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CAN MOBILITY MANAGEMENT CAMPAIGNING CONTRIBUTE TO PRO-ENVIRONMENTAL BEHAVIOUR IN GENERAL? DEVELOPMENT OF AN ANALYTICAL TOOL

ABSTRACT

This paper brings to the fore the importance of a holistic approach to attaining a general pro-environmental behavioural change in order to reduce carbon emissions and the need to strive for a spillover of pro-environmental behaviour from one area to another. An adjusted version of the MaxSEM model is developed to capture differences in stages of behavioural change regarding environmental load on entering a Mobility Management campaign and one year after. The analytical tool is applied on two test samples in order to illustrate the tool and possible difficulties and methodological challenges. The test samples consist of participants in Mobility Management campaigns with personal incentives in two cities in Sweden. The application of the tool indicates e.g. that the timing of the survey is important and that there is need to upscale the MM-campaigns, in order to further discuss and analyse the effects of voluntary mobility measures in other domains.

KEYWORDS

attitudes; change of behaviour; MaxSEM; Mobility Management

1. INTRODUCTION

1.1 Background

The term Mobility Management (MM) (or Voluntary Travel Behaviour Change) is sometimes used to describe a variety of measures such as personal travel planning, travel awareness campaigns, workplace travel plans, school travel plans, and car-sharing schemes (Cairns et al. [1]). According to Möser and Bamberg [2], different types of personal travel planning and marketing programs for sustainable transport modes are the most frequent MM measures implemented during the last ten years. MM measures have been started in several countries, e.g. Japan, Australia, the UK, Austria,

and Sweden. Personal travel planning programs to provide individuals or households with carefully targeted and individualised information are often carried out in the same way, but referred to differently in various parts of the world, e.g. Travel Smart in Australia [3, 4], and Smarter Choices in the UK, [1, 5].

The effects of MM measures have mainly been evaluated in countries with long experience of using these measures, [6, 7]. The evaluations show that car journeys have been reduced, the use of other modes of transport has increased, and the amount of carbon dioxide emissions has been reduced. According to Cairns et al. [1], actions in the UK accounted for an average decrease of 4-5% in car use. Personal travel planning at workplaces resulted in a decrease of 10-30%, while personal travel planning within the household resulted in a reduction in the number of car trips by 7-15%.

However, there is also a debate among professionals and academics as to how much can be inferred from the published results. There are thus authors that take a thorough look into relevant issues in order to evaluate MM programs, [8, 9]. Bonsall [8] concludes that although the published results show a degree of consistency, serious questions remain about the reliability of the methods used to produce these results, and about the possibility of systematic bias.

1.2 Spillover

Even though one may argue about the impacts of MM projects, there is an increasing interest in these voluntary measures. One explanation is that, in addition to those benefits that are directly measurable, such as the reduced number of car trips, there may be other benefits as well. Based on theory and some empirical results, one may find claims that there are interrelated propensities to behave in an environment-

friendly way, so-called positive spillover. This means that one behavioural change (e.g. changing to a sustainable transport mode for one's commuting trips) may lead to the adoption of other related behaviours and/or adoption of more ambitious behaviours.

One striking argument that is rather straightforward is that if you have gained some knowledge or show willingness to seek information on environment-friendly behaviour within one domain, you will quite likely apply this within other areas, [10]. There may also be psychological reasons for this positive relationship across areas, [11, 12]. Bem [13] explains this through the Self-Perception Theory, which states that if an individual changes their behaviour to a more environmentally friendly one within one domain, e.g. commuting trips, the attitude formation theory predicts that the readiness to change within other areas increases, since that individual's attitudes and self-image are likely to change. Thøgersen and Ölander [14], for example, found evidence supporting the hypothesis that people who were engaged in recycling were more likely to have positive attitudes towards other environmentally friendly behaviours, and that this effect was independent of their attitudes towards recycling.

Another theory, which is often referred to in discussions of behavioural changes, is the cognitive dissonance theory originally proposed in Festinger [15] and discussed in [16, 17]. Cognitive dissonance arises when people feel it is inconsistent to behave in an environmentally responsible way in one area, while refraining from doing so in another area. This unpleasant feeling may give rise to a behavioural change to a more consistent behaviour. Still, there are discussions on whether this relationship is independent of the significance of the behavioural change. According to Thøgersen and Crompton [18], it seems like cognitive dissonance will be less likely to lead people from simple and painless steps to more environmentally significant and difficult behavioural change, since the cognitive dissonance involved in this case is not of a significant degree.

There are thus theories that speak in favour of a positive spillover, and at the same time there are arguments for an insignificant or even negative relationship. Some researchers emphasize the uniqueness of each pro-environmental behaviour [18], which indicates that it is unlikely for pro-environmental activities within one area to have any implications for the likelihood of acting pro-environmentally in other areas. Some researchers stress people's tendency to compartmentalise pro-environmental behaviour, so that making amends within one area justifies refraining from pro-environmental behaviour in other areas, or is a poor predictor of this behaviour [19, 20]. Bratt [21], for instance, found a positive relationship between car driving and people's acceptance of the claim that if you recycle your waste, your car driving is justified.

To summarise, the efficiency of approaches to creating positive spillover is highly contentious. The literature contains empirical studies that indicate a positive relationship across domains [10], or activities within the home environment [22, 23, 24], as well as studies that cannot find such a relationship, [25].

Nevertheless, the lessons learnt so far indicate that there are key aspects which may influence whether or not spillover occurs, that this knowledge may help in designing environmental measures, [18], and that efforts are being made to increase the application of environmental psychology in the promotion of environmental behavioural changes [26].

The point of departure of this paper is the importance of a holistic approach to attaining a general pro-environmental behavioural change in order to reduce carbon emissions. This means that we ought to strive for a spillover of pro-environmental behaviour from one area to another, which also means that the design of implemented measures should aim at maximising this spillover. Today, many voluntary environmentally friendly actions are based on personal benefits (like reduced travel time and travel costs) and not on environmental benefits [27]. According to Barr et al. [28], it is only when individuals are able to transfer their behaviour between contexts, as part of an embedded set of lifestyle practices, that it will be possible to argue that 'sustainable lifestyles' can and do exist.

1.3 Research focus

MM campaigns with incentives carried out in Sweden are generally small with a very limited number of participants per project. One may then argue that this type of project is too limited, especially when it comes to strong and vital reductions of carbon dioxide emissions. However, these types of informative and voluntary measures can influence individual behaviour through general environmental awareness, especially in connection with the impacts of various daily practices (spillover), and consequently play a key role for a holistic sustainable lifestyle. There is thus an interest to try to capture whether participation in an MM-campaign affects the behavioural change in terms of environmentally friendly actions, and whether the type of campaign people participate in affects their behavioural change.

So far and to the author's knowledge this type of research had not been carried out before.

This paper presents an analytical tool for analysing these types of behavioural changes. The analysis focuses on a potential spillover in sustainable behaviour, identified as a movement in the stage of behavioural change regarding reduction in individual environmental load. The analysis is carried out using an adjusted version of a model originally developed for studying behavioural changes regarding daily car use.

As an illustration, this analytical tool is applied on a small scale sample of MM-measures in Sweden. The test sample is individuals taking part in two types of MM-campaigns with personal incentives: Test Traveller projects focusing on public transports and Test Cyclist projects focusing on cycling. These projects aim to give individuals the incentives and motivation to exchange short commuting trips by car for more sustainable transport modes during a certain period e.g. a couple of months or a year. Results from the illustration are discussed and used as an indicator for methodological problems. The paper ends with a discussion on problems and possible improvements of the tool.

2. METHOD AND DATA

2.1 The Analytical Tool

An analytical tool focusing on environmental behaviour has been developed using the structure of MaxSEM (Max Self Regulation Model). MaxSEM, developed within MAX-SUCCESS [29], diagnoses individuals' modal choice decisions by focusing on their attitudes towards current and future car use [30, 31]. According to their responses to six statements indicating the most preferred one, and their answers to questions on travel behaviour, the respondents are defined as belonging to one of four stages in the process of changing from car use to more sustainable transport modes.

- *Pre-contemplation stage* where the desire arises to change behaviour recognised as problematic,
- *Contemplation stage* where people select and validate different behavioural alternatives,
- *Preparation/Action stage* where people initiate and execute the selected new behaviour,
- *Maintenance stage* where they validate the experiences with the new behaviour and decide whether to continue with this new behaviour or not.

This type of stepwise behavioural change analysis has been applied to various environmental behaviours [32, 33, 34]. In this paper, the stage allocation steps of MaxSEM are rephrased as behavioural transformation from a high to a low personal environmental load. In the adjusted model, five statements and stages are based on an early version of MaxSEM and contempo-

rarily with the MM-campaigns. Furthermore, the second statement in *Table 1* differs slightly from the original wording to reflect the stage in a better way.

The phrasing of the adjusted MaxSEM model was tested in a small pilot study focusing on the respondents' understanding of the various stages. Based on the pilot study, some small changes were made.

2.2 Outline of the test

The analytical tool is applied on two test samples with participants in MM-campaigns. As the tool is aimed at analysing pro-environmental changes due to participation in MM-campaigns, the tool is also applied to one reference sample of people not selected to participate in order to capture other changes in pro-environmental behaviour not connected to participation.

In the test of the tool, questions are also included concerning the changes in daily car use with a corresponding layout as the analytical tool, i.e. five stages of behavioural change using the earlier version of the MaxSEM questions. Hereby, correlations between pro-environmental changes and changes in daily car use can be analysed together with comparisons with other surveys using the MaxSEM questions. In this paper a large-scaled travel survey carried out in Malmö, a city close to the location for the MM-campaigns, is used as a second reference sample.

Test sample 1:

Test travellers and Test Cyclists in Helsingborg

The city of Helsingborg launched its first MM-campaign in autumn 2009, and the target group consisted of individuals employed by the City. Information about the project was distributed through a web-based travel survey that the City carried out during spring 2009. The aim of the travel survey was twofold: to analyse travel behaviour in general, and to single out a target group of commuters based on commuting habits, travel distance, and quality of the public transport connection. Those fulfilling the conditions automatically received an invitation to participate in a Test Traveller or a Test Cyclist project later on, and were asked to indicate their interest on the web form. Of the 975 who received an offer to participate as a Test Traveller

Table 1 - Statements used to analyse stages of behavioural change regarding environmental load

Question: For the next few years, what are your plans for your environmental behaviour in general, in addition to your everyday trips?	Stage allocation
I will not change my environmental load	Pre-contemplation
I am thinking about how I should reduce my environmental load	Contemplation
My goal is to reduce my environmental load	Preparation
I will reduce my environmental load and I already know how	Action
I will not change my environmental load since I have such a small impact	Maintenance

or a Test Cyclist, only 17% accepted. The participants signed a contract to commute by public transport four out of five days per week for one month. As an incentive, the Test Travellers were given a free monthly ticket. The Test Cyclists signed a contract to commute by bicycle four out of five days per week for one year. As an incentive, the Test Cyclists received various types of equipment e.g. rain gear, reflective vest, cycle computer and cycle helmet.

The Test Traveller project consisted of 41 participants and the Test Cyclist project of 15. A questionnaire containing the analytical tool was given to the participants at the very beginning of the project: to some as a web questionnaire and to some handed out at a project meeting (survey 1). A questionnaire was distributed soon after the campaign was over (survey 2).

Test sample 2: Test Cyclists in Lund

The analytical tool was also distributed to participants of an MM-camping launched during autumn 2009 in the city of Lund. Information about the project was distributed as information sheets at workplaces, information on the web page of the City and of course through participants in earlier projects.

Through a screening process of those who were interested, the actual participants were chosen based on their commuting behaviour and distance to work. Individuals already commuting by bicycle or public transport were thus excluded. The participants signed a contract and received various types of bike equipment. The Test Cyclist project in Lund consisted of 19 participants. A questionnaire was given to the participants at the very beginning of the project, to some by mail and handed out to some at a project meet-

ing (survey 1). A questionnaire was distributed in the same way as soon as the campaign was over (survey 2). In total (i.e. in Lund and Helsingborg) the number of Test Cyclists was 34.

Reference sample 1:

Not selected Test Cyclists in Lund

As mentioned earlier, there was a screening process of participants in the Test Cyclist project in Lund. Forty-five individuals were not accepted as participants because of their commuting behaviour. These individuals received a questionnaire by mail at the same time as survey 1 was distributed to those participating in the MM-campaigns. The questionnaire was identical to the questionnaire used for the MM-participants, facilitating comparisons between individuals who could be regarded as already having sustainable travel behaviour and those participating in the MM-campaigns.

Reference sample 2: Cycle and car commuters in Malmö

The municipality of Malmö carried out a travel survey of 13,300 inhabitants (18-75 years) in autumn 2008 [35] and contained questions regarding travel habits and attitudes towards transport. The survey also included an early version of the MaxSEM questions on stages of behavioural change regarding daily car use. Data from cycle commuters and car commuters in this survey are collected and used as reference sample.

2.3 Background data of samples

Statistics are presented in Table 2 for the Test samples, i.e. MM-participants and respondents in

Table 2 - Test Cyclists and Test Travellers

	Test Cyclist			Test Traveller		
	Participant	Survey 1	Survey2	Participant	Survey 1	Survey 2
Number	34	25 (73%)	15 (44%)	41	35 (85%)	14 (34%)
Gender:						
- Man	29%	24%	33%	17%	13%	14%
- Woman	71%	76%	67%	83%	88%	86%
Age	39	41		47	49	
Travel length	8 km	7,8 km		Na	Na	

Table 3 - Not-selected Test Cyclists and cycle and car commuters in the Malmö 2008 travel survey.

	Not selected Test Cyclist			Cycle Commuter	Car Commuter
	All	Survey 1	Survey 2		
Number	45	38 (84%)	33 (73%)	251	328
Gender:					
- Male	33%	37%	36%	49%	61%
- Female	67%	63%	64%	51%	39%
Age	na	31		39	40
Travel length	9 km	9.2 km		4 km	6.9 km

surveys 1 and 2. Twenty-seven participants (13 Test Cyclists and 14 Test Travellers) responded to survey 1 and 2, i.e. both in the beginning and after participation. Based on the background data the respondents showed good representativeness.

Table 3 contains statistics for the Reference samples; Not selected Test Cyclists and cycle and car commuters in the travel survey carried out in Malmö. Thirty-one Not selected Test Cyclists responded to survey 1 and 2. Based on the background data, there is good representativeness. The commuters from the Travel survey in Malmö have shorter travel distances compared both to not selected participants and MM-participants.

3. RESULTS

3.1 Stage of behavioural change in the beginning of participation

The stage of behavioural change regarding daily car use is analysed not only to find out where participants are in the behavioural change process when they enter an MM-project, but also to analyse the representativeness of these small samples through comparisons with the travel survey in Malmö.

The majority of the MM-participants are located, as expected, in the stages of preparation corresponding to their action of entering a travel behaviour change program, see *Figure 1*. Compared to the car commuters in the travel survey in Malmö, the participants are clearly more in an active phase, whereas the majority of car commuters in Malmö state that they will maintain their car use since they need to do so.

For the not selected Test Cyclists, i.e. those already commuting by bicycle in Lund, the result is quite different compared to the participants, see *Figure 2*. This indicates, as one might expect, that those who already limit their car use express the goal to maintain this habit. In addition, the answers from the not-selected Test Cyclists correspond to people commuting by cycle

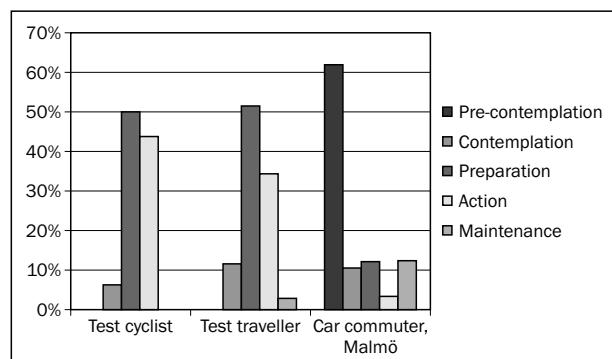


Figure 1 - Stage allocation for MM-participants and car commuters, Malmö travel survey 2008

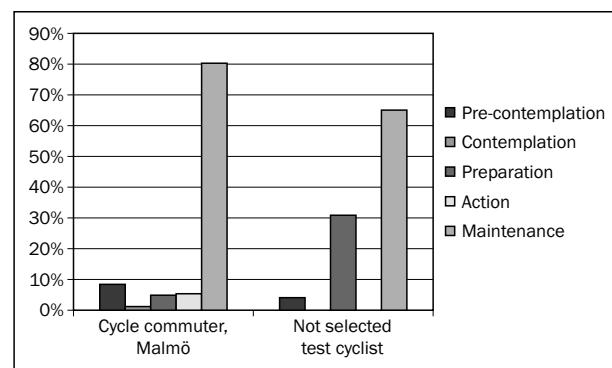


Figure 2 - Stage allocation for bicycle commuters, Malmö travel survey 2008 and not-selected Test Cyclists

in Malmö. The not-selected Test Cyclists also appear to belong to higher stages of behavioural change than the MM-participants. Using the Likelihood Ratio Test for small sample analysis, the not-selected Test Cyclist group is significantly different (5% level) from the group of MM-participants. In summary, the results indicate good representativeness of the studied groups of participants and people not selected in the screening process.

Analysing the stage of behavioural change regarding the environmental load, the majority of participants state that they are preparing to take action or are taking action to reduce the environmental load, see *Figure 3*. The answers from the not selected Test Cyclist group show a somewhat different pattern with more people stating that they are thinking of which action to take or preparing to take action. The differences are not significant though.

The analysis furthermore shows that there is a positive correlation (Pearson 0.4) between the stage of behavioural change regarding daily car use and environmental load for Test Travellers, a weak negative correlation (-0.2) for Test Cyclists and a positive correlation (Pearson 0.4) for the not-selected Test Cyclists. The indication is that the stage allocation for daily car use is not a strong predictor for the stage of behavioural change regarding environmental load.

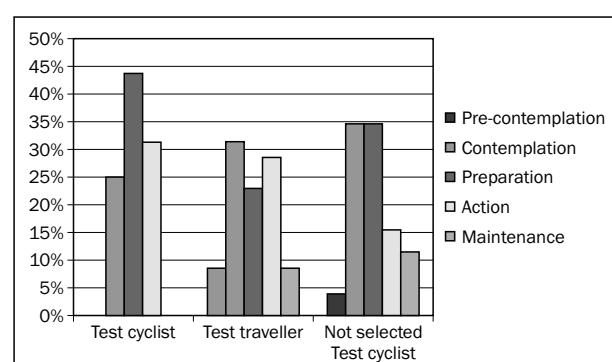


Figure 3 - Stage allocation based on behavioural change regarding personal environmental load for the coming years in addition to everyday travels

Table 4 - Movement in the stage of behavioural change regarding daily car use and environmental load

Goal to reduce:	Test Cyclist			Test Traveller			Not selected Test cyclist		
	Higher	Same	Lower	Higher	Same	Lower	Higher	Same	Lower
- daily car use	62%	15%	23%	64%	21%	14%	10%	60%	30%
- environmental load	23%	38%	38%	43%	29%	29%	34%	45%	21%
Correlation	Pearson: 0.2			Pearson: 0.4			Pearson: 0.2		

3.2 Movement in the stage of behavioural change after participation

Based on the statements regarding daily car trips and environmental load, the respondents are categorized into stages of behavioural change in the beginning of and after participation. A variable defined as the difference in the stage of behavioural change is computed, indicating movement to higher stage of behavioural change, unaltered stage of behavioural change or movement to lower stage of behavioural change.

The result, based on MaxSEM, indicates that the majority of the participants is classified as belonging to a higher stage of behavioural change regarding their daily car trips after participation, see *Table 4*. A paired t-test indicates a significant difference in the stage of behavioural change for the car use at the 5% level for all participants.

The analysis, based on MaxSEM questions modified for environmental load, shows that the majority of participants move to a higher stage of behavioural change or remain at the same stage after participation. Still, there is also a relatively high proportion of individuals who move to a lower stage of behavioural change regarding environmental load. A paired t-test does not show a significant difference for either group in the stage movement.

The Pearson correlations test shows a weak positive correlation between the movement in the stage of behavioural change regarding daily car use and environmental load for Test Cyclists, and a somewhat higher correlation for the group of Test Travellers.

4. FUTURE IMPROVEMENTS

Like most studies in environmental psychology and evaluation of mobility projects, the empirical analysis of this paper relies on self-reported information thus lacking relation between one's stage of behavioural change and actual behaviour. This might be seen as a problem since there are studies that have found a low correlation between self-reported and observed behaviour [36]. On the other hand there are also studies showing that self-reported data may reflect actual behaviour in a satisfactory way [37].

In order to fully test the analytical tool, but also the effects of mobility measures in general, we need

to apply different concepts to collect responses for instance using ICT solutions which objectively collect information on e.g. energy consumption and various purchases. When analysing travel behaviour, data could be collected e.g. by the use of GPS systems. However, so far the evaluation schemes of behavioural changes rely heavily on self-reported data. In the illustration the test presented in this paper is, though small scaled, in line with other studies on the effects of MM-campaigns, e.g. [9, 38]. The result indicates that there is a significant change in the stage of behavioural change regarding daily car use.

There are also problems regarding the timing of the first questionnaire since the questionnaires were distributed in conjunction with the start-up meetings of the campaigns, i.e. the participants were already preparing to take action for changes in travel behaviour.

It is possible that there already was a change in personal mindset when survey 1 was carried out (supported by the result indicating a higher degree of preparation and action than those not participating). This indicates that we should distribute the first questionnaire before the individuals participate in a project, possibly in the screening process prior to the campaign.

There may also be other explanations for the difference; people with sustainable travel behaviour may have already carried out actions in the past and are now thinking of/preparing for new actions. This could be controlled for by asking questions regarding prior actions for reducing environmental load. This could also be useful making the questions more concrete. Further work and test of the phrasing of the adjusted MaxSEM questions is thus needed.

The use of reference groups in the application of the tool supports the analysis. This is especially the case when analysing pro-environmental behavioural changes which can be influenced through a great variety of areas and measures in society. The use of reference groups should thus be designed carefully, possibly using samples from the screening process.

The tool should furthermore be applied to large data sets in order to gain statistical power. This affects the general planning and use of MM-campaigns with personal incentives which so far has been based on small-scaled projects. In order to analyse the effects of these measures more holistically there is need for a larger scaled application and possible involvements from other actors than today.

5. CONCLUSION

The aim of this paper is to present an analytical tool to further increase the understanding of a possible spillover effect from changed commuting behaviour to pro-environmental behaviour in general. The underlying assumption here is that there is need for a holistic view in order to achieve a universal sustainable behaviour. The type of MM-campaign analysed here is often used in Sweden, and an additional argument for carrying out such campaigns could be that they contribute to wider behavioural effects (within and beyond the transport domain) than the behavioural change that the measure is focusing on, in this case commuting trips.

This paper represents the first steps within an under-researched area. The application of the tool shows that there are some interesting areas and questions to cover but at the same time some methodological challenges to overcome. In order to investigate a spillover, we have e.g. identified the need to carry out the first survey (capturing the initial stage) before a campaign is announced. Furthermore, there is a problem (in common with other studies) regarding self-reported data which could be solved by the use of e.g. ICT. There should also be a further development and validation of the phrasing of the questions. But most importantly, in order to further discuss and analyse the effects of voluntary mobility measures into other domains, there is need to upscale the measures.

In this discussion one also has to discern between the effects achieved with the present design of the MM-campaign and the possible effects with another design more focused on environmental effects. The key characteristics of today, which disfavour a possible spillover effect, are e.g. lack of focus and feedback regarding the environmental effects. With an elucidation of the environmental effects, and with constant feedback after project completion, there is significantly larger potential for more widespread pro-environmental behaviour.

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ABSTRAKT

KAN MOBILITY MANAGEMENT KAMPAJNER BIDRA TILL ETT MER MILJÖVÄNLIGT BETEENDE GENERELLT? UTVECKLING AV ETT ANALYTISKT VERKTYG

Denna artikel utgår ifrån behovet av ett holistiskt synsätt för att uppnå en allmän beteendeförändring med avseende på minskad miljöbelastning, för att därigenom minska koldioxidutsläppen, samt behovet av att verka för

en spillover av miljövänligt beteende från ett område till ett annat. En justerad version av MaxSem modellen utvecklas för att fånga skillnader i stadier av beteendeförändring avseende miljöbelastning i början av ett deltagande i en Mobility Management kampanj och ett år efter. Analysverktyget appliceras på två testgrupper för att illustrera verktyget och eventuella svårigheter och metodologiska utmaningar. Testgrupporna utgör deltagare i Mobility Management-kampanjer med personliga incitament i två städer i Sverige. Tillämpningen av verktyget visar exempelvis på att tidpunkten för undersökningen är viktig och att det finns ett behov av att skala upp MM-kampanjerna för ytterligare diskutera och analysera eventuella effekter av ett deltagande i dessa frivilliga mobilitetsåtgärder på beteendet inom andra domäner.

NYCKELORD

attyder; beteendeförändring; MaxSEM; Mobility Management

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