Implementation of Soft Transport Policy Measures to Reduce Private Car Use in Urban Areas

Tommy Gärling[1,3], Sebastian Bamberg[2], Margareta Friman[3], Satoshi Fujii[4], and Jochen Richter[5]

[1]*University of Gothenburg, Göteborg, Sweden*
[2]*University of Giessen, Germany*
[3]*Karlstad University, Sweden*
[4]*Kyoto University, Japan*
[5]*Dresden Technical University, Germany*

Abstract

Motorised travel is in several respects a future threat to the human environment. Transport policy measures to reduce car use are therefore on the political agenda. Hard transport policy measures include physical improvements of public transport infrastructure, increased costs for car use, or control of road space. These measures are difficult to implement because of public opposition and political infeasibility. Interest has therefore increased in soft transport policy measures aimed at influencing car users by means of information and persuasion. Large-scale implementations target large numbers of households and are usually part of broader programs to encourage environmentally friendly behaviour. It has been shown that car use decreases and public transport use increases. A challenge is to understand why soft transport policy measures are effective. A self-regulation theory of car use change is presented as an explanation of the demonstrated effectiveness of different intervention types focusing on goal setting, planning, and evaluation of negative feed back.

1. Introduction

Motorised travel is in several respects a future threat to the human environment (Gärling & Steg, 2007). Transport policy measures to reduce car use are therefore on the political agenda, commonly referred to as "travel demand management" (TDM) measures (Kitamura et al., 1997; Pas, 1995). These are divided into "hard" and "soft." Hard transport policy measures include physical improvements of infrastructure for public transport, increased costs for car use, and control of road space (prohibition and rationing of car use). Although these measures may be necessary to achieve car-use reduction, they are difficult to implement because of public opposition and political infeasibility (Gärling & Schuitema, 2007). Interest has therefore increased in *soft transport policy measures* aimed at influencing car users by means of information and persuasion. Soft transport policy measures are also referred to as voluntary-change measures (Loukopoulos, 2007), psychological and behavioural strategies (Fujii & Taniguchi, 2006), and mobility management tools (Cairns et al., 2008). Frequently implemented examples of soft transport policy measures to reduce private car use include workplace travel plans (encouraging work commuters to not use the car), school travel plans (encouraging parents to not drive their children to school), personalised travel planning (encouraging reduced car use by persuasion, customized information and other decision aids), marketing of public transport (mass advertising campaigns), and travel awareness campaigns (increasing awareness of problems resulting from car use) (Cairns et al., 2008).

In the following we confine soft transport policy measures to various forms of *personalised travel planning*. First, we briefly summarize available empirical evidence for the effectiveness of soft transport policy measures. We then discuss possible determinants of effectiveness. To this end a general conceptual framework is presented to clarify the role of

hard and soft transport policy measures for car users' switching of travel mode followed by a presentation of three theories which identify psychological determinants of car users' current travel as well as their switching of travel mode. Finally, the psychological determinants identified are related to specific intervention techniques. The paper concludes with a discussion of future research needs.

2. Are soft transport policy measures effective?

The results of several implementations of soft transport policy measures in Australia, UK, Japan, and some other countries are reviewed below. See Richter et al. (2009a, 2009b) for a more extensive review including more details about the implementations.

Australia. Soft transport policy measures are in Australia known as *voluntary travel behavior change* (VTBC) programs. A definition is given by Ampt (2004) as "…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. Australia already have large-scale programs running, broadly aimed at achieving more sustainable travel in urban areas.

VTBC programs in Australia started with small-scale field tests in Sydney and Adelaide (Rose & Ampt, 2001). Overall car driver trips were reduced by about 14% (for 23% participants), car driver kilometers by about 11% (21%), and travel times in car by 19% (26%). These changes remained after six months (Ampt & Rooney, 1999). The field tests were later integrated in a large-scale program conducted in the inner Adelaide suburb Dulwich in 1998. This larger-scale program targeted about 900 households and aimed at changing car use through a partnership between the community, the local providers of services and goods, and all levels of the local government. Everyone could do their share to improve quality of life and sustainability through small changes, for instance by increasing 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 10% reduction.

Another small-scale implementation in South Perth targeted 383 households (Brög et al., 2002). Of those households 36% answered that they were interested in switching from car to other modes. Car trips as driver were reduced by 10% (from 60% to 54%) and vehicle kilometres by 14%. Public transport trips were increased by 21% (from 6% to 7%), walking by 16% (from 12% to 14%), and cycling by 91% (from 2% to 4%). The changes proved to be stable after one year (James et al., 1999).

Still another implementation was launched in the Grange district of inner northern Brisbane (Marinelli & Roth, 2002) as part of a more complex program to preserve environment and increase quality of life. The study targeted a random sample of over 1,000 households with half of them taking part in the program and the other half being a control group. Among participating households, private vehicle trips decreased by 10%, while public-transport use increased by 33% and cycling trips by 6%.

Subsequently, large implementations have been launched. From February to May 2000 a large-scale program was conducted in South Perth (Brög, 2000; Brög et al., 2002) with more than 15,000 households or about 35,000 people targeted. The results showed 14% reduction in car trips, 9% increase in car sharing, 17% increase in public-transport use, 35% increase in walking, and 61% increase in cycling.

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

UK. In the last few years the UK Department of Transport has commissioned a series of reports summarising the available evidence for the effects of soft transport policies (referred to as *personalized travel plans*) on car-use reduction. When re-analyzing the data from seven previous reviews, Cairns et al. (2008) found a consistent picture. With lower intensity application and with no complementary hard transport policy measures, soft transport policy measures reduce car traffic by 4–5% at the national level. With higher intensity application and supportive hard transport policy measures, the estimated potential was to reduce car traffic by 10–15% as a national average and by 15–20% in favourable local conditions. Under specific circumstances figures higher than this may be achieved.

Japan. In Japan soft transport policy measures are referred to as Travel Feedback Programs (TFP). In documenting the results of Japanese evaluations, Fujii and Taniguchi (2006) found that CO_2 emissions were reduced by about 19% and car use by about 18%, while the use of public transport increased by about 50%. Thus, TFPs appears to be an equally effective soft transport policy measure in a non-Western country as in Australia and the UK. The Japanese TFPs are however small-scale experiments conducted by transport researchers rather than large-scale implementations. This is different from the Australian and European projects where consultant companies and policy makers have a stronger involvement. It is still highly justified to place weight on the Japanese results because they are based on methodologically sound evaluations that are adequately reported.

Other countries. Ker (2003) reports large-scale implementations in seven German cities and two Austrian cities with more than 100,000 people targeted. Increases in public transport trips were found compared to control groups.

In 2001 another large-scale implementation was launched in Viernheim, Germany with about 31,000 inhabitants. A reduction of 12% car trips as driver and 10% as passenger was reported. Walking and cycling trips increased by 7% and 10%, respectively, and public-transport use by 29% (EU Tapestry, 2003).

In Göteborg, Sweden still another large-scale implementation in 2002 (Brög et al., 2002) resulted in a reduction of car trips as driver by 14% and as passenger by 7%. Public-transport use and walking increased by 4%, cycling trips increased by 45%.

Cairns et al. (2008) cite studies from Netherlands and the US where the average reduction in car driver trips was 17.8% for work travel plans.

Meta-analyses. Bamberg and Möser (2007) argue that meta-analysis is a superior quantitative approach to research synthesis in the context of soft transport policy measures. They analyzed the data from two narrative reviews by Cairns et al. (2002, 2004) which are based on a comprehensive data base for the UK. The conclusions from the meta-analysis yielded some differences. For instance, whereas the authors of the narrative reviews concluded that organisational and site characteristics are negligible, the meta-analysis showed 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 or average cycling access obtain the strongest effect sizes). Meta-analyses did not show that parking was a central access factor, whereas Cairns et al. (2002) 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 highlights the need for a theory-driven search for factors causing variability in effectiveness.

Taniguchi et al. (2007) conducted a quantitative analysis of the effectiveness of soft transport policy measures implemented in Japan. Since there was not enough data for school and workplace travel plans, the analysis was confined to TFPs implemented in residential areas. The results yielded 7.3% reduction in car use and 68.6% increase in public-transport use. If only TFPs with control groups were used in the analysis, the reduction of car use was 12.1% and the increase in public-transport use 38.6%. The mean effectiveness of the optimal

intervention (using the most effective techniques) showed 19.2% reduction of car use and 31.7% increase in public-transport use.

Summary. The currently available evaluation results provide empirical evidence for that soft transport policies are effective in reducing car use. Some caution still needs to be exerted since many evaluations have used a weak quasi-experimental treatment group pre-post test design which fails to control for threats to internal validity from history, maturation, testing, mortality, and regression effects (Fujii et al., 2009). Furthermore, the external validity or generalizability to the targeted population is threatened by the fact that most of the evaluation results are based on non-representative samples.

3. Why do soft transport policy measures work?

In implementations of soft transport policy measures the theoretical rationale for the proposed measures are not explicit. Frequently, the only theoretical statement is a reference to social marketing (Jones & Soman, 2006), although this is only a tool for the systematic development and implementation of an intervention (Thøgersen, 2007). Thus, proponents of soft transport policy measures cannot currently claim that the measures they implement for reducing car use are based on empirically supported theories.

In the last decades the need for theory-driven interventions has been noted (Fitz-Gibbon & Morris, 1996; Weiss, 1995). If there is no explicit theoretical link between interventions and their intended effects, the information from an evaluation is of little value for improving the intervention by enhancing aspects that work, or improving or eliminating components that do not work. Likewise, when success or failures cannot be attributed to intervention components, it is not possible to project the results of other interventions.

In the following (see also Bamberg et al., 2009; Gärling et al., 2002; Gärling & Fujii, 2009) we will show that theories developed in psychological research has a large potential in providing the theoretical underpinning of soft transport policy measures.

3.1 Conceptual framework

In a general conceptual framework (see Figure 1) the perception of the built environment (e.g. available transport infrastructure, distribution and quality of shopping/leisure facilities) forms the central interface between external spatial, socio-economic factors, and internal psychological mechanisms. Perception provides the knowledge base from which people derive their set of possible travel options. Assuming that trip chains constitute choice options (Axhausen & Gärling, 1992; Gärling et al., 2002), a travel option is defined as a bundle of attributes describing a trip chain (purposes, departure and arrival times, travel times, and monetary costs). Besides the built environment, stable individual factors (e.g., family structure, income, and working situation) influence perceptions of possible travel options. Situational factors (e.g., weather, time pressure, unexpected events) are a third determinant. These factors are disturbances forcing changes in travel. When planning a trip chain, a travel option is chosen from the perceived set of possible options.

Hard transport policy measures aim at modifying the objective environment. Such modifications must be perceived, the consequences they may have for the possible set of travel options deliberately reflected upon, and whether these consequences provide enough reasons to change current travel evaluated. In contrast, the aim of soft transport policy measures is to directly influence the decision making process by changing (or correcting inaccurate) perceptions of the objective environment, by altering judgments of the consequences associated with the use of different travel options, and by directly motivating tests of new alternative travel options. The conceptual framework stresses the interdependence of hard and soft transport policies; simultaneous implementation of hard

transport policy measures would result in that soft transport policy measures will more easily affect current car users.

3.2 Psychological determinants of current car use and car-use reduction

In the last decade much psychological research addressing decisions to use the car has been guided by two theories: The Norm-Activation Model (NAM) (Schwartz, 1977) and the Theory of Planned Behaviour (TPB) (Ajzen, 1991). Both are briefly described in the following.

The Norm-Activation Model. Originally the NAM (Schwartz, 1977) was developed to explain pro-social behaviors. Consequently, in this model car-use reduction is conceptualized as a behavior primarily driven by pro-social motives. This view is reflected in the assumption that a personal norm is the most important determinant of travel-mode choice. A personal norm is defined as the felt obligation to bring one's behavior in line with personally important internalised self-standards. The NAM assumes that the formation as well as activation of personal norms results from the interplay of cognitive, emotional, and social factors. Problem awareness and perceived responsibility are important cognitive preconditions for the development of a personal norm. The perception that one is responsible for an action that causes harm to other people frequently triggers negative emotional reactions such as feelings of guilt (e.g. Ferguson & Stegge, 1998; Weiner, 1995), which is an important pro-social emotion that results in a felt obligation to compensate for the caused damage (Baumeister, 1998). Besides feelings of guilt, social norms also contribute to the development of personal norms. They inform people about what behavioural standards their social reference group views as appropriate in a particular context. When people internalise these social expectations, social norms are incorporated in their personal norms.

The Theory of Planned Behaviour. The TPB (Ajzen, 1991) is a hedonic theory of human motivation assuming that people avoid punishments and seek rewards. According to this theory, travel mode choice is guided by a rational evaluation of consequences. The sum of perceived positive and negative consequences determines the attitude towards a travel option. Attitude indirectly determines travel via behavioral intention. The TPB also stresses the importance of situational constraints. For example, when forming an intention to use bus or car for a specific trip, people do not only take into account their attitudes toward these two transport options but also judge the difficulty of using them. This is referred to as perceived behavioral control. Social norm is a third factor influencing behavioural intention. In the TPB social norms are primarily conceptualized as perceived social pressure, that is the expectations that significant reference persons would or would not approve the use a specific travel mode. See Anable et al. (2006) and Wall (2005) for reviews of research using the NAM and TPB for explaining car use,.

A self-regulation theory. NAM and TPB focus on the explanation of current travel. However, for the development of effective soft transport policy measures, an understanding of the *process* of voluntarily change of their travel is essential. Bamberg (2008) (see also Gärling et al., 2002) therefore proposed a self-regulation theory that aims at describing this process. The term self-regulation refers to the basic tenet that behavioral change depends on the setting of change goals, the development and enactment of behavioral strategies to achieve these goals, and the regulation of attainment of these goals through negative feedback in the form of evaluation and revision of the set goals and chosen strategies (Carver & Scheier, 1998; Vohs & Baumeister, 2004).

Figure 2 depicts graphically the proposed process. The end of the first motivational stage is marked by the setting of a car-use reduction goal (or some other goal such as cutting expenses, increase public transport use). The setting of such a goal may be influenced by felt obligation (personal norm) to travel more in line with important self-relevant standards (values).

According to NAM the felt obligation to reduce car use is activated by feelings of guilt elicited by the awareness that current travel has negative collective consequences as well as the perceived responsibility for this harm. In line with TPB, an intention to achieve the desired car-use reduction goal would also depend on anticipated positive consequences of changing the current travel (or avoiding negative consequences of not changing the current travel) and the perceived feasibility of attaining the goal, that is the perception of possible alternative travel options. Because the general car-use reduction goal is too abstract to guide change directly, in the second stage a detailed behavioural strategy or plan (e.g. using the bus or the bike instead of the car) is formed to reach the goal (Gärling & Fujii, 2002; Gollwitzer, 1999). Forming a new habit (Fujii & Gärling, 2007) is the fourth stage of the behavioral change process.

4. Conclusions and practical implications

Currently, most such measures use the same intervention for all car users. If behavioural change is a transition through different stages, more flexible interventions are needed, allowing matching the employed measures to the specific motivational stage of the car user. For instance, interventions targeting car users in the first stage of goal setting would likely be more successful if increasing problem awareness and perceived personal responsibility. Interventions making supporting social norms salient would also be important in this stage. For car users who already have formed a car-use reduction goal, interventions providing information about the availability as well as advantages and disadvantages of different alternative travel options would be more effective. Car users who already have formed a car-use reduction plan involving the use of another travel mode would benefit most from interventions supporting the implementation of this intention.

The self-regulation theory (Bamberg, 2009; Gärling et al., 2002) provides a ”blueprint” for the theory-based development of stage-based interventions. Figure 2 also demonstrates how the postulated change mechanisms may be connected with specific intervention techniques that activate these mechanisms. A variety of techniques aiming to make social norms more salient (intervention type I) are available, including mass media role-modelling, entertainment-education, and behavioural journalism (e.g., Goldstein & Cialdini, 2007; McAlister, 1995; Schulz, 1998). Scenario-based risk information (e.g., Hendrickx, Vlek, & Oppewal, 1989), dramatic relief, re-evaluation, and consciousness raising (e.g., Prochaska et al., 2002) are examples of intervention techniques aiming at increasing problem awareness and self-focus (intervention type II). Locke and Latham (2002) have demonstrated that promoting setting of feasible but challenging goals (intervention type III) leads to better performance than setting easy goals. Intervention type IV comprises techniques aiming at increasing perceived behavioral control as well as a positive attitude towards alternative behavioral options (e.g. Ajzen & Manstead, 2007). Linking members to new networks by mentor programs, buddy systems, and self-help groups (e.g. Heaney & Israel, 2002) are examples of techniques of improving social support (intervention type V). Intervention type VI consists of techniques aiming at changing objective environmental conditions such that barriers to desired travel changes are reduced. Examples of type VII interventions include techniques of planning when, where, and how the new behavior should be initiated (Gärling & Fujii, 2002; Gollwitzer, 1999), training of coping skills like identifying risk situations, practicing solutions, and coping with lapses (e.g., Marlatt & Gordon, 1985).

5. Future research directions

Two lines of future research are particularly instrumental for making progress in the development of effective and efficient soft transport policy measures. One line of research should concentrate on the theory-based development and experimental tests of new

interventions. The focus of this research would be on applying the insights of behavioral research to improve the understanding of the causes of car use as well as its voluntary reduction. If supported by strong empirical evidence, in a second step the identified causes should be systematically connected with interventions that potentially are able to activate these causes. In a third step a series of small-scale experiments should be conducted to test whether the newly developed interventions activate the causes as well as whether the activation of the causes results in behavioral change (for an example of such a research program, see Taniguchi et al., 2007). A critical feature of such experiments is the random assignment of participants to experimental and control groups (Fujii et al., 2009) with the intervention applied only to the experimental group. Because the focus of this research is on inferring causes, high internal validity is essential whereas the generalizability of the results is less important. For this reason studies aiming to test the causal effects of new theory-based interventions may use convenience samples. Ideally, this type of research would result in a set of empirically supported change mechanisms as well as interventions that activate these causes.

The second line of research should focus on large-scale evaluations under realistic field conditions of "prototypes" of soft transport policy measures. In practice most policy measures consist of packages of interventions. Besides the evaluation of the procedures of the intervention (process evaluation), the aim of such large-scale evaluations is the valid estimation of the behavioural effects (outcome evaluation). For this purpose both high internal and external validity is essential. Thus, to guarantee a high internal validity of the evaluation results, true experimental research designs should be used. Fuji et al. (2009) provide an overview of how to apply such research designs within the context of evaluation of soft transport policies evaluation. To guarantee high external validity of the results, a large-scale intervention study is required based on data from a representative sample of the population. When an adequate body of high-quality evaluation studies is available, meta-analyses should be used to calculate more reliable and precise estimates of the intervention effects. Furthermore, if the synthesis of the available evaluation results indicate a strong variability of the reported intervention effects, meta-analyses provide statistical tools for analysing the potential sources of this variability, that is the possible impact on the reported evaluation results of sample characteristics, differences in the interventions, or differences in transport infra structure. A precondition for this is that the evaluation reports contain enough detailed information of these factors.

Acknowledgements

The first authors' work on this paper was financially supported by grant #2004-0297 from the Swedish Governmental Agency for Innovation Systems (VINNOVA) to the Service and Market Oriented Transport Research Group (SAMOT) at Karlstad University, Sweden.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Ajzen, I., & Manstead, A. S. R. (2007). Changing health-related behaviors: An approach based on the theory of planned behavior. In K. van den Bos, M. Hewstone, J. de Wit, H. Schut & M. Stroebe (Eds.), *The scope of social psychology: Theory and applications* (pp. 43-63). New York: Psychology Press.

Ampt, E. S. (2004). Understanding Voluntary Travel Behaviour Change. *Transport Engineering in Australia, 9*, 53-66.

Ampt, E. S., & Rooney, A. (1999). Reducing the impact of the car - A sustainable approach: Travel Smart Adelaide. 23rd Australasian Transport Forum, Perth.

Anable, J., Lane, B., & Kelay, T. (2006*). A review of public attitudes to climate change and transport: summary report.* Research report for the Department for Transport, London. Retrieved May 20, 2008, from http://www.dft.gov.uk/pdf/pgr/sustainable/climatechange/areviewofpublicattitudestocl5731.

Axhausen, K., & Gärling, T. (1992). Activity-based approaches to travel analysis: Conceptual frameworks, models, and research problems. *Transport Reviews*, *12*, 323-341.

Bamberg, S. (2009). *Why and how do people voluntarily change environmentally harmful behaviors? A self-regulation approach*. Manuscript submitted for publication.

Bamberg, S., Fujii, S., Friman, M., & Gärling, T. (2009). *Evaluation of soft transport policy measures based on behavioural theory*. Manuscript submitted for publication.

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology***,** *27,* 14-25.

Baumeister, R. F. (1998). The self. In D. T. Gilbert, S. T. Fiske & G. Lindzey (Eds.), *The handbook of social psychology* (pp. 680-740). Boston: MacGraw-Hill.

Brög, W. (2000). Switching to public transport. Presented at the UITP Asia Pacific Congress, Melbourne, October 2000.

Brög, W., Erl, E., & Mense, N. (2002). Individualised Marketing. Changing Travel Behaviour for a better Environment. Paper presented at the OECD Workshop: Environmentally Sustainable Transport, Berlin, 05./06.12.2002.

Cairns, S., Davies, A., Newson, C., & Swiderska, C. (2002). Making travel plans work. Research report. Department for Transport, Local Government and the Regions (DTLR), London.

Cairns, S., Sloman, L., Newson, C., Anable, J., Kirkbride, A., & Goodwin, P. (2004). Smarter Choices - Changing the way we travel. London: Department for Transport.

Cairns, S., Sloman, L., Newson, C., Anable, J., Kirkbride, A., & Goodwin, P. (2008). Smarter Choices: Assessing the Potential to Achieve Traffic Reduction Using "Soft Measures". *Transport Reviews, 28 (5),* 593-618.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.

EU tapestry (2003). Viernheim Household Transport. Available at http://www.max-success.eu/tapestry/www.eu-tapestry.org/p_dwl/csr/csr_c6_germany.pdf [11/11/2008]

Ferguson, T. J., & Stegge, H. (1998). Measuring guilt in children. A rose by any other name has still thorns. In J. Bybee (Ed.), *Guilt and children* (pp. 19-74). San Diego, CA: Academic Press.

Fitz-Gibbon, C., & Morris, L. L. (1996). Theory-based evaluation*. Evaluation Practice, 17*, 177-184.

Fujii, S., Bamberg, S., Friman, M., and Gärling, T. (2009). Are effects of travel feedback programs correctly assessed? *Transportmetrica, 5,* 43-57.

Fujii, S., & Gärling. T. (2007). Role and acquisition of car-use habit. In T. Gärling & L. Steg (Eds.), *Threats from car traffic to the quality of urban life: Problems, causes, and solutions* (pp. 235- 250). Amsterdam: Elsevier.

Fujii, S., & Taniguchi, A. (2006). Determinants of the effectiveness of travel feedback programs - a review of communicative mobility management measures for changing travel behavior in Japan. *Transport Policy, 13*, 339-348.

Gärling, T., Eek, D., Loukopoulos, P., Fujii, S., Johansson-Stenman, O., Kitamura, R., Pendyala, R., & Vilhelmson, B. (2002). A conceptual analysis of the impact of travel demand management on private car use. *Transport Policy*, *9*, 59-70.

Gärling, T., & Fujii, S. (2002). Structural equation modeling of determinants of implementation intentions. *Scandinavian Journal of Psychology, 43,* 1-8.

Gärling, T., & Fujii, S. (2009). Travel behavior modification: Theories, methods, and programs. In R. Kitamura, T. Yoshii & T. Yamamoto (Eds.), *The expanding sphere of travel behaviour research* (pp. 97-128). London: Emerald.

Gärling, T., & Schuitema, G. (2007). Travel demand management targeting reduced private car use: Effectiveness, public acceptability and political feasibility. *Journal of Social Issues, 63(1)*, 139-153.

Gärling, T., & Steg, L. (Eds.) (2007). *Threats from car traffic to the quality of urban life: Problems, causes, and solutions*. Amsterdam: Elsevier.

Goldstein, N. J., & Cialdini, R. B. (2007). Using social norms as a lever of social influence. In A. R. Pratkanis (Ed.). *The science of social influence* (pp. 167-192). New York: Psychology Press.

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54*, 493–503.

Heaney, C. A., & Israel, B. A. (2002). Social networks and social support. In K. Glanz, F. M. Lewis and B. K. Rimer (Eds.), *Health behavior and health education: Theory, research and practice* (pp.185-209). San Francisco: Jossey-Bass.

Hendrickx, L., Vlek, C., & Oppewal, H. (1989). Relative importance of scenario information and frequency information in the judgement of risk. *Acta Psychologica, 72,* 463.

James, B., Brög, W., Erl, E., & Funke, S. (1999). Behaviour Change Sustainability from Individualised Marketing. *Papers of the Australasian Transport Research Forum, 23 (2)*, 549-562.

Jones, P., & Sloman, L. (2006). Encouraging behavioral change through marketing and management: What can be achieved? In K. W. Axhausen (Eds.), *Moving through nets: The physical and social dimensions of travel* (pp. XXX-XXX). Oxford: Elsevier.

Ker, I. (2003). Travel demand management: Public transport business case. Victoria: Contract Report RC5051 for Department of Infrastructure.

Kitamura, R., Fujii, S., & Pas, E. I. (1997) Time use data for travel demand analysis: Toward the next generation of transportation planning methodologies. *Transport Policy,* 4, 225-235.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist, 57*, 705 – 717.

Loukopoulos, P. (2007). A classification of travel demand management measures. In T. Gärling & L. Steg (Eds). *Threats from car traffic to the quality of urban life: Problems, causes, and solutions* (pp. 275-292). Amsterdam: Elsevier.

Marinelli, P., & Roth, M. (2002). TravelSmart suburbs Brisbane – A successful pilot of a voluntary travel behaviour change technique. Proceedings of the 25th Australasian Transport Research Forum, Canberra, October 2002.

Marlatt, G. A., & Gordon, J. R. (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York: Guilford Press.

McAlister, A. (1995). Behavioral journalism: Beyond the marketing model for health communication. *Journal of Health Promotion, 9*, 417-420.

Möser, G., & Bamberg, S. (2008). The effectiveness of soft transport policy measures: A critical assessment and meta-analysis of empirical evidence. *Journal of Environmental Psychology*, *28*, 10-26.

Pas, E. I. (1995). The urban transportation planning process. In: S. Hanson (Ed). *The Geography of Urban Transportation, 2nd edition,* 53-77. New York: The Guilford Press.

Prochaska, J. O., Redding, C. A., & Evers, K. E. (2002). The transtheoretical model and stages of change. In K. Glanz, C. E. Lewis and B. K. Rimer (Eds.*), Health behavior and health education: Theory, research, and practice* (pp. 99-120). San Francisco: Jossey-Bass.

Richter, J., Friman, M., & Gärling, T. (2009a). *Review of implementations of soft transport policy measures*. Manuscript submitted for publication.

Richter, J., Friman, M., & Gärling, T. (2009b). *Soft transport policy measures: Gaps of knowledge*. Manuscript submitted for publication.

Rose, G., & Ampt, E. (2001) Travel blending: An Australian travel awareness initiative, *Transportation Research D*, *6*, 9–110.

Schulz, P. W. (1998). Changing behavior with normative feedback interventions: A field Experiment on curbside recycling. *Basic and Applied Social Psychology, 21,* 25-36.

Schwartz, S. H. (1977). Normative influence on altruism. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 221-279). New York: Academic Press.

Taniguchi, A., Suzuki, H., & Fujii, S. (2006). A meta-analysis to evaluate an effectiveness of mobility management in Japan and comparison to the case of EU countries. CD-ROM of proceedings for European Transport Conference 2006, Strasbourg, France.

Taniguchi, A., Suzuki, H., & Fujii, S. (2007). Mobility management in Japan: Its development and meta-analysis of travel feedback programs, *Transportation Research Record*, *2021*, 100-117.

Taylor, M. (2007). Voluntary travel behavior change programs in Australia: The carrot rather than the stick in travel demand management. *International Journal of Sustainable Transportation, 1(3)*, 173-192.

Taylor, M., & Ampt, E. S. (2003). Travelling smarter down under: policies for voluntary travel behaviour change in Australia. *Transport Policy, 10*, 165–177.

Thøgersen, J. (2007). Social marketing of alternative transportation modes. In T. Gärling & L. Steg (Eds). *Threats from car traffic to the quality of urban life: Problems, causes, and solutions* (pp. 367-381). Amsterdam: Elsevier.

Wall, R. (2005). *Psychological and contextual influences on travel mode choice for commuting.* PhD thesis, Institute of Energy and Sustainable Development, De Montfort University.

Weiner, B. (1995). *Judgments of responsibility: A foundation for a theory of social conduct*. New York: Guilford Press.

Weiss, C. H. (1996). Excerpts from evaluation research: Methods of assessing program effectiveness. *Evaluation Practice, 17,* 173-175.

Vohs, K. D., & Baumeister, R. F. (2004). Understanding self-regulation: An introduction. In R. F. Baumeister & K. D. Vohs (Eds), *Handbook of Self-regulation: Research, Theory, and Applications* (pp. 1–9). New York: Guilford.

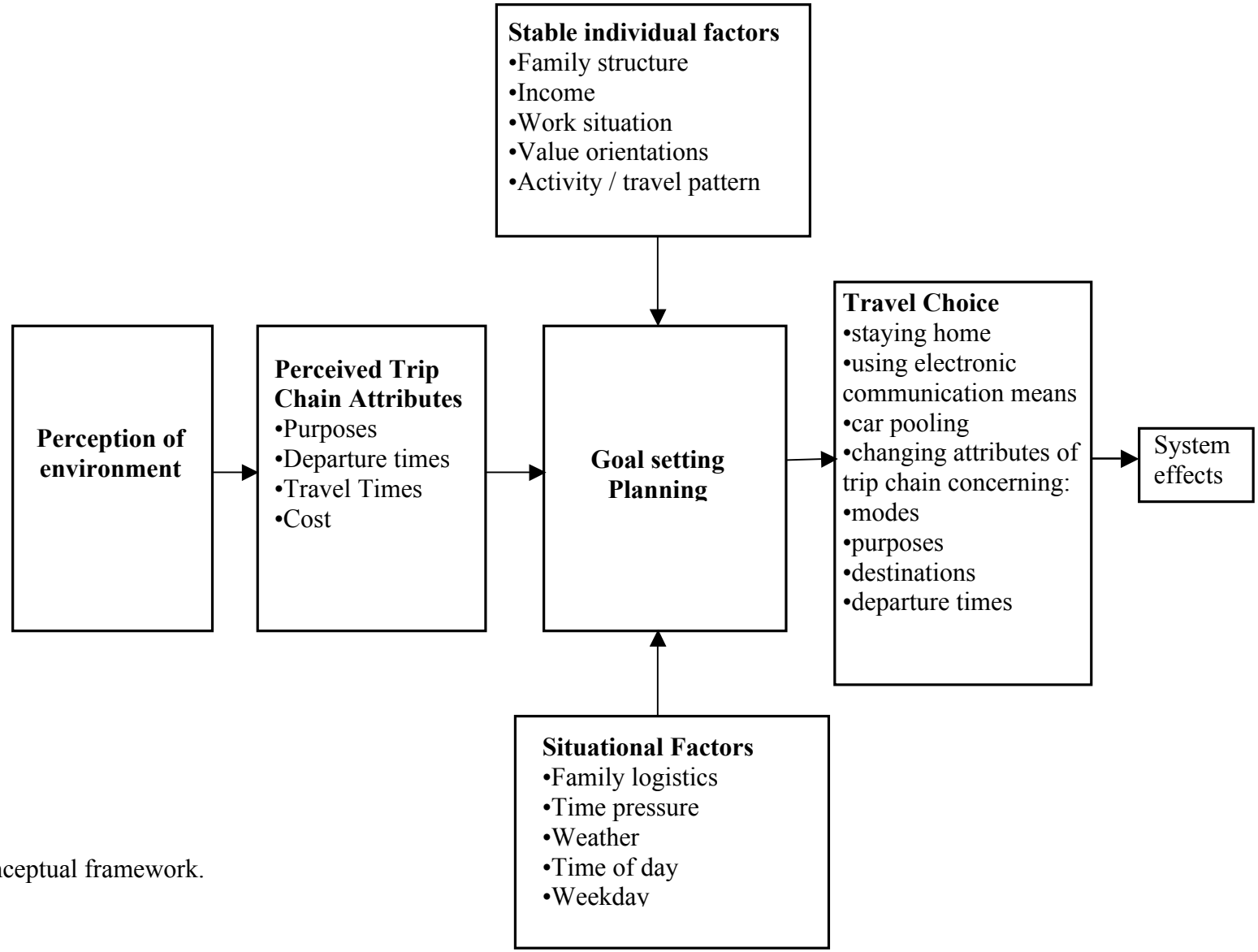

Figure 1. Conceptual framework.

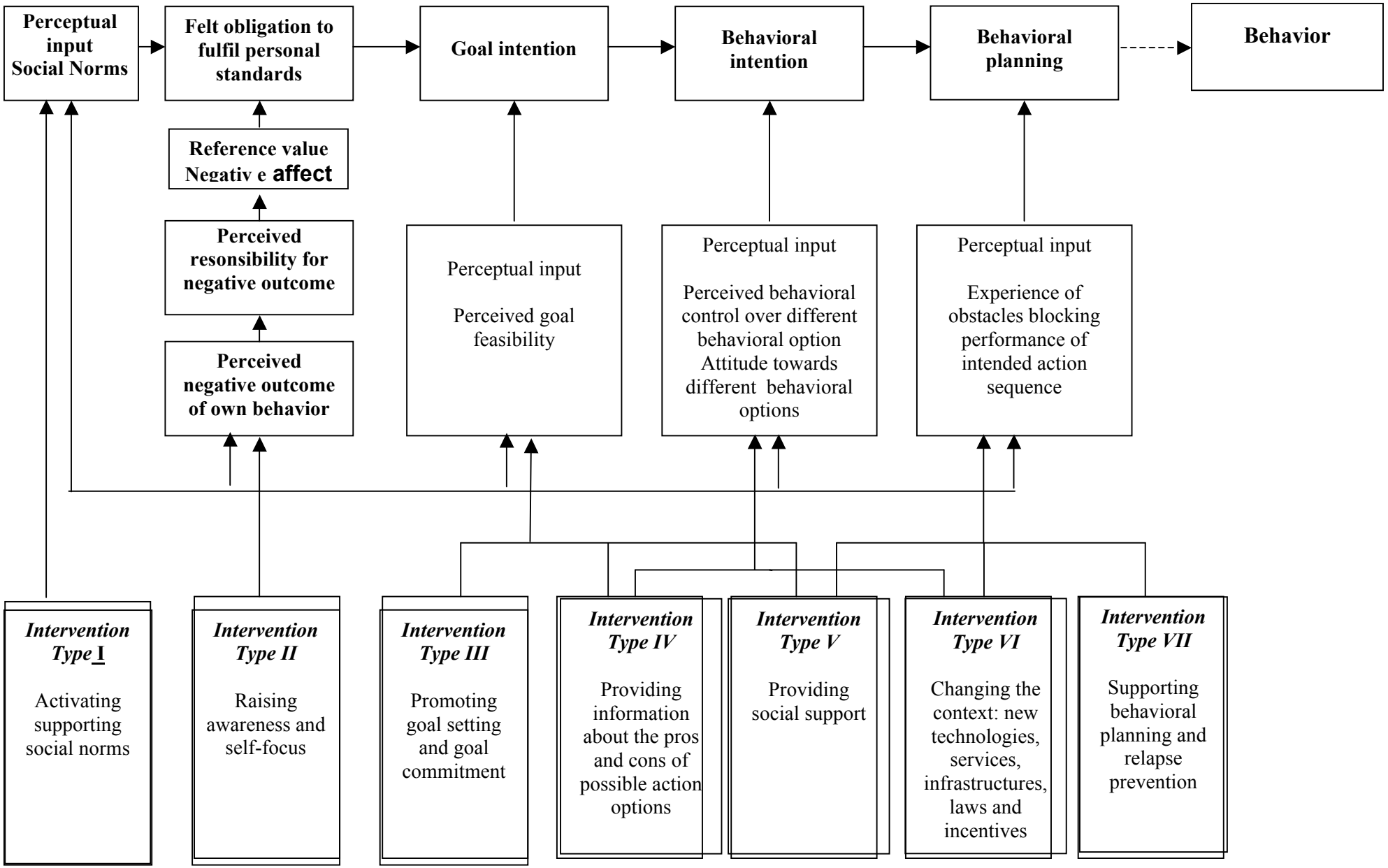

Figure 2. Intervention type related to process of behavioral change.