Measure title: **Integration of Cycling with Public Transport**

City: **Malmo** *Project:* **SMILE** *Measure number:* **8.3**

A Introduction

With 410 km of bicycle lanes in 2009, an ambitious Bicycle Program, a climate and topography well suited for bicycle traffic, coupled with the fact that most residents (over 90%) in Malmö have a bicycle at their disposal, it is clear that Malmö is a leading European city when it comes to the infrastructure for and use of bicycles. Prior to SMILE more than 20% of all trips in Malmö were by bicycle and the figure for trips to and from work was higher.

The Malmö City government began promoting bicycles as an important mode of transport in 1996, when the Bicycle Program was first published. The main focus in the Program is on the construction and expansion of a complex network of straight and safe bicycle lanes, secure and centrally located parking facilities and information activities and campaigns. Free bicycle maps have been available since 1965. Beginning in 1995 these maps have been updated more frequently and recently have become available on the Internet.

Historically in many cities efforts to promote cycling have focused narrowly on just cycling and cycle infrastructure. This measure was originally intended to focus on the connections between cycling and public transportation with the idea that promotion of cycling in conjunction with public transportation would lead to both more cycling and more patronage of bus and train services. Construction of the City Railway Tunnel has started, and it will be finished and commence operations in approximately December 2010. This underground railway links the central station with the Öresund Bridge via central locations in Malmö. Originally measure 8.3 was seen as a way to better prepare the city for use of the City Railway Tunnel vis-à-vis cycling.

While in the original project description the emphasis was on better integration of cycling and public transport - at the Central Station and the Södervärn nodes in the network - changing circumstances intervened. The construction of the City Railway Tunnel itself as well as decisions independent of SMILE to renovate and change the Central Station complex in conjunction with the City Railway Tunnel have led to significant changes in the emphasis and actual execution of this measure. In this report the primary focus will be on what has actually been achieved in this measure within the context of SMILE. With the necessity of changes in this measure, many of the original objectives and tasks remained but the orientation and weight placed on the objectives and tasks changed.

A1 Objectives

The original measure objectives were:

- **Objective 1:** The establishment of two high security bicycle parking facilities located at the Central Station and at Södervärn. These facilities should also provide some kind of bicycle service (perhaps purchasing of bicycle helmets, free air for tires, etc.
- **Objective 2:** To improve cyclists' safety and convenience as well as reduce cycling times through the use of cycle radar at about 20 intersections with street traffic.
- **Objective 3**: To develop an existing bicycle lane into a demonstration bicycle lane to see the effects of improved safety, lighting, signs, weather protection, information, etc.
- **Objective 4:** To produce information materials concerning safe cycling and the health effects of cycling.
- **Objective 5:** To introduce campaigns to promote cycling.

Not all of these original objectives were possible to realise during SMILE. In a report about the measure written by the measure leader in February 2009 the following objectives were stated instead. Comments appear in italic.

- **Objective 2009-A:** To implement new solutions for improving safety and comfort at crossroads [sic] intersections. *This incorporates the original objective 2*.
- **Objective 2009-B:** To improve safety, security and comfort on two selected [sic] bicycle lanes. *This incorporates the original objective 3.*
- **Objective 2009-C:** To produce a 3d-demonstration of a high security parking facility for bicycles. *This replaces the original objective 1.*
- **Objective 2009-D**: To produce information materials concerning safe cycling and the health effects of cycling. *This corresponds with the original objective 4.*
- **Objective 2009-E**: To introduce campaigns to promote cycling. *This corresponds with the original objective 5.*

The original objectives were subject to change at various points during SMILE. Some of these objectives are formulated in ways that are difficult to evaluate. The actual tasks undertaken to fulfil the intentions behind the objectives are frequently of greater interest. To reduce confusion, the original objectives will be retained in the evaluation.

Through all these objectives the intention has been that cycling should take shares from the other transportation modes and increase by 3% during the duration of SMILE. This later "objective" was not **explicitly** stated in the original documentation about the measure and during the initial implementation stages. For this reason, because of not being formally stated as being an objective, it is not included in the list (original or later) objectives but is instead mentioned here as a target to be reached through all of the five objectives. This target will, however, appear later in the evaluation report.

A2 Description

Originally four tasks were included in the description of this measure. The task numbers have been retained here to facilitate the reader's comparison with the original description. Task 1, which was not completed as originally intended, is briefly described in a footnote[1], below.

The replacement for Task 1
was a "manual" and "conceptual design study" for how to make high-quality bicycle parking facilities located near public transit nodes. This study was carried out and resulted in a manual which, it is claimed, will help inform the process of establishing three such facilities at the three train stations that are included in the City Tunnel line that will open during late 2010. The city car parking company has also received copies. Since this manual would not be used until after SMILE, it has not been evaluated during SMILE.

[1] Task 1 originally involved the construction of two bicycle garage facilities, originally planned for at the Central station and at the Södervärn regional and urban bus terminal/transfer point. Construction of the City Tunnel line connecting the Central Station with the rail line coming from the Öresund Bridge to Denmark involved so much work in and around the Central Station that no suitable available space could be found for the parking facility that would be left intact during the duration of SMILE. At Södervärn after closer inspection it proved difficult to find a location that would work.

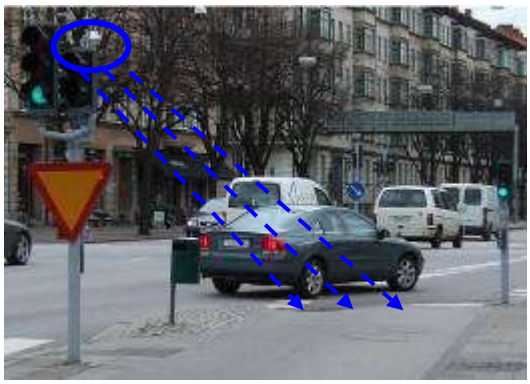
Task 2 Bicycle detectors
The majority of traffic lights in Malmö are equipped with buttons which cyclists and pedestrians may push to get a green light. Prior to SMILE cyclists were forced to stop and get very close to car traffic in order to press the buttons, which was inconvenient and in some cases exposed the cyclist to potentially dangerous situations. Prior to SMILE some intersections with buttons had been combined with sensors under the road so that the traffic light system was alerted to the arrival of cyclists. This solution is very expensive and an alternative would be to install radar detection at the busiest intersections. During SMILE a system of bicycle radar has been tested, demonstrated, and used at 20 intense high-risk intersections in the city of Malmö.

A picture of a detector appears below. The original detailed measure plan for this measure only states that the radar would be "used" but no mention is made of **how** the radar would be used and in what ways it would influence traffic. It would appear that there have been deviations made from the implicit idea that the detectors would be operating all the time and influencing bicyclist and motorist waiting times, via the traffic lights. A more in-depth description of the bicycle radar and its use appears in sections B4 and C2.4

Task 3 Demonstration bicycle lane
Two existing cycle lanes on busy cycle routes have been further developed into demonstration cycle lanes. These lanes were then evaluated in terms of safety, security, lighting, signs, comfort, facilities to pump up bicycle tyres, etc. Both of the existing lanes run close to or through one of the public transportation nodes to emphasis the connections with public transport in the original project description. A description about what was actually done appears under section B4. While not a deviation *per se*, since neither the exact location of the lanes nor their "qualities" as demonstration lanes was decided prior to SMILE, the description of the realisation of this measure is included under deviations.

Task 4 Information and marketing activities
Information materials were created for and campaigns were carried out during the project. These include material concerning safe cycling and the health effects of cycling. Marketing of cycling was also carried out through campaigns where the information materials and alternative marketing techniques were used. Thematic bicycle maps (culture tour, nature tour etc.) were produced in Swedish and English and then distributed free of charge. Through these activities the City of Malmö promoted cycling as a serious mode of transport. Two bicycle barometers were installed on two busy bicycle routes. A bicycle "barometer" is an intelligent bicycle measuring device that combines sensors and a display of bicycle traffic with the stated purpose of encouraging cycling. See the pictures below which show one barometer close up and at a distance.

The primary campaigns, exhibitions etc were called "Status cykel" which has held during 2006, "Inga löjliga cyklar" which has held during 2007 and 2008, and "Cyklar" held 2007 at Form-Design Centre in Malmö and then repeated 2008 in Stockholm at the "Swedish Design" exhibition. The content and execution of the most central information and behaviour changing campaign "Inga löjliga cyklar" appears under section B4.



Picture 1: Bicycle "radar" detector, mounted on traffic light pole, sensing arriving cyclists along bicycle lane. Prior to the start of SMILE, the application submitted to CIVITAS claimed that use of this kind of detector on such a wide scale would be unique to Malmö.

Pictures 2A and 2B: One of the two bicycle "barometers" in Malmö. Sensors are located under bicycle lane. Barometer displays number of cyclists that have passed on that day (1633 so far on this day) and in "bars" indicates monthly and yearly totals to date. There are two displays on opposite sides of the barometer so that cyclists, pedestrians and motorists can see from either direction.

B Measure implementation

B1 Innovative aspects

Innovative Aspects:

- New soft measure solutions – The City of Malmö, despite its Bicycle Program, has never had a consistent and coherent marketing and campaign strategy to promote bicycle usage. Previous work has tended to be piecemeal and carried out in isolation from other transportation activities. This measure has developed and tested such marketing and campaign strategies that can be easily repeated on a yearly basis so that general awareness of these campaigns and marketing will hopefully increase.

- **New physical infrastructure solutions** – Good bicycle conditions are crucial to succeed to get car drivers to choose bicycles instead. To support the combination of bicycle and public transport it is important to reach a fully intermodal transport system. Bicycle radar detection in crossroads has not been tested before. The demonstration bicycle lane was expected to have important demonstration values.

B2 Situation before CIVITAS

In 2003 about 20% of all trips were made by bicycle in Malmö. The existing bicycle network before SMILE was 390 km long. Bicycle lanes either ran parallel with a busy street or though park/green areas. Lighting along most bicycle lanes was based on a standard concept which was seldom adapted to more local conditions. Services along cycle lanes, such as air pumps and overview maps of the network, did not exist. Cyclists complained about the poor posting of signs and resultant confusion along cycle lanes that cyclists were not familiar with. Integration between cycling and public transportation nodes, with the exception of some bicycle parking at the Central Station, was poor or non-existent.

B3 Actual implementation of the measure

The various parts of the measure were implemented in parallel. An approximate chronology which follows the implementation of key parts of the measure follows below.

Stage 1: Planning and removal of task 1 *(Feb 05- Jan 06) – During this phase communication was necessary with measure leaders in 12.2 and 12.7 in order to not have traffic signal conflicts between bicycle priorities and bus priorities. During this stage it became clear that it would prove more difficult to realize the high security parking facilities and most of the other parts of Task 1 that linked to public transportation nodes in Malmö. Work on renovation of the Central Station was announced and became known to the measure leader which made it next to impossible to establish such a facility there until after SMILE. The first bicycle barometer was installed.*

Stage 2: Some detectors installed, planning for execution of task 4 *(Feb 06 – Jan 07) During this stage the first six detectors were installed. Plans were started for task 4 and the beginning of the realization of task 4 commenced. Discussions about which two bicycle lanes could be candidates for becoming demo lanes were started. The second bicycle barometer was installed.*

Stage 3: Marketing materials and campaigns, more detectors installed *(Feb 07 – Jan 08) More work on marketing materials and campaigns. During the spring of 2007 a major campaign "Inga löjliga bilresor" which attempts to pull car drivers onto bicycles was launched and has had repetitive follow-ups during the fall of 2007 and beyond. Nineteen additional detectors were installed and put into use.*

Stage 4: Demonstration lanes, further campaigns, a few more detectors installed *(Feb08 – Jan 09) Work on the demo lanes commenced during this final stage. Inga löjliga bilresor returned during the Spring of 2008. Two additional intersections received detectors. Some intersections with detectors in only one direction received an additional detector for cyclists moving in the opposite direction.*

Maps of the location of the various parts in this measure appear in section C of this report.

With regard to the choice of the locations of the two demonstration lanes: this process has not been entirely transparent to the evaluator but the idea has been to choose lanes with high volumes of cyclists and lanes that cross or are close to major public transit nodes. For the Heleneholmstigen a tunnel and adjacent locations along the bicycle lane were a problem and for Universitetsstråket the Fersen Bridge was clearly an important part of the decision making criteria. See B4 for more discussion about the Fersen Bridge and Map 5 for the locations of the demonstration lanes.

B4 Deviations from the original plan

The principle deviations from the original plan comprised:

- **Change in infrastructure provision**

  The two high security parking facilities were not built within the CIVITAS-SMILE timeframe. The work on the tunnel for the railway (City Tunnel Railway) with two new stations in Malmö and the expansion of the original Central Station has made the timeframe for the high security parking facilities too narrow to realise within the SMILE framework. An implementation at this stage would have meant that no long lasting gains would come from their construction. Firstly several alternative parking scenarios were drafted and presented to decision-makers but these scenarios were rejected. Secondly an up-scaling of other objectives (demonstration lanes, bicycle promotion campaigns, and bicycle radar) was proposed as well as a bonus addition of a 3D-model of a state-of-the-art parking facility that shows the latest development in this area, particularly in terms of inter-modality. This model has been presented to the public in various places and can be

used as a model when the construction of the City Tunnel Railway is over and construction of bicycle parking facilities begin.

- **Shift in emphasis toward tasks 3 and 4**

  This has been described in previous parts of this report and will not be repeated here.

- **Bicycle radar usage**

  In the original detailed measure plan for this measure it is stated that bicycle radar will be put into place and used. There is no explicit statement of how the radar will be used and what kind of priority cyclists will receive because of this sub-measure at the various crossings. The bicycle radar detectors were to be installed at intersections so that cyclists would not have to push a button and wait for green but instead the radar/sensor would note increasing numbers of cyclists arriving and switch to green for cyclists (and pedestrians) at various crossings. The implicit assumption made by many who read the description was that the radar would be working and helping to decrease cyclists' waiting times every hour and on a daily basis. However, in actual practice, the radar detectors are either "off" or do not influence the traffic signals during peak travel hours since this would disrupt car traffic too much. Therefore the implicit intention that installation of radar would lead to significant time reductions for cyclists is lost since the measure has not been implemented in such a way that cyclists get maximum benefit. Instead it would appear that cars still receive top priority during rush hour, which is when the greatest potential for bicycle travel time savings could be realised. Whether this is a deviation form the original plan or not can be a subject of discussion. However, it would appear that readers of the application for funding have assumed that the radar would be able to reduce cycling times 24 seven, but that in practice the Department of Streets and Parks has been reluctant to let the full effects of this measure lead to reduced bicycle waiting times and increased car waiting times.

- **Demonstration lanes**

  Depending on the existing conditions of these lanes and perceived problems with the lanes, improvements or modifications of these lanes could include: improved or enhanced lighting designed for cyclists based on the conditions (tunnel, vegetation), provision of air pump service, better signs, new cycle lane asphalt surface etc.

  Selection of which bicycle lanes to be changed into demonstration lanes was based on the following methodology:

  1. Located by or servicing public transportation nodes (since this measure concerns interlinkages between public transportation and cycling) Södervärn (urban and regional buses), the future "Trianglen" station which lies along the underground CityTunnel rail route which will be inaugurated during late 2010, Gustaf Adolfs torg (urban buses)
  2. High-volume lanes with many cyclists.

  Using these criteria, during SMILE it became apparent that one of the demonstration lanes would also include one of the main bicycle bottlenecks in the centre of Malmö, Fersens Bridge, which was – prior to SMILE – a two lane bridge with narrow pedestrian walkways on each side. Cyclists were either forced into traffic or rode on the walkways which caused incidents for pedestrians, motorists and cyclists. During SMILE the Bridge was widened and high-quality demonstration features were placed on or near the bridge. After SMILE the Bridge part of the demonstration lane has separate bicycle lanes in both directions and wider pedestrian walkways. This improved safety for all modes of transportation along the bridge. While a much needed improvement with benefits for the entire bicycle network in the City of Malmö, one must question to what extent the widening of the bridge is part of the purpose of demonstration or not, even if there were clear linkages between the goals of widening the bridge and the establishment of the demonstration lane in terms of increased safety.

- **Inga löjliga bilresor**

  This was the major behaviour change campaign in 8.3 and sought to make motorists consider cycling as an alternative. The majority of car trips in Malmö are – as one of the campaign messages claimed "ridiculously short" – suitable to be replaced by bicycle trips. While not a deviation *per se*, the exact formulation, design and execution of this campaign was not envisioned on paper prior to the start of SMILE and campaigns were not a large part of this measure's budget. Since this campaign received a lot more emphasis and funding compared with the original planning documents, this can be seen as a deviation.

  During this campaign, staff members and students from among others Malmö University participated in numerous activities. Such activities included riding in traffic with signs on the front and back saying "This is a motorist on a bike" and this in traffic situations where cyclists often could have a faster average speed while motorists were stuck in line. Advertisements on billboards, demonstration of bicycling in very public places where motorists could not help but see the campaigns, etc were included in this major campaign.

- **Locations of the bicycle barometers**

  Decisions about the locations for the bicycle barometers were based on locations with high volumes of bicycle traffic which would also be visible by others in traffic. The one near Södervärn is close to a major regional and city bus station, close to an entrance to one of the city blocks where the main hospital (UMAS) is located as well as being located along side an intersection. The one close to Captain's Bridge (Kaptensbron) can be seen by motorists exiting and entering one of the larger parking garages in the centre of the city.

B5 Inter-relationships with other measures

The measure is related to other measures as follows:

- **Measures 12.2 (Traffic Monitoring in Malmo) and 12.7 (Bus priority system in Malmo)** – The traffic signal measures in 12.2 and 12.7 are related to the 8.3 Sub-measure concerning bicycle detector radar at 20 intersections.

- **Measures 8.1 (marketing of new bus routes) &, 8.2 (improved security & safety on buses)** – these are all part of the new bus routes and the goal of a 10% increase in journeys is a result of all these measures working together. The goal of the new bus routes is to make the network simple to understand and reduce the amount of time that travellers have to wait for a bus. Since task 1 of 8.3 will not be realised during the course of SMILE the interrelationship with 8.1 and 8.2 is rather weak at this time.

- **Measure 11.1 (Mobility Management**) – those parts of 11.1 that are the responsibility of the Department of Streets and Parks have connections with the "softer" parts of 8.3. Since 11.1 involves information materials and campaigns to shift drivers from exclusive use of cars to a plurality approach, the pull towards bicycles from cars in 8.3 is clearly related.

- **Measure 12.4 (Internet tool for traffic planning)** – this is a measure to include cycling as a trip planning option on, among others, Skånetrafiken's web-based trip planner.

C Evaluation – methodology and results

C1 Measurement methodology

Introduction: This measure has had significant changes from the original description both in terms of actual implementation and chronological implementation. Furthermore, the multitude of various activities in task 4 - as mentioned in section A2 - has forced the evaluators to place some parts of task 4 outside the scope of the technical evaluation.

Data collection summary: For the softer parts of the measure (primarily task 4) during the spring of 2008 inhabitants in the city were polled in a questionnaire and/or cyclists at three locations along two major bicycle lanes (which also were those lanes which have been transformed into demonstration lanes) were briefly interviewed. A telephone survey was conducted during 2007 shortly after the first part of one of the major campaigns "Inga löjliga bilresor" was conducted. For task 2 bicycle delay/wait times at intersections with bicycle radar were determined on several occasions and "test runs" along a 1.5 km route past more than one radar detector were undertaken. For task 3 cyclists at three points along the demo lanes were briefly interviewed. The previously mentioned questionnaire also contained questions about demo lanes and cycling in general. Finally, in the polling of Malmö residents of several parts of SMILE conducted during April/May 2008 a number of questions were asked about parts of 8.3

The goals of the evaluation were as follows:

- For task two: To determine reduction in cycling time
- For task three: To determine awareness/acceptance of features in the demo lanes
- For task four: To determine awareness/acceptance and impact of the bicycle promotion campaigns
- For all tasks: To poll the general public about awareness/acceptance of the activities and determine cycling habits in relation to other transport behaviour. This latter effort was an attempt to gauge changes in cycling pre-SMILE versus after much of the 8.3 measure was carried out.

The bicycle barometers were left outside of the scope of the evaluation, as were all the smaller bicycle promotion campaigns and information materials in the form of maps, helmet use promotion etc. It was only the main promotion campaign - Inga löjliga bilresor - that was subject to evaluation. Finally, as mentioned previously, an evaluation of the model/manual for constructing parking facilities for bicycles was left outside the evaluation since no effects would arise until after SMILE.

C1.1 Impacts and Indicators

The following table of indicators differs from the original evaluation plan because of changes in the implementation of the measure (example elimination of task 1) and better understanding of the remaining parts of the measure as the measure evolved and shifted emphasis.

Table 1: List of indicators

Nr. or relates to GUARD nr	INDICATOR Name	DESCRIPTION	DATA /UNITS
	Revenue/income	Revenues or incomes from this measure	SEK
	Cost	Costs for the implementation of this measure	SEK
MSE-14 14/19	Reduction in cycling time	How much time is saved on bicycle trips before/after SMILE actions	Estimated time and/or clocked time
MSE-15 14/19	Comfort/experience while cycling	How bicycling comfort changes because of demonstration lanes	Qualitative, survey
	Awareness		
	Acceptance		
MSE-17 27	Modal shift to cyclists	Number of trips by bicycle as result of measures in 8.3	Increase in the number of counted cyclists compared to changes in other transport trends

A detailed description of the indicator methodologies appears under C1.4.

C1.2 Establishing a baseline

Since there are several different tasks in the measure, different kinds of baselines have to be established for each task and not just one baseline for the entire measure.

For task two the baseline was established by turning off the radar detectors and timing cyclists' delay or stop time at relevant intersections. When the detectors are off the bicyclists are faced with the same situation as before SMILE started.

For task three the baseline would be how cyclists experience the bicycle lane prior to reconstruction and improvement into the demonstration lane. This proved very problematic, since the location and timetable for the demo lanes changed at least once during the duration of SMILE, and some of the work on the demonstration lanes was not complete when the first draft of this report was submitted. (August 2008).

For task four the baseline could be about awareness and acceptance of cycling before CIVITAS and after the campaigns. However, ideally this should be for each individual campaign to be able to better gauge the effects.

Prior to SMILE, in the Autumn of 2003, a travel survey was conducted among over three thousands residents in the City of Malmö. This survey suggested that 20% of all trips taken in Malmö were by bicycle. While this figure, 20%, can be considered a baseline figure, not all changes in the modal shift can be attributed to measure 8.3.

C1.3 Building the business-as-usual scenario

The business-as-usual would be if no cycle radar was installed, no demonstration lanes were planned and renovated/improved and if the previous kinds of bicycle promotion were carried out. For task two the business-as-usual scenario would be that no radar detectors were installed: that means that the situation is the same as the baseline.

In parallel with the SMILE measures a number of other activities have occurred which have to be factored into an understanding of the business-as-usual. During the latter half of 2007 and into 2008 bicycle sales grew significantly in many urban areas in Sweden which suggests a general increase in interest in cycling in the country. Bicycle merchants complained of running out of new bicycles to sell. This increase in interest could be the result of higher fuel prices, a general climate debate in society or other factors. Since this interest in cycling appears to have occurred in many places in Sweden, this might be considered to be a part of business-as-usual. However, there are no quantitative figures that can be used to back-up these statements.

Prior to SMILE there were approximately 390 km of bicycle lanes in Malmö. At the start of 2009, post-SMILE, the network of bicycle lanes had grown to approximately 410 km in measures undertaken outside of SMILE. While the increase in the network may have had some impact on encouraging cycling in general, it is likely that the increase in total km of bicycle lanes reflects growth in the city – i.e. new buildings and neighbourhoods – and new bicycle lanes in peripheral locations and not extension of the network in more central locations. Therefore while a more extensive network surely adds to the potential for more cycling, in this case it is most likely that specific locations have benefited from the expanded network and not cyclists and potential cyclists as a whole.

C1.4 Detailed description of methodology and data collection

A further and rather thorough description of the methodology and data collection follows below. It is possible, however, to skip to section C2 Measure Results directly if desired and then later return to the appropriate sections of C1.4 to better understand how the Measure Results were obtained.

C1.4a Methodology and Data Collection for Task 2: Bicycle Radar Detectors

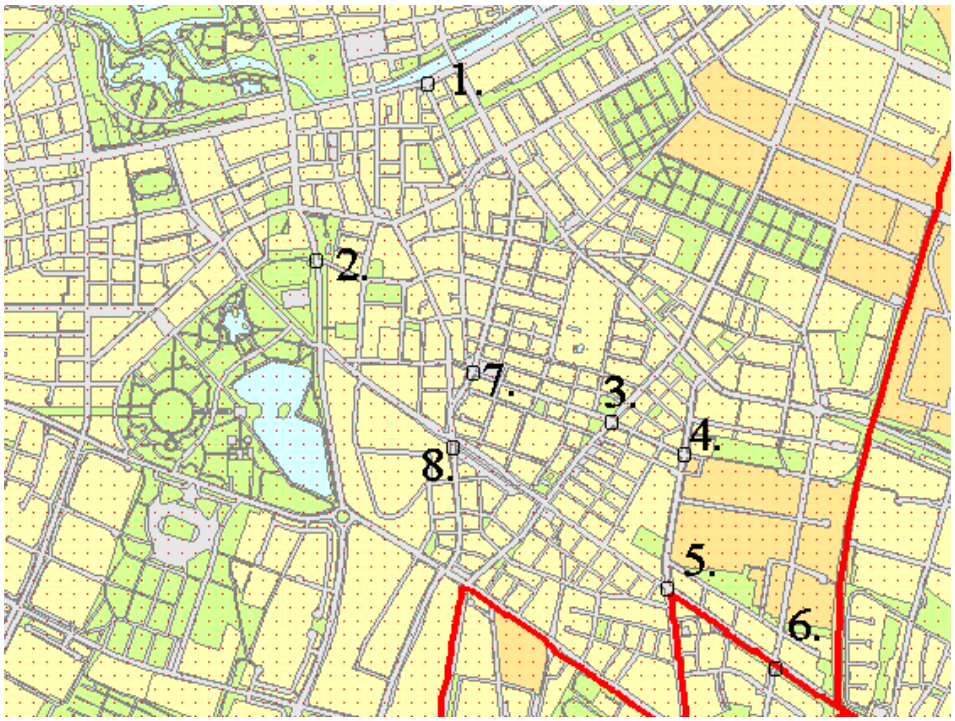
The methodology for determining the effects of bicycle radar detectors was of two kinds.

A. Three intersections with bicycle radar detectors were studied to determine the amount of time cyclists were stopped for given periods when the detectors were steering the traffic signals and when they were not.
B. One approximately 1.5 km section of integrated bicycle lane was used in an attempt to determine the effects of passing through several detectors in a row.

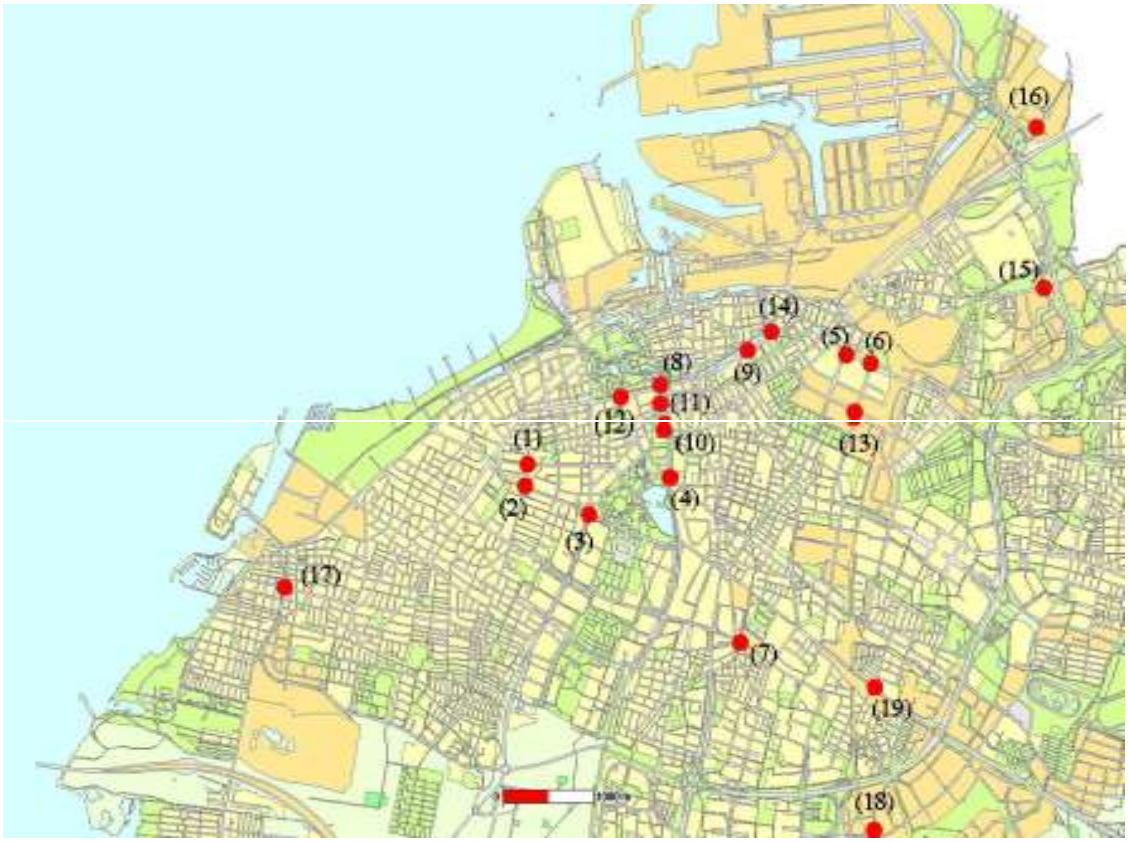
The baseline in Task 2 was created by temporarily turning off the bicycle radar detectors thus returning the situation to a pre-SMILE status. Bicycle stop times at intersections and the average speed along the integrated bicycle lane were compared between the simulated baseline and the situation during SMILE after the installation and use of the detectors.

A further description of the methodology and data collection follows below.

To get a better understanding of where the bicycle radar detectors were installed, see maps 1 and 2. Map 1 shows the proposed locations for the detectors installed first and map 2 the location of installations during the second stage. Only six of the eight proposed locations actually received detectors during the first round of detector installation. Note that the maps do not indicate how many detectors were installed at each intersection, as there could be one or two detectors installed per intersection. Places where bicycle detectors could not be installed without coming into conflict with the goals of 12.7 (bus priority) can be determined by referring to the report on that measure.



Map 1: Plans for the installation of Bicycle Radar Detectors during Stage 1 (2005). Note detectors 1-6 were installed during the first round of installation, but 7-8 were not because of potential bus priority conflicts. Intersections 1 and 2 were in a pre-study during 2006 and then later included in the full study in the spring of 2008.



Map 2: Plans for the installation of Bicycle Radar Detectors during Stage 2 (2006). Detector 14 was included in the full study in the spring of 2008. Furthermore, detectors 8, 11, 10 and 4 were passed by cyclists in "test runs" to measure effects of passing several detectors in a row along a bike lane.

The radar detectors affect cyclists differently: at Kaptensgatan/Drottninggatan (2006:1) the detectors affect southbound traffic, at Pildammsvägen/S:t Johannesvägen (2006:2) the detectors affect both eastbound and westbound traffic, at Exercisgatan/Drottinggatan (2007:14) the radar detector affects only northbound cycle traffic. Continuous observations were made during 17:30-19:30 followed by a pause and then continuous observations were made from 20:00-21:00 during various days in April and May 2008. Those observing the stop times for cyclists did not know when the detectors had been shut off to simulate/create a baseline and when the detectors were on. This lack of information was used to reduce the potential for bias. The intersections 2006:1 and 2006:2 were the object of a pre-study during 2006 to determine feasibility and the detectors were shut off for a time in a similar fashion.

Considerations of the choice of intersections to study involved several factors.

1. Intersections should not be far from the centre because of the likelihood of low bicycle traffic volumes and difficulties finding a result from such small volumes.
2. Intersections should reflect different traffic situations.
3. Centrally located intersections would be easier to staff for observations during extended periods.

Repeat use of 2006:1 and 2006:2 after the pre-study enabled comparison.

2006:1 is a crossing between a bicycle lane which continues through the intersection southward away from the original centre of the city. There is no road parallel to the bicycle lane. The bicycle detector is located on the north side of the crossing and reduces bicycle stop times for southbound traffic only. Bicycle traffic leaving the centre of the city during the afternoon/evening rush hour as well as the evening was observed and studied.

2006:2 is a crossing on the east side where the bicycle lane runs parallel with a street but on the west side the bicycle lane runs into a park and sports area with no car traffic. Both eastward and westward cyclists benefit from the detectors. Bicycle traffic both leaving and entering the centre of the city during the afternoon/evening rush hour as well as the evening was observed and studied.

2007:14 is a crossing with the bicycle lane running parallel with a street running north-south intersecting with another street running east west. The detector is located on the south side of the crossing and reduces bicycle stop times for northbound traffic only. This traffic runs into the city centre. Bicycle traffic entering the centre of the city during the afternoon/evening rush hour as well as the evening was observed and studied.

Depending on the number of observers and their experience varied amounts of information could be obtained. In the best cases at 2006:2 the following information was collected for each of the three one hour periods: the numbers of cars passing through the intersection, the number of bicyclists travelling eastward and the number travelling westward, the number of bicyclists stopped by the red light travelling eastward and the number of stopped travelling westward, the total amount of stop time for all bicycles in the two respective directions. At other times and at other intersections less information could be obtained either because of only one person carrying out all the observations or because of less experience and practice on the part of the participants.

The Pre-Study: Inspiration and Comparison

The 2006 pre-study was carried out on two April evenings using 2006:1 and 2006:2. The results of the pre-study in 2006 suggested that the bicycle detectors at 2006:2 when on between 19-19:30 lead to 60% of bicyclists being stopped whereas when the detectors where off during the same time but on a different day 65% of the bicyclists were stopped. The

average stop time for all bicyclists (total stop time divided by all cyclists) was 1.3 seconds longer when the detectors were off.

The results of the pre-study at 2006:1 were more pronounced: 43% of cyclists had to stop when the detectors were on whereas 59% of cyclists had to stop when the detectors were off. The average stop time for all bicyclists (total stop time divided by all cyclists) was 5.4 seconds longer when the detectors were off.

While the differences at 2006:2 seemed very marginal, the more pronounced differences at 2006:1 merited further study. Observations during the pre-study were limited to two 30 minute sessions at each crossing (on different days) which meant the possibility for error and chance circumstances on a given day influencing results. From the pre-study the idea arose to study the effect of cyclists passing through more than one detector crossing and not being as likely to be stopped at all when the detectors were on versus the likelihood of being stopped more than once when the detectors were off.

The Present Use of Cycle Radar Detectors and the Goal of the Main Study of Individual Intersections

During normal operations Monday-Friday the detectors start to influence their respective traffic signals starting at 19:00 (7pm) or at 20:00 (8pm) in the evening depending on traffic loads. By having observations divided into three time periods 17:30-18:30 with detectors always off, 18:30-19:30 detectors on for about half of the time and 20:00-21:00 detectors always on the idea was that it would be possible to observe fewer bicycles stopped at intersections and reduced bicycle stop times from one observation period to the next. Furthermore, when the baseline was simulated, the detectors were always off during each period. The baseline observations for 17:30-18:30 should be nearly identical, those during 18:30-19:30 should differ somewhat and those between 20:00-21:00 should be very different. The goal was to repeat the pre-study methodology on a much greater scale with three crossings observed at least once each in a baseline simulation (detectors off) and at least once each in the present operating mode. This methodological goal was easily achieved at all three crossings.

The Use of Passing Several Detectors in a Row as a Complementary Methodology

While a reduced percentage of stopped cyclists at intersections and a reduced wait time at the traffic signal for stopped cyclists is a goal of the measure, making observations at individual intersections is a very blunt tool to determine the results of task 2. Instead a more dynamic approach could perhaps be taken with cyclists passing through several detectors in a row over a longer distance so that the cumulative effects of fewer and shorter delays could be observed.

As can be seen in map 3 below, three detectors could be passed going southbound and one detector could be passed going northbound on this 1531 meter long bicycle lane. Three people cycled the lane some 50 times at various times on various dates during April and May 2008. The expectation was that northbound cyclists would have no difference in cycling times because of only passing one detector whereas some indication of the effects from the detectors on the travel speed of the southbound cyclists should be possible to identify.

To our surprise, it was difficult to find an effect stemming from the cycle radar detectors using this methodology. Clearly a variety of factors may have influenced the results such as: weather, cyclist fatigue after numerous trips back and forth on the same route and same day, variations in vehicle traffic affecting the traffic signals, etc. The results are reported under C2.4 Transport.

0. This detector influences southbound only and was not affected by the test runs.
1. This detector influences southbound.
2A. This detector influences southbound.
2B. This detector influences northbound.
3. This detector influences southbound.

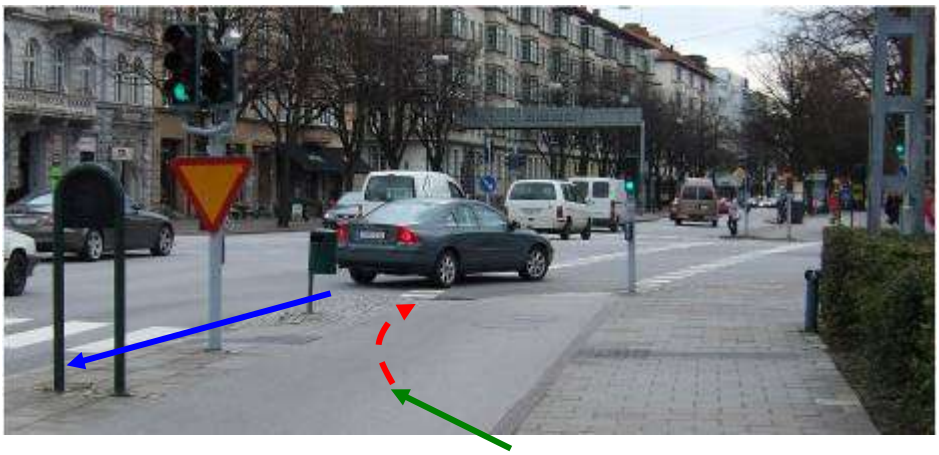
N

S

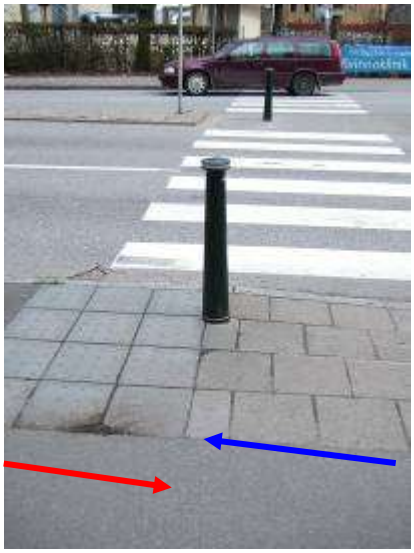
Map 3: Location of the test runs along the long bicycle lane with several detectors. Black arrow shows the route which is approx. 1531 meters. Detector locations are numbered.

Map 4: Location of the test runs in relations to the rest of the City of Malmö and the built-up area in particular. The dotted blue arrow is an approximation of the built-up areas in the city of Malmö; areas south and east of the line are rural or primarily agricultural land with lighter settlement.

Picture 3 View of start/end at northern end



Picture 4 View of start/end at southern end



Explanation:

The solid green arrow in Picture 3 shows where test cyclists heading south started. The dotted red arrow shows the path test cyclists took to avoid the detector mounted on the traffic light with the yield sign.

The solid blue arrow in Picture 1 shows where northbound, returning, test cyclists ended their run.

The solid red arrow in Picture 4 shows where test cyclists ended their southbound run. The solid blue arrow shows where test cyclists started their northbound test. To the right of picture 2 is the rest of the roundabout.

C1.4b Methodology and Data Collection for Task 3: Demonstration Bicycle Lanes

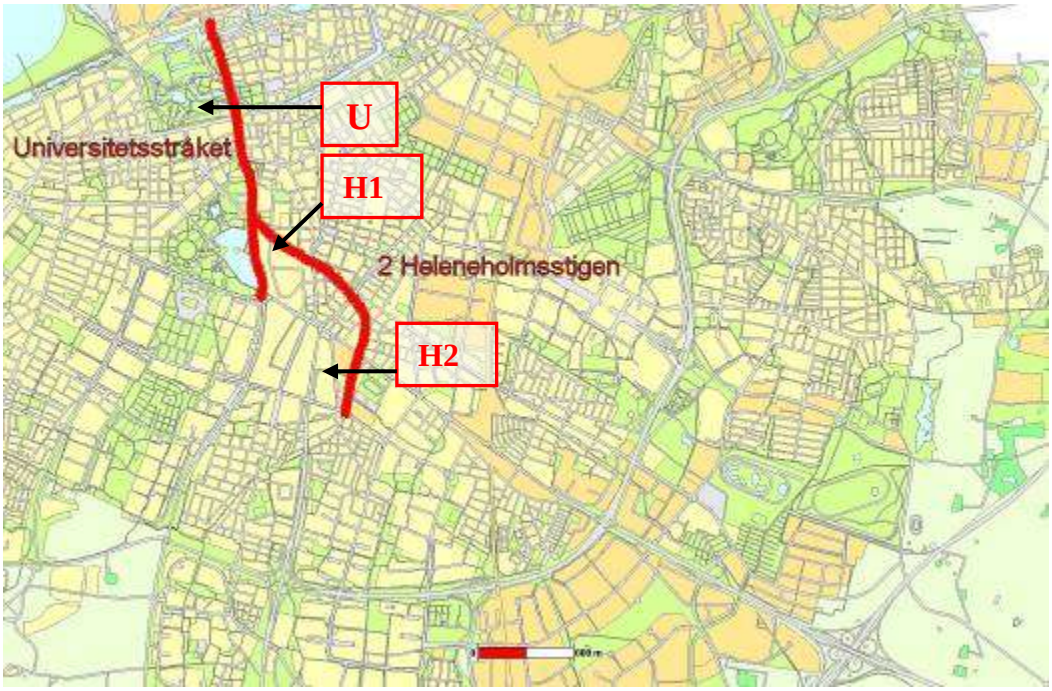
Since it is the users of bicycle lanes who ultimately should be satisfied with their condition and improvement, the methodology was primarily based on asking cyclists on the demonstration lanes about their general cycling habits, their opinions about cycling in Malmö in general, and their awareness and opinions of specific features/improvements in the demonstration bicycle lanes.

Three locations along the two bicycle lanes were selected for asking cyclists questions. The questionnaire was tested once and modified slightly as a result. The survey locations are indicated on Map 5. The two demonstration bicycle lanes have been designated “Universitetsstråket” and “Heleneholmstigen” based on common practice among a number of employees at the Department of Streets and Parks. The three locations are called H1, H2 and U on the map and in the rest of this report.

H1 is located at the western edge of the Södervärn Public Transit Centre, across the street from the main hospital, UMAS. This location reflects the original intention of the measure to integrate cycling with public transportation. H2 is located at a less central location in Malmö at a bicycle crossing over a busy street where much improvement of the crossing is necessary to improve safety, or at least the feeling of safety by cyclists using the route. U is located adjacent to the City Library, at a major intersection and just south of a narrow bridge, Fersens Bridge, that has hindered continuation of safe cycling on the cycle lane. As part of this

measure and SMILE the bridge is being widened and will be incorporated into the demonstration cycle lane called "Universitetsstråket".

The locations are places along the bicycle lanes where many cyclists must stop, either because of traffic light regulation in the case of H1 and U, or because of the heavy traffic and relatively unsafe conditions at H2. In this way a greater number of cyclists would be inclined to answer the questions since they would be stopped anyway.



Map 5: The extent of the two demonstration bicycle lanes and the locations where cyclists were surveyed in the bicycle study. See the text for more explanation about the selection of the locations.

As previously mentioned, delays in the selection of the location of the demonstration lanes followed by delays in the actual work on the lanes has had a negative impact on the evaluation of this task. It has been nearly impossible to construct a true baseline in a timely manner. Work was continuing on the demonstration bicycle lanes during August 2008 after the evaluation was completed. This means that it is not possible to determine the awareness of and opinions of cyclists about the completed lanes in time for the evaluation report. Because of this, the evaluation -- conducted in April and May 2008 -- should be seen as a snapshot of the ongoing work with the demonstration lanes.

The survey yielded 489 responses but some of these were incomplete. Staff received instructions about which of the questions to "skip" if the respondent was pressed for time but this was rarely needed in practice. The question about lighting was intended for darker times of the day. A copy of the form used by staff appears in an appendix. An explanation/translation of the questions asked appears below.

Overview of questions in form:

Administrative questions posed to staff: where, date and times, who asked the questions.

Questions asked of cyclists:

- year of birth
- gender

- frequency of using this bicycle lane (daily, several times a week, several times a month, seldom)
- cycling experience along this lane (1-5 where 1 is best)
  A Safety B Speed C Comfort D Signs for cyclists E Lighting (EVENING)
- (Have you) seen improvements along this lane?
  -- If yes, what/which/where?
- Which form of transport is most common for you? (cycle, car, bus, walking)
- What other bicycle activities/measures have been held/carried out during 2007-2008 to encourage cycling?

The results of the survey are described and analysed under the relevant sub-sections of C2.

C1.4c Methodology and Data Collection for Task 4: Information & Marketing Activities

As part of gauging awareness and acceptance of several measures as well as determining travel habits, a questionnaire was distributed and collected during April and May in central locations in Malmö. In total some 3000 questionnaires were returned. Questions about bicycle information and marketing activities as well as cyclists experiences of/opinions about cycling in Malmö were asked.

A telephone survey was conducted during 2007 shortly after the first part of one of the major campaigns – *Inga löjliga bilresor* – was held.

C2 Measure results

Prior to presentation of the results under the sub-headings -- corresponding to the areas used for indicators ie economy, energy, environment, society and transport – some results of the demonstration bicycle lanes survey are included. In some cases, the measure results in the sub-headings are divided based on the tasks.

C2.0 Survey population (C1.4b) in relation to the general population in Malmö

The results of the survey show that while the survey population is approximately similar in terms of gender to the general population in Malmö (51% of the Malmö population is female whereas 53% of the respondents in the bicycle study are female), there is a shift towards the categories 16-24 and 25-44 years of age. This is to be expected since the very young and the very old tend not to cycle very much. More results of the survey can be found in the relevant subsections of C2.

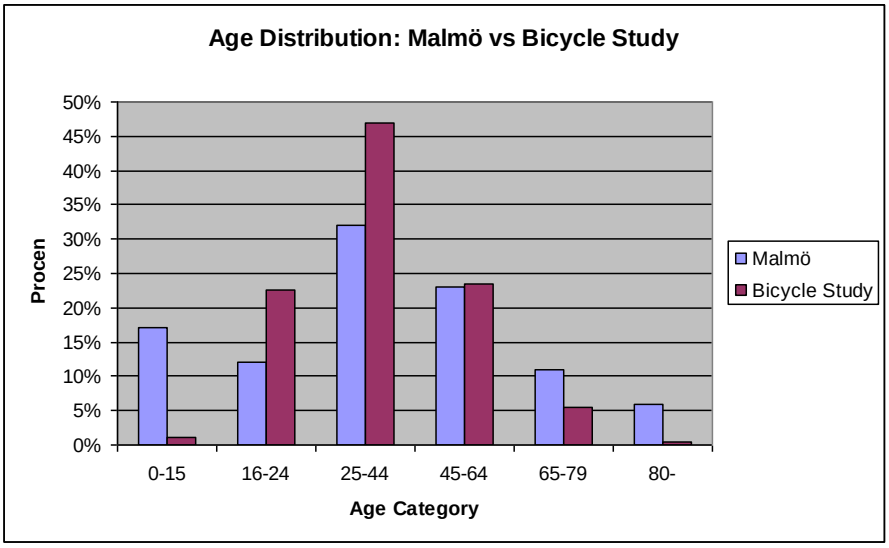


Diagram 1: Age distribution of residents in Malmö versus age distribution of cyclists who participated in the bicycle study along the demonstration lanes.

Respondents were asked how frequently they cycled on the bicycle lane. On a scale from 5 to 1 where 5 is daily, 4 is several times per week, 3 is several times per month and 2 is seldom (1 was added for the one person who rode on the bicycle lane for the first time) the median result was 5 and the average was 4.3. This means that the population represents very frequent users of bicycles on these bicycles lanes.

Furthermore, the respondents in this bicycle study tended to be very frequent cyclists in general. Approximately 86% of all trips the respondents took were by bicycle with other modes being 5% by car, 3% by bus (or other public transport), and 6% by walking. This means that the respondents are an ideal group for determining how the public is reacting to the improvements in the demonstration lanes: frequent cyclists on the demonstration lanes and frequent cyclists in general. However, this frequent cyclist population is not representative of the population of Malmö.

Differences in the sample population between the three locations

While there are some differences in the composition of the sample population between locations, these differences are not very great. There are also some differences concerning the travel habits of the cyclists who answered the questions at the three locations. See below:

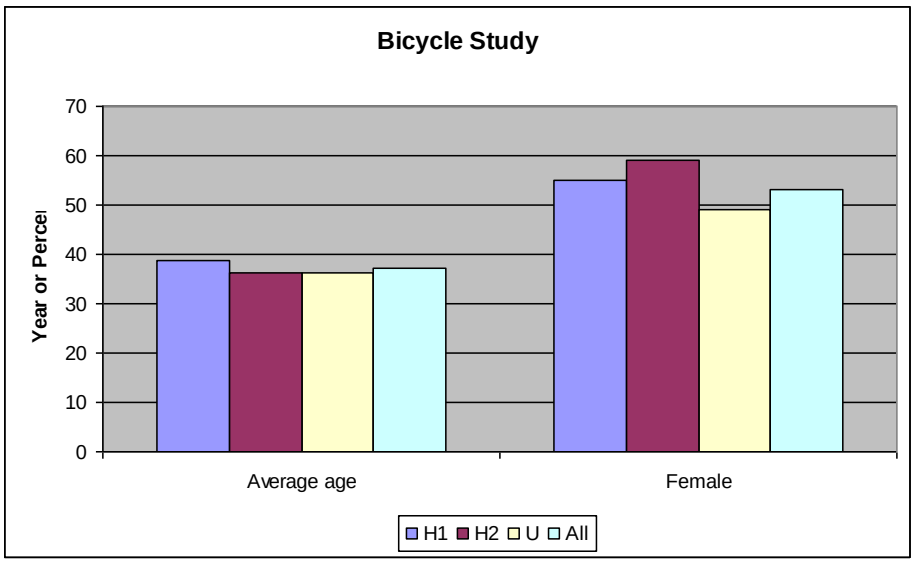


Diagram 2: Differences in Average Age and Percent Female Cyclists at the Three Locations Compared with the Average

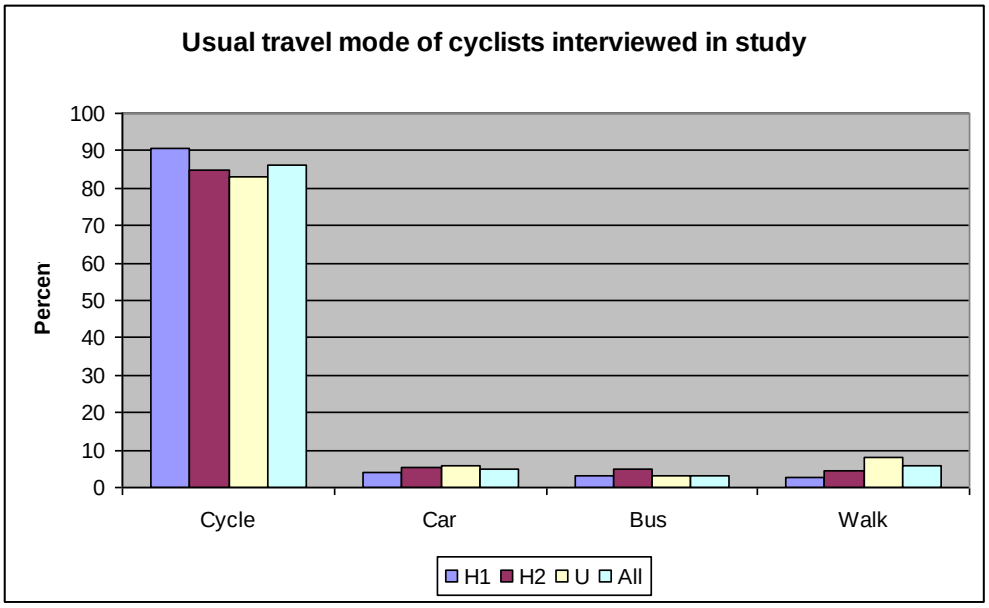


Diagram 3: Comparison of the usual travel mode of the cyclists interviewed at the various locations.

This simple analysis of the data suggests that there are only small differences among the samples at the locations. The overwhelming majority of cyclists interviewed are very frequent cyclists at all locations.

C2.1 Economy

The revenues for this project - in terms of revenues accruing to the division of the Department of Streets and Parks which was responsible for this measure - were 0 SEK. The preliminary total costs for the project are 10 874 502 SEK. This includes the EU contribution and the contribution from the Department of Streets and Parks.

C2.2 Energy

The use of the cycle radar detectors is intended to encourage the use of bicycles by reducing cycling time without compromising safety and other factors. In the short run this might lead occasional cyclists - who otherwise travel by car - to shift towards more cycling and less use of the car, leading to a reduction in the use of energy for transportation among these people. This effect is difficult to gauge.

The demonstration cycle lanes will also encourage more cycling on the part of those who already use the cycle lanes. This may encourage a shift towards bicycles away from cars. However since the overwhelming majority of cyclists surveyed on the bicycle lanes very regularly cycle and are not heavy car users, the short term effect will be marginal at a city wide level.

The information and marketing campaigns have been targeted towards people who do not regularly use bicycles. Here the effect of getting regular car users to try other modes of transportation and especially cycling is more likely to lead to less car usage on the part of those drivers. This effect cannot be gauged within the scope of this evaluation. Furthermore, measure 11.1 also promotes cycling so it may not always be clear which measure has lead to a reduced energy use through reduced car usage.

C2.3 Environment

What has been said about changes in energy usage above can be repeated here. It would be reasonable to expect that this measure will lead to small changes in primarily frequent bicycle users as the result of tasks 2 and 3 (detectors and lanes) over the short term. This could lead to an extremely small reduction of emissions. In the longer term task 4 (information and marketing) may more likely "pull" heavy car users out of their cars and put them on bicycles but this will be the result of continuous campaigns in the area of mobility management in general and promotion of cycling in particular.

C2.4 Transport

The principle results of this measure are in the area of transportation in general. More specifically the use of cycling as a transport mode; the experiences, attitudes, awareness and expectations of cyclists and the general public about bicycling in Malmö; and the actual, measurable improvements in cycling quality in the city of Malmö as a result of this measure are the concrete results of this measure.

The results of the two types of data collection for task two, bicycle detectors, are presented here.

At crossing 2006:1, depending on which dates and times are used for comparison, the average time a cyclist is delayed going southbound is reduced because of the detectors between 2-5 seconds, probably towards the higher number. This is calculated by taking the total time cyclists were stopped and dividing this by the total number of all passing cyclists, regardless of whether they were stopped by the light or not. The pre-study conducted by Kostovic and Arnslätt Malmgren in 2006 gave figures for reduced waiting time because of the detectors on the order of 4-5 seconds for this crossing. However their study was very small.

At crossing 2006:2, again depending on which dates and times are used for comparison, the average time a cyclist is delayed is reduced between 1 and 8 seconds. This is calculated by taking the total time cyclists were stopped and dividing this by the total number of all passing cyclists, regardless of whether they were stopped by the light or not. The pre-study conducted by Kostovic and Arnslätt Malmgren in 2006 suggested a time improvement of only 1.5 seconds for this crossing.

The percentage of cyclists that are stopped for any length of time varied greatly on the different observation dates. In the best cases the percentage of cyclists stopped fell from 64% to 47% and 63% to 58% when the detectors were on. On some days there was no noticeable drop in the percentage of cyclists that were stopped. The average time that a stopped cyclist waited behind the traffic light for green was reduced by between 2 to 7 seconds, perhaps towards the lower number. The pre-study conducted by Kostovic and Arnslätt Malmgren in 2006 reached similar figures: a reduction of the percentage of cyclists stopped falling from 65% to 60% but a small improvement in the average time that a stopped cyclist had to wait behind the traffic light for green, namely only 1 second.

The third crossing, not included in the Kostovic and Arnslätt Malmgren study, was 2007:14. Here the result is clear: the detector at the crossing reduces waiting times by almost 3 seconds in all circumstances. This is calculated by taking the total time cyclists were stopped and dividing this by the total number of all passing cyclists, regardless of whether they were stopped by the light or not.

That these results vary significantly by crossing is interesting and has consequences for this study:

1) It is not possible with the size of the study (each observation lasting three hours during times the detectors are normally on and normally off at:
- crossing 2006:1 observed twice on days with detectors in the normal mode and once when completely off;
- crossing 2006:2 observed twice on days with detectors in the normal mode and twice when completely off;
- crossing 2007:14 observed twice on days with detectors in the normal mode and twice when completely off)
to determine the full effect of the times savings across all of Malmö with all detectors

2) The variation between crossings is great in terms of time savings, suggesting that general traffic flows and other factors unique to the intersection have a moderating factor that dampens the effects of the cycle radar

However, pressed to make a qualitative estimate on the results, it would be possible to say that the effect of the cycle radar detectors is about 3 seconds of reduced waiting time for the typical cyclist but that variations by day and crossing are very great. Further study, including additional crossings, would be required to achieve a figure that is more reliable or leads to better understanding of why there is some much difference between intersections with bicycle radar detectors.

For task two, the series of test runs passing through several detectors lead to an average increase in speed of 2 km/h when the detectors were on as opposed to when the detectors were off. Based on the study design, we cannot know for sure if the entire increase in speed is solely the result of action of the detectors, or if part of the increase in speed is the total reduced traffic volume when the detectors were functioning in the evening versus when they were off during periods of greater traffic volume. Even if the data collection seems sufficient (25 different test runs back and forth on the 1.5 km bicycle lane) there is still room for error, unknown factors and cyclist fatigue as they continued back and forth on the various days. Despite this, the results suggest that during off-peak traffic times and when passing through multiple bicycle radar detectors that are on a cyclist's average speed may increase by as much as 2 km/h.

A drawback for the success of this measure is that during peak travel times, the bicycle radar detector function is not connected and does not influence traffic signal lights. This means that the majority of all cyclists passing the detectors in Malmö do not benefit at all from reduced waiting times and increases in average speed. Therefore the positive figures of 3 seconds of reduced waiting time and an increased average speed of 2 km/h would fall significantly given the limitations of the present use of bicycle radar detectors.

If the bicycle radar detectors were to be operational during all hours of the day, some intersections during rush hours and peak travel loads would have longer lines of waiting cars which would lead to increased emissions from these cars. In the short-term: increasing the operational time of the bicycle radar detectors might lead to marginal reductions in waiting time for more cyclists and the marginal increase of emissions from vehicles. In the long-term: continued increased operational time of the cycle radar detectors might indirectly push some motorists away from the crossing streets onto other streets with some changes in traffic patterns. Furthermore, some motorists may tire of waiting for cyclists and instead experience cycling to work instead. The latter is the wished for effect of this part of the measure, the effects of would be difficult to find within the SMILE timeframe.

The results of the bicycle survey for task three, demonstration lanes, are presented here.

The experiences of cyclists along the demonstration lanes show that there is awareness of the transformation of the specific location into part of a demonstration bicycle lane and that there is a similar level of awareness of the improvements in other sections of the demonstration lanes. However the latter awareness may in some cases refer to improvements noticed in other locations in Malmö.

There are differences in the level of awareness depending on:

- The location (i.e. which lane and where) of the cyclist[2]
- The age of the cyclist
- The gender of the cyclist

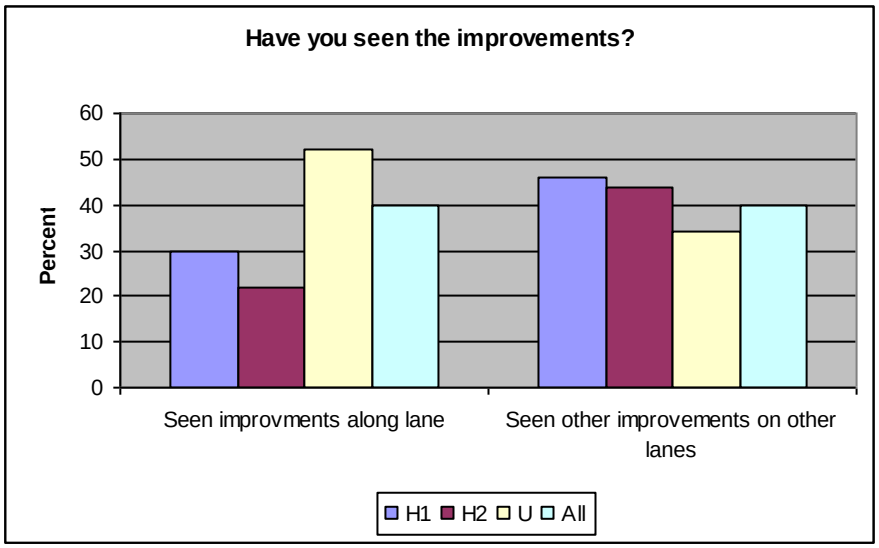


Diagram 4: Results of asking where respondents saw the improvements. Locations H1, H2, U can be seen on Map 5.

With increasing age (older age category) the percentage of respondents that claimed they noticed improvements increased. This was the case for both the lane they were cycling on as well as other lanes. Only 31.6% of the 16-24 years group noticed improvements while 47.8% of the 65-79 years group noticed improvements on the lane.

There are small gender differences: 39% of women and 38% of men claimed to notice improvements in the lane they were cycling on at the time they were interviewed. 41% of women and 35% of men claimed to notice improvements elsewhere in the city's bicycle lanes or equivalent bicycle promotion. The location "U" has the highest percentage of respondents that have seen improvements to the demonstration lane. This is because of the widening and improvement of a bridge over the canal where part of the demonstration lane "Universitetsstråket" will pass. 52% see improvements at this point which is located very close to "U." Location "U" also has the lowest score for cyclists identifying other locations with improvements (34%). While cyclists at "H2" find few improvements at their location (22%) they claim that other places have had improvements (44%).

There were many improvements that respondents noted during the interviews. If we group these according to the categories Major infrastructure, Minor infrastructure, Campaigns, and Other the following picture emerges. Major infrastructure would involve tunnels, bridges and more lanes for cyclists. Minor infrastructure includes air pumps, signs, markings, clearing away vegetation that obstructs the view. Note that these improvements are for the entire city.

[2] Refer to Map 5 for the locations.

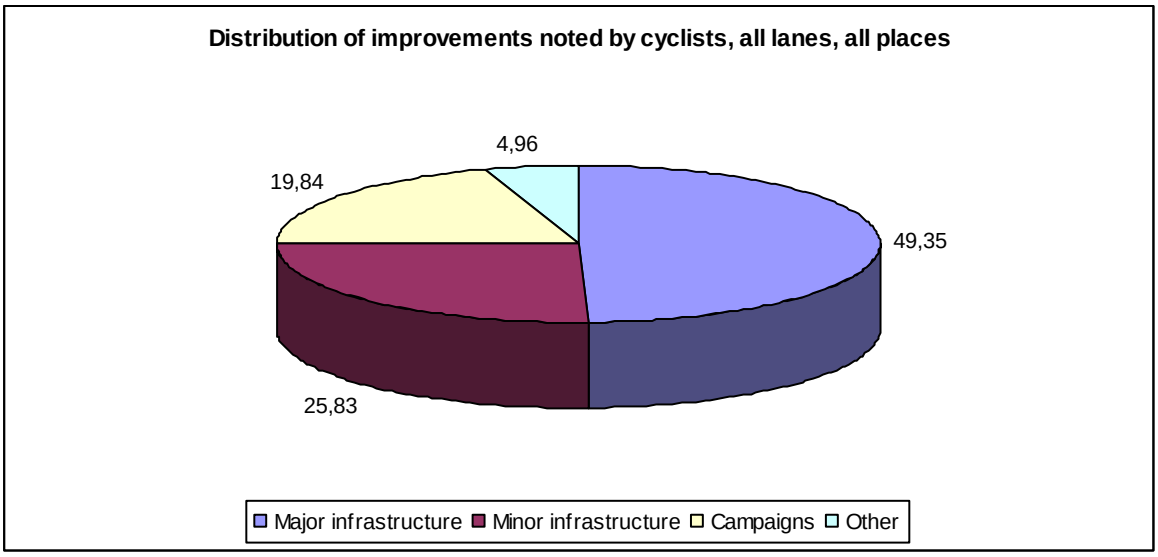


Diagram 5: Distributions of note improvements

Among the improvements noted by cyclists are activities/investments undertaken in Malmö that are <u>not</u> part of measure 8.3!

Of the improvements <u>along the two demonstration cycle lanes</u> that cyclists observed the following are most dominant:

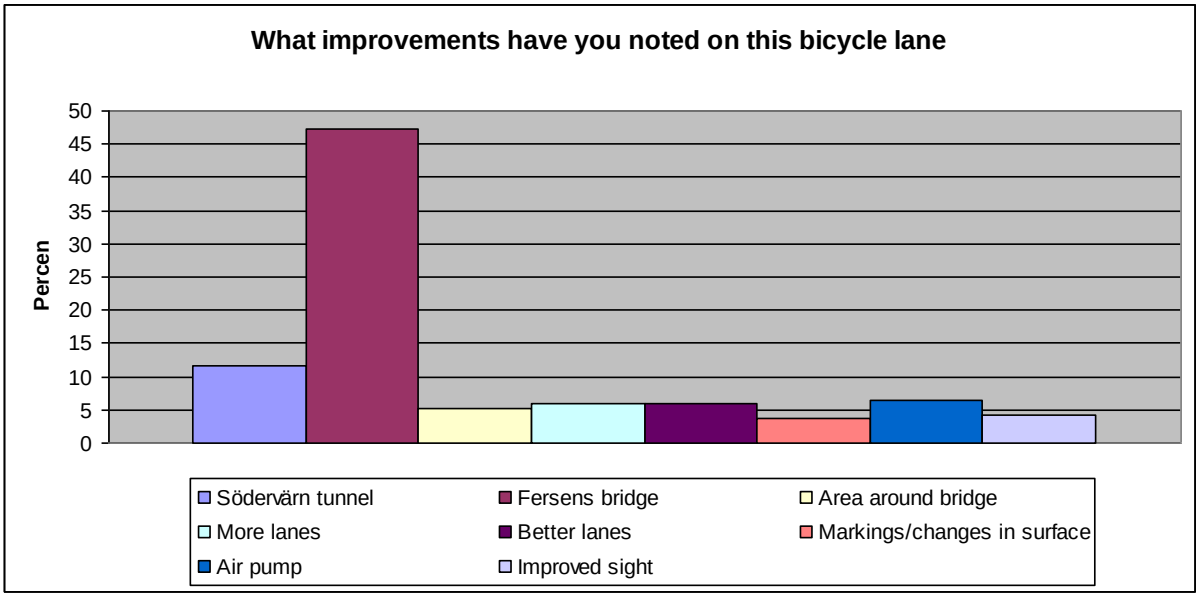


Diagram 6: Results of asking what improvements were noted on a specific bicycle lane

All of these features or improvements that were noted are part of 8.3 with the exception of "More Lanes" i.e. the construction of more lanes. We therefore see that there is a high degree of awareness of the improvements that are making the two lanes into demonstration bicycle lanes. With the exception of the present inconvenience caused by work on Fersens bridge, the level of acceptance of this part of the measure is similarly high.

If we were to remove the dominant feature of the bridge the resultant picture would be less favourable for 8.3. Cyclists are either not noticing some of the "minor" improvements which, if taken together, lead to great improvements or they have difficulty to connect several improvements as part of one larger project.

In most cases there was no great difference between observations made by men and women. If we look at the entire response, including improvements and campaigns mentioned taking place at other places than the two bicycle lanes then we see that men mentioned the bridge improvements near location U slightly more often than women. Men had also a slightly greater tendency to mention the provision of bicycle maps by the city and specifically mention the bicycle promotion slogan *Här cyklar en bilist* (Look! A motorist on a bike!) that was used in the *Inga löjliga bilresor* campaign more often than women.

Women were 50% more likely to notice the bicycle counters/barometers than men. Women mentioned "improved sight/brush cut away" three times more often than men. Women also mentioned campaigns with the provision of bicycle helmets four times more often than men. Finally women accounted for approximately 60% of the examples of what they thought were improvements and men the remainder. This is considerably more than what the distribution of female/male respondents might suggest.

Changes in personal transport behaviour

One result from the 2003 travel habits survey conducted by the City of Malmö was that some 20% of journeys in Malmö were by bicycle. Other surveys have suggested that in favourable conditions (summer half of year) as many as 29% of all trips to/from work are by bicycle while the average for all trips is about 20%.

As part of SMILE a general survey has been conducted in public places in Malmö to ask respondents about a variety of SMILE measures as well as to determine general biographic data and travel habits. Over 3000 people completed the questionnaire.

Respondents were asked how often they travelled by car, bus and bicycle during the last half year (which, depending on when the respondent completed the questionnaire, was a timeframe from November 2007-May 2008). Respondents were also asked to compare this travel behaviour with how they travelled in Malmö five years ago, ie to compare with approximately November 2002-May 2003. This comparison period was about two years before SMILE started and close in time to the travel habits survey conducted by the City of Malmö in 2003.

The results of these questions are presented below in two diagrams. When examining these diagrams it is important to consider that the population sampled with this questionnaire is not entirely representative of the general population of Malmö. 57.8% of respondents to the questionnaire were women compared with 51% for the general population. The age distribution among the respondents also differed with a great overrepresentation among those 16-24 year and an underrepresentation among the very young (15 years and younger).

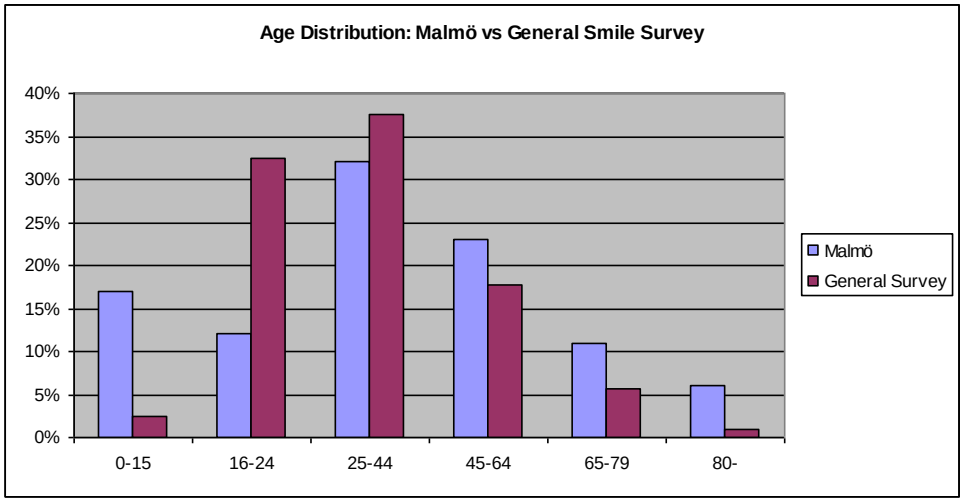


Diagram 7: Comparison of Age Distribution, general population in Malmö versus the General Smile Survey conduced April-May 2008.

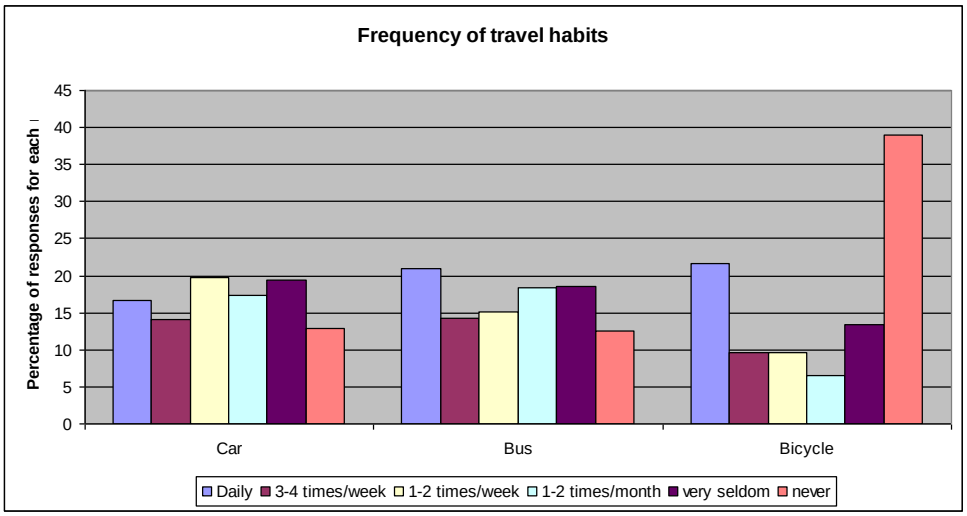


Diagram 8: Frequency of travel habits among people participating in the General Smile Survey April-May 2008.

Here we can see that almost 40% of the inhabitants of Malmö never take a bicycle whereas almost 22% use a bicycle on a daily basis. This suggests an increase in bicycle usage from about 20 to about 22% in Malmö during SMILE. Compared with the transport modes of car and bus where usage habits are more or less even in the different categories, usage of bicycles appears to fall into three distinct groups: over 20% who are very frequent cyclists who use them on a daily basis, almost 40% who use them anywhere from often to seldom, almost 40% who never use them.

Changes in travel habits among the respondents show them using a little less car transport today than five years ago (the change is slight), a shift towards more usage of buses today compared with five years ago and a reduction in bicycle usage during the last five years.

A reduction in bicycle usage in this population of respondents means that five years ago the average respondent used his/her bicycle more. This seems inconsistent with an otherwise apparent increase in bicycle usage from 20% in the 2003 Travel Habit Survey conducted by the City of Malmö to 22% today in the General SMILE Survey. This inconsistency means that we cannot draw conclusions from this result. In all likelihood a reason for this difference is that the survey in 2003 and the survey in 2008 used different delivery and return mechanisms and reached a different population sample.

It is likely that the statistical uncertainties within such an approach, even with what are relatively large sample sizes, are big enough to mask what are likely to be small changes in bicycle use when spread over the city as a whole. This implies that the impact at city level is more one of further embedding cycling as a well-used mode of transport in Malmö and keeping the modal share stable.

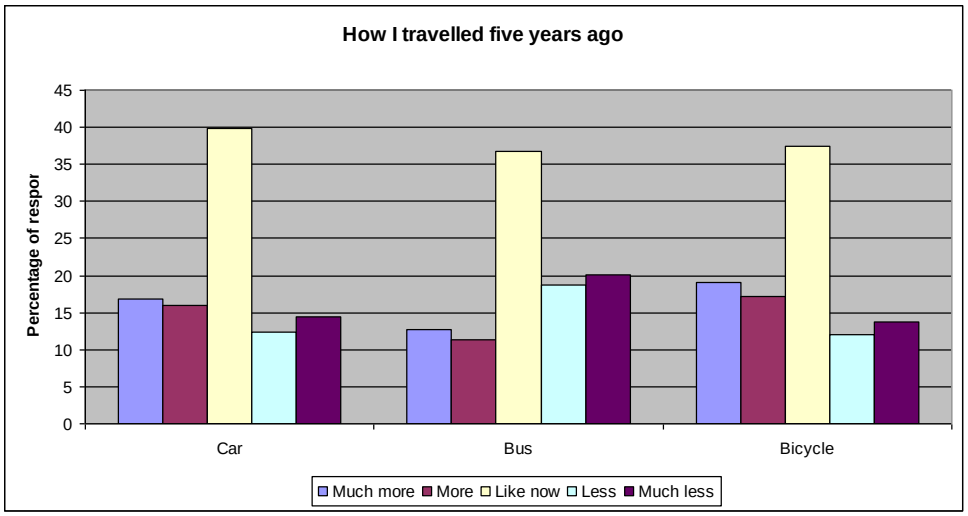


Diagram 9: How participants in the General Smile Survey April-May 2008 travelled five years before.

In the autumn of 2008, following the completion of SMILE, the Department of Streets and Parks held a major travel habit survey. This was a repeat of the same kind of survey with same delivery mechanism that was held by the same Department in 2003. The results of this survey were not available to the evaluators until the end of March 2009. The result points to an increase in cycling by 3% as described as a modal shift. This means that the measure 8.3 as a whole contributed to its non-explicit goal of a 3% change in travel habits towards bicycles.

However, a word of caution is needed here. Interest in cycling rose significantly during 2008 in Sweden with cycle merchants running out of new bicycles for sale during this year. This interest is often attributed to high fuel prices and a general understanding about future climate changes on parts of some members of the public. Furthermore, measure 11.1 surely contributed to a switch away from cars to other personal transport modes. Finally, Malmö has witnessed a major inflow of inhabitants during this decade. This coincides with an economic turn-around and the founding and enlargement of a university. People who are moving to Malmö tend to be young and mobile and not all of them have driving licenses which means that their moving to Malmö would tend to dampen any growth in car mobility. Therefore we cannot attribute all of the increase in cycling to the success of measure 8.3

Perception of cycling in Malmö 2007-2008

The General SMILE Survey conducted during April-May 2008 asked respondents their perceptions of using bicycles in Malmö and how this had changed during the past year. Respondents were asked to rate changes with regard to safety, speed, convenience, signs for cyclists.

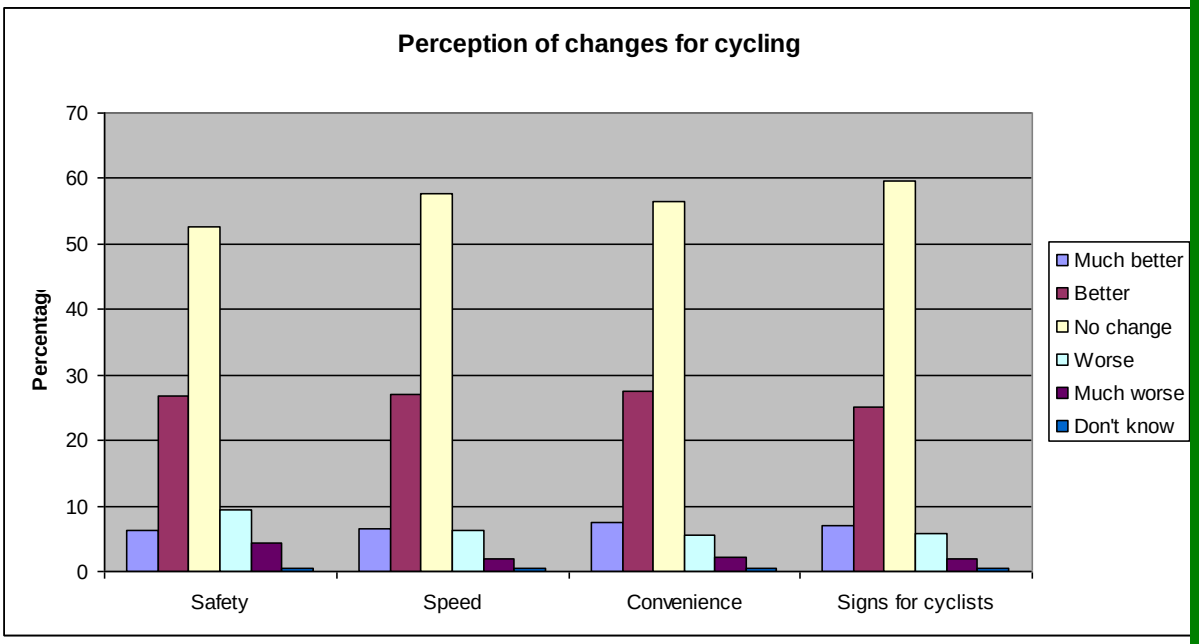


Diagram 10: Changes in perception of cycling

This suggests that respondents who have perceived a change tend to say that for all four factors there has been a change for the better. However, just fewer than 10% say that safety has declined a bit. Also, perception of improvements in signs for cyclists has been a bit less than for the other changes.

C2.5 Society

Task four in this measure is the promotion of cycling through information campaigns and marketing. While this has been done in several ways (bicycle map, various campaigns, bicycle barometers, etc) the largest part of task four was a campaign started in the Spring of 2007 which was followed up during the Autumn of 2007 and the Spring of 2008. The name of the campaign is *Inga löjliga bilresor* (or in English "No ridiculous car trips") and the awareness and acceptance of this campaign has been the subject of this part of the evaluation. The campaign was very visible on billboards, advertisements, in public places. Teams of cyclists rode around in traffic with signs promoting messages and themes.

The Department of Streets and Parks conducted a telephone survey after the first part of the campaign that was held during the Spring of 2007. The results of the telephone interviews suggest that 40-50% of all residents noticed and knew about the campaign Inga löjliga bilresor and that about 10% of all residents thought about or actually changed their travel habits because of the campaign. This should be considered as very successful.

In April and May 2008 over 3000 questionnaires were distributed and returned dealing with a variety of SMILE measures. A pilot questionnaire was distributed first and the result of this led to changes in the remaining questionnaires that were distributed. One observation from the pilot study was that respondents felt that there were too many questions. Therefore in the main part of the study two versions of the questionnaire were used. Both versions contained the same questions in the first half but the second half had different questions in the two versions.

The survey was distributed in a variety of public places in Malmö (squares, public transit nodes, shopping centres) on various days of the week (including Saturdays and Sundays) at various times of the day. Staff sought to have the questionnaires completed on site and returned but there was the option of mailing in the completed questionnaire. The return rate was very high.

1782 people answered the following question: "No ridiculous car trips was a campaign held during 2007. Did you notice the campaign?" The reason for the formulation that the campaign was held in 2007 and not during 2008 was that the pilot questionnaire was distributed in early April before the campaign repeated during May 2008. The exact same question formulation was retained in the revised version of the questionnaire to ease comparison.

18.3 percent of respondents said that they had noticed the campaign which signifies some awareness.

However there was a follow-up question to determine how well those who responded 'yes' that they had noticed the campaign actually knew the content and main message of the campaign.

The messages that respondents were asked to identify with the campaign included three messages that were part of the campaign and two that were not. The latter "false" messages were included to gauge the degree to which some respondents might say that all the messages were part of the campaign. The messages have been translated in English beside the originals in Swedish. Note that the translations are approximate with the intention of getting the meaning across (i.e. the translations are not literal).

Possible messages that were part of the campaign
Här cyklar en bilist – Look! A motorist on a bike!
Det finns plats för flera bilister på bussen – There is room for more motorists on the bus!
Hälften av alla bilresor är löjligt korta – Half of all car trips are ridiculously short!
Ta det sunda, friska alternativet – Take the healthy alternative!
Det är snabbare och smartare att ställa bilen – It is faster and smarter if you park your car at home!

The responses are as follows with percentages indicating degree of agreement that these messages were part of the campaign.

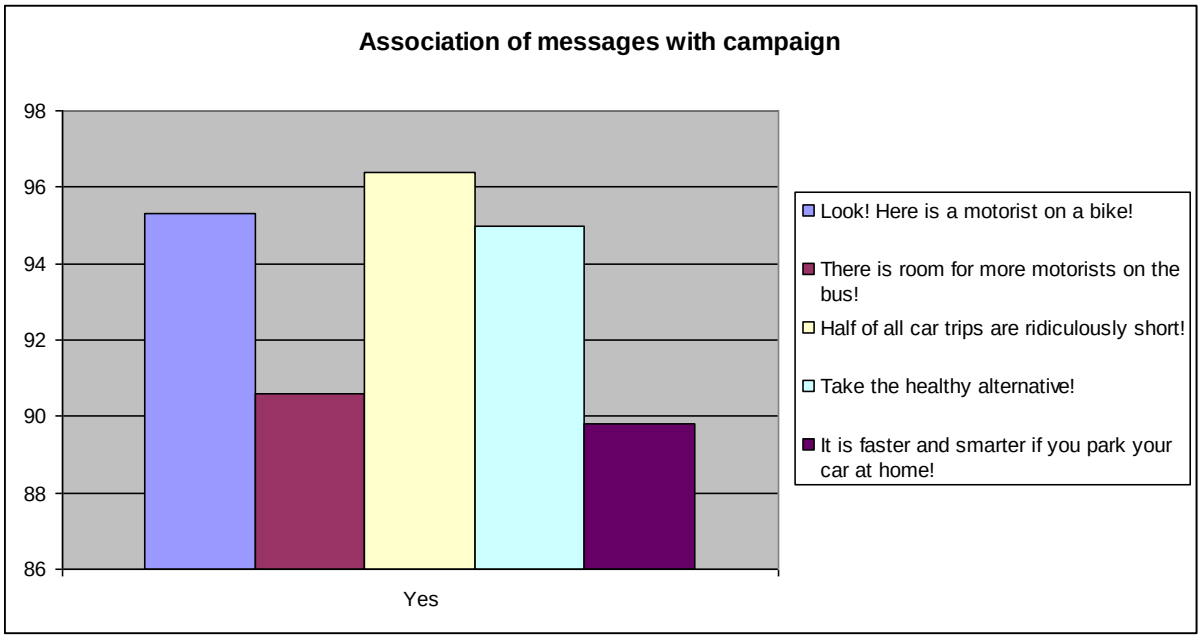


Diagram 11: Respondent's degree of association of messages/slogans with campaign Inga löjliga bilresor

At first glance this looks very good. However, on average only 68% of the respondents who answered that they had noticed the campaign attempted to then identify what the campaign messages actually were. This means that on average only about 12.5% of the respondents who answered the first question about noticing the campaign (either yes or not) felt comfortable or knowledgeable enough to identify the central messages of the campaign.

The 2nd and 4th messages were false. While these messages were considered as part of the campaign at an early, planning stage, they were for various reasons later abandoned. What can we say if many among those who thought that they knew the central messages of the campaign picked incorrect messages? Clearly this is some association of the campaign to the respondents own experience and knowledge. However in some cases there is probably some guessing behind the answers.

Another source of answers to questions about awareness and acceptance
In the bicycle survey concerning the demonstration cycle lanes, respondents were asked to identify examples of bicycle promotion during 2007-2008 in other places than the cycling lane they were on at the time. Almost 20% mentioned some form of campaigns or information. In some instances these were part of 8.3. In other cases they were examples of projects completed as part of SMILE measure 11.1 or other activities. Some of the respondents, when trying to name the campaign *Inga löjliga bilresor* said instead *Inga onödiga bilresor* where the meaning is changed from "ridiculous" to "unnecessary". And the sense of unnecessary was a secondary message that the campaign has contained.

However, those surveyed on the demonstration bicycle lanes are regular cyclists and do not really represent the population of Malmö as a whole. Therefore we cannot "translate" the figure of 20% as a confirmation that some 18% of the general population had noticed the campaign, particularly as research elsewhere suggests that regular cyclists are more likely to notice and respond to campaign messages based around promoting cycling.

It is, however, probably correct to assume that between 11-12% of all Malmö residents not only were reached by the campaign *Inga löjliga bilresor* but they also recognized approximately one year later at least one of the principle messages contained within the campaign. This assumption is based on the response to the question about message recognition and the campaign.

What of how the campaign influenced those who heard about the campaign? 1407 respondents or 79% of the number of those that had heard of the campaign answered that they had been influenced by the campaign. This is a much higher percentage than those who tried to identify the central messages. Of these respondents some 74.4% claimed that they were not at all influenced by the campaign. It is however hard to be influenced by a campaign if you have neither noticed it or if you have noticed it but do not know at least one of the central messages.

217 respondents said that they were affected very little by the campaign. 115 respondents said that they were affected by the campaign. 28 respondents said that they were affected quite a lot by the campaign. These absolute numbers together are greater than the total number of respondents who, two questions earlier in the questionnaire, said that they had noticed the campaign. This could mean that some people in Malmö did not directly and personally notice the campaign but instead were influenced indirectly by friends, family, co-workers, neighbours who noticed or participated in the campaign. This is however just conjecture: there is no concrete evidence of this from the survey results.

If we instead take those who were affected or affected quite a lot by the campaign this gives 143 respondents. These 143 people taken together are 8% of those who answered the question about noticing the campaign.

Summary:

The telephone interview conducted during 2007 points to 40-50% awareness and 10% acceptance, the latter measured as "considering to change travel habits because of the campaign" or claims by respondents that they actually changed their travel habits.

The interviews of cyclists combined with the general public SMILE survey during the Spring of 2008 suggests that at least 18% of Malmö residents noticed the campaign *Inga löjliga bilresor* and that 11-12% were sufficiently aware of the campaign to be able to identify one or more of the central messages of the campaign. A smaller percentage, 8% of Malmö's population may have been affected by the campaign. 1.5% of those who answered whether they noticed the campaign or not claim that they have been greatly affected by it.

Thus we see that awareness was halved but still rather high approximately one year later and prior to the smaller repeat of the *Inga löjliga bilresor* campaign in late Spring. While acceptance has been measured somewhat differently in the different data collection methodologies, the results seem to suggest a retained level of acceptance despite almost one year passing. This should be seen as a very good result.

With more people cycling and a greater proportion over all people's trips taken by bicycle as opposed to cars and public transportation, some form of health effect or bonus may be measured (fewer sick days, fewer visits to clinics, reductions in heart disease, etc.). However this effect would take several years to manifest itself after a significant increase in the use of cycling. This measure has not produced a significant increase in cycling and SMILE is not yet over so it would be premature to look for these kinds of effects.

C3 Achievement of quantifiable targets

Table 2: Overview of target fulfilment

No.	Target	Rating
1	Bicycle detectors, 20 installed, resulting in reduced waiting times and faster speeds: detectors installed = *** since 26 intersections now covered, reduction in waiting etc = * (uncertain)	**
2	Demonstration bicycle lanes: 2 lanes built instead of 1 = * (because lanes not complete at time of report writing), Awareness/acceptance improvements = * or ** depending on improvement type	*
3	Information and marketing activities: *Judgement based on evaluation of one activity only.* *Inga löjliga bilresor* exceeded expectations and demonstrates message acceptance up to one year after initial campaign = ***. However, other activities may not have exceeded expectations as the expectations have not been well quantified in the project documentation.	** (***)
NA = Not Assessed 0 = Not achieved * = Substantially achieved (> 50%) ****= Achieved in full ***= Exceeded**		

C4 Up-scaling of results

As in the case of establishing a baseline, the different tasks could be up-scaled in different ways: therefore a discussion of up-scaling must be broken down into the various tasks.

For task two, there are two ways that the function could be up-scaled.
1. The number of detectors could be increased so that greater numbers of intersections would provide a time advantage for cyclists. It is difficult to say how much up-scaling would be possible here since some intersections give cyclists a time advantage in only one direction. In some cases it would be possible to provide this advantage in the opposite direction. However, the safety of cyclists must be assured and in some cases intersections would have to be redesigned/reconfigured to accommodate these changes.

The Department of Streets and Parks has selected those intersections with the greatest potential for helping cyclists during SMILE. Remaining intersections might be less suitable or provide less benefit to fewer numbers of cyclists. Furthermore, installation of cycle detectors at some intersections is not possible since crossings with car, bus and cycle traffic must also be able to prioritize bus priority signals of the kind used as part of measure 12.7.

2. Presently the time of day when the bicycle radar detectors steer the operations of traffic signal lights -- and thus give cars longer stop times – is limited. The Department of Streets and Parks has decided not to have the radar change the phasing of the traffic signals except during off peak hours. This means that cyclists travelling through intersections at, for example, 5pm have to wait the same time despite the installation of the bicycle radar. On the other hand the installation works to reduce waiting times for cyclists at 9pm. This means that at the time of day when the greatest number of cyclists is moving around the system does not provide these cyclists with any time savings. However when few cyclists are moving around the system is in operation.

We can therefore see that letting the system operate during more hours of the day and in particular during rush hours would generate a greater advantage for cyclists and better fulfil the goals and objectives of this measure.

For task three, the results of the positive effects of the demonstration lanes could be applied to many other bicycle lanes in the city in particular those with high volumes of cyclists and those located near public transport nodes. The demonstration lanes are supposed to inform the planning and construction of new bicycle lanes in the city. It might be of value to widen some parts of demonstration lanes in the future to accommodate greater volumes of cyclists, particularly for children, in the location of key travel targets or goals.

For task four, the campaigns could be held more often and broken down into district wide campaigns more targeted towards residents in particular districts and/or carried out in conjunction with other mobility management campaigns. Linkages between *Inga löjliga bilresor* and other mobility management campaigns should be sought to enable synergistic effects.

To what extent this up-scaling ***might*** take place, see section D4.

C5 Appraisal of evaluation approach

The evaluation approach achieved a successful evaluation of the objectives and tasks in measure 8.3 with an efficient use of the available financial resources.

The primary things that we would have liked to have done differently are linked to the timely execution of the measure as originally planned and the availability of funding. Since the measure deviated from the plans and the funding was insufficient to do everything we might want to have done then it become a very academic and impractical exercise to create a wish list that cannot be realised because of funding and project execution constraints.

Forced to make a wish list nonetheless it would have been most fruitful to have more observations of time savings to be able to have a more conclusive result AND attempt to gauge better the long distance effects of passing through several detectors to be able to determine to what extent observations of time savings at individual detectors translates into savings in the overall pattern of bicycle travel. However, given that the city is "under-using" the potential of the bicycle detectors, attempting to study an incompletely rolled-out measure is a questionable use of limited resources.

Additional possible improvements could have involved an attempt to better establish a baseline for task three and carrying out the evaluation of this task after its completion. However because of changing circumstances in the planning of the demonstration lanes it was difficult to achieve a baseline in time. Moreover, task three was delayed several times leading to the completion of the task during the same time period that the evaluation was supposed to be complete. Completing the evaluation after the measure was completed and has had a chance for the full impacts to occur is not an option within the framework of SMILE or other similar projects.

Problems with the evaluation arose prior to the start of SMILE when non-quantitative objectives were permitted and the author of the measure objectives did not reflect upon evaluation needs or consult with someone who might be charged with evaluation tasks for this measure. Such problems are difficult to address by evaluation staff once an EU-project has commenced. Measure 8.3 in SMILE is no different from a number of other projects in CIVITAS where non-quantitative objectives were approved and no consideration of evaluation needs were incorporated in the objective formulation process.

C6 Summary of evaluation results

The key results are as follows:

- **Bicycle radar detectors lead to some changes, despite limitations in use** – The introduction of bicycle radar detectors has lead to some reduction in waiting time, perhaps as much as 3 seconds per cyclist under favourable circumstances. However the majority of bicycle trips in Malmö are not affected by this change because the detector system is disabled during peak travel hours. Furthermore, cyclists travelling through multiple intersections with detectors may achieve greater average speeds by as much as 2 km/h under favourable circumstances. These results would need more study for confirmation.

- **Cyclists awareness of demonstration lanes** – Most cyclists using the demonstration lanes are frequent cyclists. They appear to recognize two main improvements in the demonstration lanes: the widening of a bridge and the construction and improvement of a tunnel (tunnel construction was actually pre-SMILE) but the majority of smaller activities that are part of the enhancement process characterizing these demonstration lanes has been relatively unnoticed by the majority of cyclists. This lack of awareness may be in part a

function of this part of the measure being behind schedule and not complete when the evaluation was conducted but also may be a function of respondents not seeing the series of improvements as part of an integrated process.

- **Perceptions of cycling –** Generally the public believes that there has been little change in terms of safety, speed, convenience and sign posting for cyclists during the past year in Malmö. Of those that have perceived a change the change has been mildly positive. This result is likely to have been influenced by the good starting point in respect of cycling in Malmö.

- **Campaigns to promote cycling –** Some 40-50% of the city of Malmö has been reached by the major campaign, judging by the response to a telephone survey held shortly after the campaign. This campaign had small return or repeat exercises during the Autumn of 2007 and late May 2008. About 18% of the population of Malmö still recalled being reached by this major campaign *Inga löjliga bilresor* to promote cycling. One year on perhaps as many as 11-12% of the public can identify one or more of the central messages in the campaign. As many as 8% of the public may claim that they have been affected by the campaign, based on a survey conducted more than one year after the campaign started. Between 1-2% of the public say that they have been greatly affected by the campaign. This suggests a good result for raising awareness and the acceptance of the message of the campaign. This demonstrates a high degree of retention of the acceptance of the campaign through time. However, this does not necessarily automatically lead to changed behaviour and a measureable modal shift towards bicycling.

- **Wider effects –** At the city level it is likely that the impacts at the level of the measures implemented will be marginal and have the effect of embedding cycling as an accepted transport mode, rather than leading to measurable energy or environmental impacts. While the autumn 2008 travel habit survey conducted by the Department of Streets and Parks shows a clear drop in the use of cars towards, among other modes, bicycles, as has been discussed this change cannot be solely attributed to 8.3. Furthermore, the absolute traffic volume of cars has not been reduced during SMILE: it is a relative shift away from cars that can be observed.

D Lessons learned

D1 Barriers and drivers

D1.1 Barriers

- **Barrier 1** – A barrier to the evaluation has been a change in the scope to the original measure content and objectives which could have affected the evaluation process in terms of its adaptability to evaluate changes to the newly defined measure. This is not a criticism of the evaluation process but merely an observation.

- **Barrier 2** – A potential barrier exists to gauge the success of the measure in that the evaluation needs to be performed before the completed measure has been operational for sufficient period of time in which it is truly possible to gauge success of its implementation. This has not been possible for all sub-measures that make up 8.3

- **Barrier 3** – Integration with other modes of transport is a fundamental element of this measure, yet caused part of the change to the technical implementation due to conflicts over space and resource at the interchange sites. Presumably this reflects a lack of sufficient scoping on the part of the original measure proponent.

- **Barrier 4 –** The desire to operate the cycle detectors only at off peak times in order not to risk increasing congestion for cars and buses is a barrier to its full potential and its wider implementation. Should detectors be used during all hours in the future it is important that algorithms are used that permit cyclists to receive more priority during rush hours.

D1.2 Drivers

- **Driver 1** – one of the key drivers is the pre-existing high proportion of bicycle access in Malmo (90%) and relatively high proportion of cycle journeys (20%).
- **Driver 2** – the desire to further support cycling as a mode of transport because even though the level of bicycle use is relatively high, there is still a gap between use and access that provides potential for further bicycle use.

D2 Participation of stakeholders

- **Stakeholder 1 –** People travelling in Malmö, including travellers by car, bus and cycle, living in the city as well as visitors.
- **Stakeholder 2** – Malmö stad, local/regional administration has a leading role in the project.
- **Stakeholder 3** – Skånetrafiken, transport/traffic department, is a partner in marketing and information activities.

D3 Recommendations

- **Recommendation 1 -** it is recommended that measuring the increase of cycle journeys as a result of the measure implementation is included in measure objectives and should tie in with wider transport monitoring activities and transport models.
- **Recommendation 2** – marketing campaigns and activities for promotion of cycling should become strategic and policy driven to form part of the local and national transport policy to encourage uptake of similar measures in other cities and towns.
- **Recommendation 3 –** For the success of this measure it is important that soft and physical measure solutions are complementary, i.e. marketing as a soft improvement measure should have a holistic approach to promoting the benefits of cycling including the promotion of new build cycle lanes, cycling facilities and public transport interchanges to achieve modal switch from cars to bicycles. This could involve targeting campaigns in the areas around new infrastructure or for particular types of trips.

D4 Future activities relating to the measure

To fully evaluate the success and the impact of the measure it would be worth repeating some of the surveys to achieve comparability between 'before' and 'after' measure implementation. Goals of evaluation should incorporate the increase in the number of cyclists as a result of tasks 2, 3 and 4.

Future marketing campaigns can run periodically and need to adopt a holistic approach to promotion of benefits of cycling.

Malmö intends to continue to work to improve conditions for cyclists and will use the bicycle parking facility model in coming work as the stations along the underground City Tunnel railway near completion.

E Appendix

A copy of the questionnaire form in Swedish used at the locations indicated in map 5.

	Var?	Datum och tid	Vem?

		1	2	3	4	5
Födelseår						
Kvinna/Man						
Hur ofta cyklar längs stråket? * Dagligen * Någon gång/vecka * Någon gång/månad * Sällan						
Upplevelse av stråket (1-5, 1 bäst)						
A. Säkerhet						
B. Snabbhet						
C. Bekvämlighet						
D. Skyltning för cyklister						
E. Belysning (KVÄLLEN)						
Sett förbättringar längs detta stråk?						
- Om JA, vad/vilka/var?						
Vilket transport vanligast för dig? * Cykel * Bil * Buss * Gå						
Vilka andra cykelåtgärder har gjorts under 2007-2008 att gynna cykling?						