained the same. Changes in public-transport use were confirmed by the public transport company and evaluations one and two years after the initial implementation showed stable changes in the modal shift.

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

In 2004 the National Travel Behaviour Change Program (NTBCP) 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 tonnes of CO₂ equivalents over the period 2008-2012 (Australian
Government, 2008a), there are other economic, environmental and social policy goals and performance indicators of the NTBCP as well, for example reductions in other impacts of car use like noise and congestion (Australian Government, 2008b). Taylor (2007) stated that although widely differing levels of impact, Australian mobility management projects could decrease car use in all cases. These results as well as supporting broad programs will hopefully give a fresh impetus to soft transport policy measures.

2.3 UK

The results of a major study of large-scale soft transport policy implementations of the UK Department for Transport are reported in Cairns et al. (2008). The authors use seven previous reviews that made estimates of the overall effect of different soft policy measures on traffic levels in UK. According to these reviews, the lowest estimates tended to emerge when it was assumed that there would be little momentum for soft policy measures, when the impacts of specific factors were averaged over 24-hours national traffic flow, and/or when caveats were made about induced traffic. The highest estimates emerged as a result of assuming the simultaneous application of many different, consistent initiatives (including supporting hard policy measures) and where results were expressed as a proportion of the traffic levels in a specific locality, by journey purpose, or by time of day. When re-analyzing the data from the seven previous reviews, the authors found a consistent picture. The results suggested that, with lower intensity application and/or without support from complementary hard policy measures, soft policy measures could reduce traffic levels by 4–5% at the national level. With higher intensity application and supportive hard policy measures, the estimated potential for soft policy interventions was to reduce traffic levels by 10–15% as a national average and by 15–20% in favourable local conditions. Under specific circumstances figures higher than this could be achieved. Unfortunately, apart from the need of supportive hard policy measures, these circumstances are not explicated in more detail.

Based on their category system (cf. section 1.2), the authors report the following overall conclusions:

1. **Work place travel plans** typically reduce commuter car driving between 10–30%. Typical cost to the local authority for promoting workplace travel plans was £2-4 per affected employee per year. When prioritised, city authorities had typically managed to engage with organisations representing about 30% of the workforce, whilst county authorities had managed to engage with organisations representing about 10% of the workforce.

2. When implemented across a local authority area, **school travel plans** cut school run traffic by between 8–15% on average. The authors note that many local authorities were devoting more resources to school travel plans than to workplace travel plans, and some expected to reach nearly all schools in their area in the next ten years.

3. **Personalised travel planning** reduces car driver trips by their target group of 7-15% in urban areas, 2-6% in rural and smaller urban areas.

4. **Public transport information and marketing** had recorded increases in bus use of about 1-5% when combined with other improvements.

5. **Travel awareness campaigns** have varied from relatively general to closely targeted intensive approaches. The latter tended to achieve higher levels of individual change in car-use reduction.
Car clubs are estimated to lead to an average reduction of five privately owned cars per car club vehicle. Yet, these are new initiatives in the UK and no well-founded conclusions can be drawn. For the results of organised car sharing, teleworking, teleconferencing and home shopping, see Cairns et al. (2004) for a detailed review. Due to their technical nature, and as was discussed above, for the last-mentioned five initiatives, more convincing data has to be gathered in the future.

Regarding work travel plans, Cairns et al. (2002) did a more extensive review for UK and reported a reduction of at least 18% in the proportion of commuter journeys being made as a car driver. In other words, travel plans implemented in UK resulted in at least 14 fewer cars arriving per 100 staff. On average, the proportion of staff commuting by public transport, cycling or walking had nearly doubled. Organisations have often been motivated to encourage their staff to commute more sustainably because of growing parking and congestion problems or planning restrictions. Yet, they also reported benefits afterwards, including improved travel options for staff, attraction of new employees, reduced commuting stress, retained staff and positive PR. Cairns et al. (2002) suggest that the key to more sustainable commuting is the overall strategy adopted by the organisation and that it is usually necessary to introduce parking management, as well as providing incentives to use alternative modes to achieve substantial changes.

Cairns et al. (2008) developed two scenarios regarding what effect soft transport policy measures could 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 are assumed. The “high intensity” scenario constitutes a projection based on a substantial expansion of the activity, commitment and resources devoted to soft transport policy measures. The scenarios suggest a potential for soft policy measures to reduce national traffic levels by about 11% with reductions of up to 21% of peak urban traffic. The authors stress the fact that these predictions (Table 3) are not intended to be a forecast for 2014, because no allowance was made for other conditions that would have changed by then (demography, income, economic growth, road user charging, induced traffic, etc.). Compared to the previously mentioned results from other studies, the high intensity estimate of 11% is conservative.

### Table 3: Potential impacts of soft factors on future traffic levels in the UK

<table>
<thead>
<tr>
<th></th>
<th>High-intensity scenario</th>
<th>Low-intensity scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>14%</td>
<td>3%</td>
</tr>
<tr>
<td>Peak times</td>
<td>21%</td>
<td>5%</td>
</tr>
<tr>
<td>Non-urban areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>8%</td>
<td>2%</td>
</tr>
<tr>
<td>Peak times</td>
<td>14%</td>
<td>3%</td>
</tr>
<tr>
<td>Nationally</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>11%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Peak times</td>
<td>17%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Source: Adapted from Cairns et al. (2008)
2.4 Other countries

Ker (2003) reports large-scale applications of IndiMark in seven German cities and two Austrian cities with more than 100,000 people targeted. In each city an increase in public-transport use relative to control groups was achieved (Table 4).

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

Source: Adapted from Ker (2003)

Another large-scale application of IndiMark took place in Viernheim, Germany with about 31,000 inhabitants as part of the EU project “TAPESTRY” (Travel Awareness Publicity and Education Supporting a Sustainable Transport Strategy in Europe) in 2001. Its results were relative decreases of 12% in number of car trips as driver and 10% in number of car trips as passenger. Walking and cycling trips increased by 7% respectively 10% and public-transport use increased by 29% (EU tapestry, 2003).

In Gothenburg, Sweden a large-scale application of IndiMark was conducted in 2002 (Brög et al., 2002). A reduction of car as driver by 14% was achieved and of car as passenger a reduction by 7% was achieved. Public-transport use and walking increased by 4%, cycling trips increased by 45%. Total number of trips remained the same, but the experimental design of the study was not entirely clear. It is stated that the before study was conducted in January and February while the after study was conducted between August and September. Although IndiMark claims to use control groups (Brög and Schädler, 1999), it seems to be a one group pre-post-design in this case. As such, at least part of the modal shift should probably be ascribed to seasonal changes (cycling and walking is more common in summertime).

Cairns et al. (2008) quote studies from Netherlands and USA where the weighted average reduction in car driver trips for work travel plans was 17.8%. This number is remarkably close to 18% reduction in the UK, as reported in Cairns et al. (2002).

2.5 Meta-analyses

In the light of some criticism of the narrative review approach, Bamberg and Möser (2007) published a paper with the objective to present meta-analysis as an alternative,
quantitative approach to research synthesis in the context of soft transport policy measures. They adopted the data from two narrative reviews by Cairns et al. (2002, 2004) which can be seen as a comprehensive data base of empirical evidence available on soft policy measures for the UK. The comparison of conclusions from narrative and meta-analytic research syntheses yielded some differences. For instance, whereas the authors of the narrative review came to the conclusion that organisational and site characteristics are negligible, the meta-analysis results indicated a strong impact of these factors (e.g. work travel plans implemented in public organisations, organisations with a mainly female staff and on sites with poor/average cycling access report the strongest effect sizes). Meta-analyses did not show the importance of parking as a central access factor, whereas Cairns et al. (2002) think it is a vital aspect (cf. section 2.3).

Möser and Bamberg (2008) gathered 141 studies which reported information about car use before and after an intervention as well as information about sample sizes. Difficulties arising during the collection of the studies are discussed in section 2.6. They categorized the initiatives in three types of soft policy measures loosely based on Cairns et al.’s scheme (cf. section 1.2).

1. Workplace travel plans (n=44)
2. School travel plans (n=25)
3. Personalised travel planning / travel awareness campaign / public transport marketing (n=72) (Cairns et al.’s groups 3 to 5)

This kind of distinction is necessary, because the intervention types differ in how they typically operationalise car-use reduction. Travel plans use the proportion of employees / pupils arriving on a specific day by car at their workplace / school. Studies evaluating the effects of personalised travel planning / travel awareness campaign / public transport marketing typically use the proportion of trips conducted by car in relation to the total number of reported daily trips (modal split). An important problem is the issue of weak quasi-experimental designs that have been used in all the primary studies. The authors stress that meta-analysis cannot deal with fundamental methodological deficits of the existing soft policy measure evaluations. Thus, due to lack of control groups, one group pre-post-test designs do not permit strong causal inferences. This severely limits the policy recommendations drawn from the results. But the authors also believe that it is better to base policy decision making on weak empirical evidence than no evidence. The overall effect size (ES) was 0.15 which equals a 7% decrease of the proportion of trips conducted by car from 61% to 54%. Results for the different interventions are listed in Table 5.

<table>
<thead>
<tr>
<th>Implementation form</th>
<th>Effect size</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work travel plan</td>
<td>0.24</td>
<td>Proportion of employees not reaching their workplace by car before intervention (35%) and after (47%)</td>
</tr>
<tr>
<td>School travel plan</td>
<td>0.08</td>
<td>Pupils not coming to school by car before intervention (60%) and after (64%)</td>
</tr>
<tr>
<td>Personalised travel planning / travel awareness campaigns / public transport marketing</td>
<td>0.11</td>
<td>Proportion of trips not conducted by car before intervention (34%) and after (39%)</td>
</tr>
</tbody>
</table>

Source: Adapted from Möser and Bamberg (2008)
As the authors point out, there was a strong heterogeneity of the ES distributions, which reduces practical significance and underscores the importance to identify moderators. This highlights the need for a theory-driven search for factors causing variability of soft policy measures. 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 school travel plan ES. Data source and school size could explain 71% of the ES variance. Yet, the heterogeneity statistic for the residual ES was still significant, indicating that there are additional sources of ES heterogeneity. For work travel plans, data source, study year and before sample were checked as potential moderators but none was statistically significant. After deleting two outliers from the ES distribution of personalised travel planning / travel awareness campaign / public transport marketing, the value of the heterogeneity statistic was not significant.

The importance of systematic moderator analyses goes along with the need for a change in publication practice to get more details. This is supposed to be a problem given the conditions under which the studies are carried out. Consultant companies that are commissioned to evaluate soft policy measures have no incentive to disclose details about their practices, apart from effectiveness. Nevertheless, Bamberg and Möser (2007) also stressed the positive message that with the ES of 0.15 there is indeed empirical support for the claim that soft policy measures are an effective strategy for reducing car use. Arising from the source of data (Cairns et al., 2002, 2004), all studies of work and school travel plans in the meta-analysis had been conducted in the UK. In case of personalised travel planning / travel awareness campaign / public transport marketing 24 of the 72 studies had been conducted in the UK, 12 in Australia, 16 in Germany, 5 in Italy, 3 in Portugal, 2 each in Switzerland, France, and Netherlands, 1 each in Norway, Spain, Luxemburg, Denmark, Austria, and Finland. The total amount of studies must not be confounded with the number of participants. For example the 16 German studies included account for a study N of 83,792 whereas the 24 studies from the UK account for a study N of about 26,981.

Taniguchi et al. (2007) conducted a quantitative analysis of the effectiveness of mobility management in Japan (Table 6). They collected data on TFPs issued before December 2005 and containing data up until 2003. Because of the differing effects in residential areas, schools, and workplaces, the authors divided their analysis and found 18 projects implemented in residential areas, targeting 4,407 people. Ten projects were implemented in schools, targeting 869 people and four were implemented in workplaces, targeting 917 people. Since they did not have enough data to conduct a sound meta-analysis on school and workplace travel plans, the authors used only data from TFPs implemented in residential areas. For these TFPs they found a 7.3% reduction in car use and a 68.6% increase in public-transport use. Measurements also made of mediating psychological factors showed a 10.4% increase in intentions to limit car use and a 7.5% increase in intentions to use public transport more often. If only TFPs with control group were used for the analysis, the reduction of car use was 12.1% and the increase in public-transport use 38.6%. Compared to a control group, the intention to limit car use increased by 9.6% whereas the intention to reduce car use decreased by 0.3%. For methodological reasons these means may be underestimated. The mean effectiveness of the optimal intervention of TFP using nine cases with control group showed a mean reduction of car use of 19.2% and an increase in public-transport use of 31.7%. 
Table 6: Meta-analyses results of TFPs for residential areas

<table>
<thead>
<tr>
<th></th>
<th>Reduction in car use</th>
<th>Increase in public-transport use</th>
<th>Intention to limit car use</th>
<th>Intention to increase public-transport use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before-After-Intervention-Comparison</td>
<td>7.3%</td>
<td>68.8%</td>
<td>10.4%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Comparison to a control group</td>
<td>12.1%</td>
<td>38.6%</td>
<td>9.6%</td>
<td>- 0.3%</td>
</tr>
<tr>
<td>Optimal intervention</td>
<td>19.2%</td>
<td>31.7%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Adapted from Taniguchi et al. (2007)

Fujii et al. (in press) derived a mean effect size of 0.17 from 15 studies using pre-post-test design with control group. This corresponds to a decrease in the number of weekly car trips from 6.9 to 5.7, equal to 11% car-use reduction. The focus of this study was to show differences in using different designs and is addressed in detail in the next section.

2.6 Differences and commonalities among various approaches

As previously indicated, mobility management measures in Japan and EU countries respectively Australia differ. Taniguchi et al. (2006) point out that in the UK and every other country where large-scale mobility management implementations have taken place, consultant companies and governments play the most important role in the implementation and organisation of these measures, whereas researchers are usually responsible for monitoring and evaluation. In contrast, the concept and technique of mobility management in Japan have been introduced and carried out by researchers.

The two leading consultant companies that implement large-scale soft policy measures are Socialdata based in Germany and Steer Davies Gleave based in the UK. In the TFPs from Socialdata people are divided into several groups by their interests regarding travel behaviour change and their actual travel behaviour such as frequency of public-transport use. The different groups are then addressed differently (cf. section 1.3). In large part the reported reduction in car trips for implementations in Germany, Australia, Sweden, and USA was between 4% and 14% (Cairns et al., 2004). Steer Davies Gleave stresses the importance of community development through TFP projects. By requesting travel diaries, they want to sensitise people to overuse of the car and generate problem awareness. Programs in Australia and USA reported 9% to 15% reduction in car driver trips (Cairns et al., 2004).

In their comparison of TFP effects between Japan and EU countries, Taniguchi et al. (2006) focused on Personalised Travel Planning (PTP) as one method of the “Smarter Choices” program in the UK with effects reported in residential areas (7 cases), workplaces (6) and schools (2). Results for PTP were sometimes projected across the whole target population which is of practical value, yet made it impossible to compare them directly to Japanese results that were reported for participants only. Some Japanese results that could be used indicated a 12.1% car-use reduction in residential TFPs if compared to a control group, respectively 19.2% average effect of optimal TFP intervention. These outcomes were not largely different from comparable UK results with 7–15% reduction. The authors acknowledge that the target population should be assessed, but the proportion of participants in TFPs in Japan has not always been well-assessed and documented because of the experimental nature of Japanese TFPs. To assess the target population, Taniguchi et al. (2006) use the assumptions made by Cairns et al. (2004) for the UK and conclude 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 9.6% or even more could be achieved.

Taniguchi et al.’s (2006) paper is one of few that addresses cultural differences in terms of mobility management. While the analysis did not find large differences between Japan and EU countries, some questions remain like, for instance, whether attitudes towards car use and car-use reduction differ and therefore moderate the uptake and/or outcome of mobility management.

Bamberg and Möser (2007) level harsh criticism at the approach of narrative reviews with a special regard to Cairns et al. (2004), stating for instance that “... this conclusion is quite subjective, guided more by implicit á priori assumptions than data” (p. 19). Without doubt meta-analysis has led to new possibilities and can increase statistical power and detect intervention effects even if they are small (as it is often the case). Yet, it is important not to see it as an approach superior to narrative reviews but rather with a different goal. While meta-analyses can deliver unbiased quantitative results, the narrative approach is for instance important to detect gaps of knowledge. Although there are many studies in the field of mobility management with the same overall topic of car-use reduction, the way they are conducted is different most of the time. The presence of these slightly different studies leaves meta-analysis in its effort to be comprehensive with its own problems, for instance the criticism of “mixing apples with oranges” or the use of studies of bad quality which in turn leads to results of bad quality (“garbage in, garbage out”).

The latter issue of methodically weak designs in the primary studies has been discussed. 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. They argue that only post-test design with control groups is adequate for making causal inferences concerning what factors make TFPs effective. The more convenient treatment group pre-post-test design without control group does not permit this because it does not eliminate threats to the validity of causal inferences (Shadish et al., 2002). The overall importance of adequate study design is also stressed by others (Fujii et al., 2008; Taniguchi et al., 2006). In fact, there is consensus among researchers concerning what is a best practice evaluation of soft policy measures (Taylor, 2007). Evaluations have to be made independently and changes should be measured for the target population as a whole, for the program participants, and for an untreated control group. Furthermore, measures should include trip rates, vehicle kilometres travelled, travel time by transport modes, and choice of travel mode (public transport, walking, cycling, or car passenger/driver). To date, the impacts of soft policy measures are reported for different measures due to differences in the programs’ main objectives (Fujii and Taniguchi, 2006). Standardisation would be valuable, particularly with regard to the application of meta-analysis. A publication bias towards successful implementations also needs to be taken into consideration.

Fujii et al. (in press) show that effect sizes in different research designs vary to a significant degree. Their meta-analysis results, derived from 15 Japanese TFPs with initial pre-post-test design with control group are reproduced in Table 7. Direction of the mean TFP effect sizes derived from three different research designs is the same, indicating that the implementation of a TFP reduces the average number of weekly car trips. But the results also indicate a substantive difference in the average TFP impact, when using the effect sizes obtained from the different research designs. Furthermore,
estimates of the heterogeneity of treatment effects appeared to differ, suggesting that inferences of causes of TFP effectiveness vary with research design.

<table>
<thead>
<tr>
<th>Design</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment group pre-post-test without group</td>
<td>-0.121</td>
</tr>
<tr>
<td>Only post-test with control group</td>
<td>-0.109</td>
</tr>
<tr>
<td>Pre-post-test with control group</td>
<td>-0.165</td>
</tr>
</tbody>
</table>

Source: Adapted from Fujii et al. (in press)

3. Conclusions

The aim of this paper was to review results of implementations of soft transport policy measures. In summary, the results show that soft policy measures have positive outcomes in a variety of ways. Yet, it is exactly this variety that 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 work on large-scale implementations by private consultant companies is not accessible to researchers. In Japan, where researchers are highly involved in developing soft policy measures, implementation conditions are mostly experimental and well-controlled but remain small-scale.

Although results underscore the effectiveness of soft policy measures in general, we have found several gaps of knowledge, thus suggesting that more research is needed to address this complex field more appropriately. A companion paper (Richter et al., 2008) will discuss such gaps with the aim of identifying research needs related to the implementation of soft transport policy measures, particularly with respect to moderator variables and the use of different techniques.
Acknowledgements

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References


Soft transport policy measures

To abate problems resulting from increased car use, hard transport policy measures have been introduced. Such measures often meet public disapproval, are politically infeasible, and may alone be insufficient. As a consequence, alternative soft transport policy measures have been proposed. These measures are designed to motivate individuals to voluntarily reduce car use. This paper reviews implementations of soft transport policy measures in Japan, Australia, UK, and several other countries. The review underscores the effectiveness of soft transport policy measures in general and points to a variety of positive outcomes. Yet, the variety in the results makes it hard to infer why the measures are effective. Several gaps of knowledge are also identified. A companion paper will discuss these and identify research needs.