

## **A Introduction**

Measure 6.1 includes changes in the geographical extent of the existing environmental zone for heavy vehicles in Malmö, the educational efforts to inform relevant actors in the freight sector about the changes including the extent of and regulations concerning the zone, and changes in the enforcement methodology and organisation. The changes in the enforcement methodology and organisation are mentioned in this technical evaluation report but are not subject to a technical evaluation.

To assist in understanding and make this report less wordy, the previous environmental zone for heavy vehicles in Malmö that existed prior to SMILE will be referred to as “the old zone” in the rest of this report. The new environmental zone for heavy vehicles in Malmö which came into place during SMILE will be called “the new zone”. When the word zone is used in isolation this concerns environmental zones for heavy vehicles in Sweden in general or is used to talk about both the old and the new zone. Maps of both the old and new zones in Malmö appear later in this report.

### **A1 Objectives**

The aim of the measure is to reduce emissions from heavy vehicles in (central) Malmö and improve local air quality. The measure objectives are:

- **Objective 1:** To extend the old zone’s geographical coverage and thus establish a new zone.
- **Objective 2:** To change the Swedish national laws and regulations concerning extended environmental zones so that the monopoly on enforcement held by the police is lifted.
- **Objective 3:** To educate and inform stakeholders and the public about these changes
- **Objective 4:** To commence enforcement by parking guards.
- **Objective 5:** To evaluate the results and use the findings of the evaluation for possible changes in the future
- **Objective 6:** To promote stricter regulations for heavy vehicles.

### **A2 Description**

The extent of the new zone was determined after studies of heavy vehicle traffic patterns and discussions within the Department prior to presenting a proposal to the political body that would decide on zone expansion. To make it easier for relevant actors in the freight sector to comply with the changes and to encourage their acceptance, a non-SMILE goal was to coordinate Malmö’s efforts with similar efforts in Göteborg and Stockholm. In this way similar regulations would be in place in Sweden’s three largest cities and zone expansion would take place at about the same time. This influenced the roll-out of the measure in Malmö where, in the interest of greater national impacts and synergies, there were some delays and adjustments.

Both the old and new zones target heavy vehicles that use diesel as their source of power. Heavy vehicles that use other fuels are exempt from the regulations and compliance with the zones.

Buses, lorries and other vehicles that are heavier than 3.5 tonnes are covered by the regulation. However, since all urban buses in regular use that provide intra-urban services in Malmö are running on vehicle gas (an approximately 50-50 mix of biogas and natural gas) [see measure 5.2 Biogas on the net], these vehicles are not covered by the zone. Furthermore, inter-urban buses that run between Malmö and Lund (the closest commuter destination) also run on vehicle gas and some other inter-urban buses running to/from Malmö also regularly run on vehicle gas. This means that the overwhelming majority of buses running within Malmö are not fuelled using diesel. For this reason buses have been kept out of the study and the focus has been on lorries and other similar vehicles.

The reader should note that in previous information about 6.1, ie the original detailed measure plan from 2005, there were only 5 tasks. In this evaluation report the tasks are renumbered and the actual legal establishment of the zone is added as an official task. It should be obvious to have zone implementation as a separate task but this has not been the case hitherto.

#### ***Task 1 Planning for a larger zone – i.e. the new zone***

Planning the new zone was based on the evaluation of the old, existing zone, assessment and traffic statistics. Discussion with heavy vehicle organisations and the cities of Stockholm, Göteborg and Lund took place in parallel. The enlargement of the zone depended on decisions taken by the political committee which deals with traffic in the city of Malmö.

#### ***Task 2 Stricter regulations for heavy vehicles***

Together with Stockholm, Göteborg and Lund a suggestion for new stricter regulations for heavy vehicles in the new zone was developed. This included dialogue with branch organisations and relevant national ministries. The stricter regulations in the new zone required a decision from Swedish ministries and a decision taken by the political committee which deals with traffic in the city of Malmö.

#### ***Task 3 Information campaign about the new environmental zone and stricter regulations for heavy vehicles***

Originally there were plans to have information on the Internet, malmo.se, about the zone and the new stricter regulations as well as distribution of information brochures to different branch organisations.

#### ***Task 4 The new zone is established***

This task follows from success in tasks 1 and 2 and is completed after task 3 is started. Surprisingly this task has not been explicitly mentioned in some documents concerning this measure.

#### ***Task 5 Influence the law to improve surveillance and enhance compliance***

Co-operation with Stockholm, Göteborg and Lund was sought to make a proposal for change in the law. The goal was a change in the law so parking guards can supervise the enforcement of the law i.e. the new zone. It was essential to convince different ministries in Sweden that it is important to change the law and to make a suggestion for the change of the law. This was unsuccessful and is commented upon in deviations.

#### ***Task 6 Enforcement of the new environmental zone***

This task follows on from task 5. Since task 5 was not realised this impacted on the realisation of task 6. Instead of parking guards to supervise the zone regulations, measure leaders have had dialogues with the police about enforcement.

## **B Measure implementation**

### **B1 Innovative aspects**

- **New organisational arrangements or relationships**– In the past each municipality in Sweden that wanted to create a zone mostly worked alone and there was not much collaboration. This measure involved extensive co-operation between different actors such as the municipality of Malmö, Stockholm, Göteborg, Lund, transport organisations and national bodies. By establishing national level regulations about emissions and vehicles in zones this opened up for other municipalities to establish their own zones with a geographical extent based on local needs. This means that Stockholm, Göteborg, Malmö and Lund lead the way which may make it easier for other Swedish cities to follow in the future.

In the past each city had its own information about their respective zone. In SMILE Malmö actively collaborated in the creation of a common information pamphlet which was distributed in each city. In this way, for example, a lorry driver and his company in Stockholm learns about the geographic extent of the zone in Malmö before coming to Malmö. Materials in English were also created so that foreign lorry drivers could learn about the zones and their regulations when crossing into Sweden and not when approaching each city, by which time it would be too late.

New ways of enforcing and evaluating the compliance were intended in this measure. The idea of “ticketing” parked lorries in violation of the zone was very innovative instead of a more gate keeping function or enforcement of heavy vehicles entering the zone which might be considered obtrusive and lead to wider slow traffic flow. The idea of letting parking guards ticket lorries while they were stopped would have made enforcement easier and more effective. However, because of the “failure” of task 4, this was not possible

### **B2 Situation before CIVITAS**

#### **Sweden**

Ambient air quality has improved in the centres of urban areas in Sweden thanks to a number of measures undertaken since the 1960s to the present. SO<sub>x</sub> levels are now very low but NO<sub>x</sub>, PM10 and O<sub>3</sub> levels are still high at times in a number of places and the principle culprit is traffic.

#### **Zones**

One action that can help keep emissions low is the implementation and proper enforcement of environmental zones for vehicles so that those with low enough emissions can have access to the entire city. Other vehicles, with higher levels of emissions, are not permitted in environmental zones thus reducing emissions directly and – in the long term – indirectly, since vehicles with higher levels of emissions become less interesting to use and keep. This may have effects on vehicle retirement rates. In the Swedish context only heavy vehicles have been subject to the laws and ordinances pertaining to environmental zones for vehicles.

#### **Malmö**

In a variety of central locations in Malmö ambient air quality has not met environmental norms for good air quality as established by the Swedish environmental goals process and/or

the EU. Several strategies may be required to improve the situation and in Malmö a new zone was identified as a tool to improve the situation.

The old zone in Malmö included only the very central parts of the city. Discussions were underway, prior to SMILE, to enhance or extend the old environmental zone.

### B3 Actual implementation of the measure

Because of changes in measure leadership and the evaluator's efforts were mostly directed at data capture concerning movements of heavy vehicles as well modelling of traffic flows. Information was not gathered about the actual implementation of the measure in terms of stages. The following timeline is an approximate reconstruction where 1<sup>st</sup> means first half of the year and 2<sup>nd</sup> means the second half of the year.

Table 1: Graphic Representation of the Approximate Stages of Measure Implementation

	2005	2005	2006	2006	2007	2007	2008	2008
Task	1st	2nd	1st	2nd	1st	2nd	1st	2nd
1. Planning new, larger zone								
2. Stricter regulations								
3. Information campaign								
4. New zone established								
5. Law change for new enforcement								
6. Enforcement						?	?	?
E: Evaluation activities: traffic flow data collection = X contacts with companies = C questionnaire general public = Q		X C		X		X	Q	

Note that "grey boxes" in the table either indicate that the task was ended because it was not possible to realize (task 5) or that deadlines meant that no further work was possible (task E). In task 6, the measure leader has pursued enforcement but it is unclear how regular police activity has been since the start of task 4.

### B4 Deviations from the original plan

The deviations from the original plan comprised:

- **Deviation 1: Implementation delayed.** – The original measure leader intended for the new zone to come into force during 2006 but this was postponed for two main reasons: 1) in the interest of collaboration with the other cities for better coordination of timing and regulations and 2) because of wanting to ensure a positive decision by the political body that would decide on the new zone. A further reason *could be* that at some point there was an idea to delay implementation in an effort to include Task 4 and Task 5 but this is unclear because of changes in measure leaders during the measure.
- **Deviation 2 Unsuccessful Task 4 and Task 5** – Because of decisions not taken at the national level, *police forces retained the exclusive right and responsibility to enforce zone regulations*. The cities (including Malmö) were unable to realise an extension of the right to

enforce the zone to other bodies/organisations including the municipalities/cities themselves. In Malmö's case the intention was to use parking guards to ticket parked/stopped heavy vehicles in violation of the zone. This "failure" may have, in part, been the result of the cities having different ideas about this and other points and national ministries therefore sticking with a national level enforcement mechanism i.e. the police. Göteborg wanted all vehicles to have stickers or decals issued by the city proving that they had access to the new zone while Stockholm and Malmö were not as interested in using stickers as a solution. In Malmö among others the measure leader at the time could foresee parking guards with a portable 'mini-computer' with the registration numbers of vehicles that were permitted in environmental zones. Using this technology the guards could ticket those vehicles stopped on public roads or publically owned parking lots that did not appear in the database. One of the points of opposition that arose concerning the Malmö proposal was that vehicles parked in privately owned park facilities could not be reached by law enforcement. Furthermore, lorries based in Malmö that did not make deliveries in Malmö, could continue driving in and out of the zone for deliveries elsewhere since when the lorry was not used it would be parked in the company's own property out of reach of enforcement.

- **Deviation 3 Information** – National level coordination of an information campaign was hoped for but not planned for in SMILE. This positive deviation helped implementation in Malmö and led to slight changes in the location information and education activities.

The exact content and timing of the information part of the measure was not clear to the evaluation staff and what planning there was apparently changed because of shifting circumstances. The exact geographical extent to the new zone was subject to discussions and decisions in Malmö and it could be that the original, preliminary, geographic delimitations changed somewhat during the measure planning phase. However, as far as the technical evaluation staff can tell, the exact geographical coverage of the new zone was not stipulated in the original SMILE application. This means that while there were surely deviations from the original planning it is difficult to attach quantitative, descriptive information to these changes.

## **B5 Inter-relationships with other measures**

This measure is not directly related to any other measures in SMILE since it operates independently. However, 6.1 and other measures have clear objectives to improve air quality in central parts of Malmö. This means that there are some linkages.

5.2 Biogas on the Net. In the long run because of the availability of biogas mixed with natural gas and sold as "vehicle gas" it will become an option for the owners/operators of heavy vehicles to use lorries that do not run on diesel. The advent of the new zone may provide encouragement to use the results of 5.2 as a means to meet the requirements of the new zone.

Malmö LBC measures. Malmö LBC is one of the largest locally-based freight hauling organisations. Their measures have involved heavy eco-driving and freight driver support. It is possible to envision connections between Malmö LBC and similar organisations and 6.1

## C Evaluation – methodology and results

### C1 Measurement methodology

Evaluation efforts and methodology concentrated on three tasks:

- A. Collection of traffic data for heavy vehicle movements in relation to the zones and regulations. This work was conducted by the technical evaluation staff in conjunction with the measure leader(s). University students and others were enlisted for data collection.
- B. Attempt at evaluation of awareness and acceptance on the part of organisations and lorry owners directly affected by the measure. This work was done primarily by the Department of Streets and Parks.
- C. Evaluation of awareness and acceptance about the measure on the part of the general public. This work was done primarily by the technical evaluation staff at LTH and Mah with the assistance of university students for questionnaire distribution and collection followed by data entry/coding of the questionnaire.

#### C1.1a Impacts and Indicators

Table 2: Table of Indicators used in this Evaluation Report.

Nr.	Relates to GUARD	INDICATOR Name	DESCRIPTION	DATA /UNITS
1		Measure revenues	Direct financial revenues as the result of this measure	SEK
2		Measure costs	The costs for the tasks required for this measure with the exception of task 6	SEK
4		Fuel mix	Energy per type of fuel, per vehicle type	Derived
8		CO <sub>2</sub> emissions	CO <sub>2</sub> per vkm	G/vkm, derived
10		NO <sub>x</sub> emissions	NO <sub>x</sub> per vkm	G/vkm, derived
11		PM10 emissions	Pm10 per vkm	G/vkm, derived
13		Awareness level	Degree to which the general publics awareness has changed	Survey
14		Acceptance level	Survey of opinions on part of general public Survey of opinions on part of operators	Surveys
MSE-33	14	Compliance	Degree to which drivers comply with the regulations	Observation, survey, checking of registration

Indicator 4 is included in case this was needed for determination of indicators 8, 10 and 11. Reduction of CO<sub>2</sub> emissions was not an objective of this measure but is included nonetheless to facilitate comparison of the results of this measure with other SMILE measures. ***This means that indicators 4 and 8 can be considered a bonus since they were not originally specified for the evaluation of this measure.***

While the emissions from heavy vehicles in Malmö have an effect on NO<sub>x</sub> and PM10 levels, the quality of air “imported” from outside Malmö effects these levels in Malmö as well. Observed NO<sub>x</sub> and PM10 levels show no changes that can be directly attributed to the measure and therefore are excluded from consideration as indicators. According to the City Department of Environment, air quality on a yearly basis worsened in 2006 compared to 2005. In 2007 there was an improvement in comparison with 2005 and 2006 but this was because of better weather conditions during otherwise problematic times of the year. These better weather conditions lead to much faster dispersion of emissions. During much of SMILE total traffic work in and around Malmö increased because of general economic growth in the EU, in the Öresund Region (eastern Denmark with Copenhagen and Skåne), and in Malmö itself. See Box 1 below for a further discussion and more information.

A more detailed description of the indicator methodologies follows below:

- **Indicator 1** (Measure revenues) – There are no direct or indirect revenues accruing to the Department of Streets and Parks from the implementation of this measure.

Reduced emissions may lead indirectly to reduced costs on the part of other actors/organisations in and around Malmö.

- **Indicator 2** (Measure costs) - This is based on information provided by the measure leader. Costs for task 6, enforcement, fall outside CIVITAS and are carried by the police force. Had objective 2 and task 5 been realised then objective 4 would have been pursued as part of task 6 and the costs incurred within CIVITAS. Costs for compliance on the part of the lorry owner/operators are not included.
- **Indicator 4** (*Fuel mix*) – This indicator concerns not the fuel actually used by the vehicles *per se* but rather the kind of fuel the motor is registered as built for. Information here is obtained by recording vehicle registration plates on vehicles moving into and out of the new zone and comparing this with information provided by the National Road Administration's vehicle data base. Using this information it is possible to estimate emissions from the various vehicles moving into and out of the zone given certain assumptions about their total traffic work in the zone itself. This indicator is primarily used to help obtain results for indicators 8, 10 and 11.
- **Indicator 8** (*CO<sub>2</sub> emissions*) – This indicator is an estimate of the amount of CO<sub>2</sub> emissions prior to the new zone and after the establishment of the new zone. Reductions of CO<sub>2</sub> emissions are not part of the objectives and tasks of this measure since it is the ambient air quality in Malmö which is supposed to be improved by this measure and CO<sub>2</sub> is a “global pollutant” and not a “local pollutant”. Consider, therefore this indicator to be a bonus. Changes in CO<sub>2</sub> emissions come primarily from a switch of lorry fuel and the figure is derived from an observed switch of lorries.
- **Indicator 10** (NO<sub>x</sub> emissions) – This indicator is an estimate of the amount of NO<sub>x</sub> emissions based on observed changes in lorries using the zone. Lorry models and their emissions are derived from registration of vehicle registration plates and comparison with the National Road administration's vehicle data base in a way similar to that described under indicator 4.
- **Indicator 11** (PM<sub>10</sub> emissions) -- This indicator is an estimate of the amount of PM<sub>10</sub> emissions based on observed changes in lorries using the zone. Lorry models and their emissions are derived from registration of vehicle registration plates and comparison with the National Road administration's vehicle data base in a way similar to that described under indicator 4.
- **Indicator 13** (Awareness level) and **Indicator 14** (Acceptance level) – Awareness and acceptance goals *per se* are not part of measure, objective and task fulfilment but are used to describe the relationship of freight companies to zones and the level of awareness and acceptance on the part of the general public after the establishment of the new zone.
- **Indicator MSE-33** (relates to Guard/Meteor indicator 14) – But this Malmö-Specific indicator concerns driver and company compliance with the regulations and the new zone. This is measured by recording vehicle registration plates on vehicles moving in/out of the zone and comparing these with model, make and year of manufacture and year of registration to determine percentage of vehicles in compliance with the new zone and percentage illegally in the zone.

**Box 1: The following are NOT indicators but factors for discussion.**

Factor 6 NO<sub>x</sub> levels and Factor 7 PM<sub>10</sub> levels are determined by measurements undertaken on a regular basis by the Department for the Environment, Malmö, at various locations. These factors can be used to determine the “success” of several SMILE measures which, taken together, may have reduced NO<sub>x</sub> and PM<sub>10</sub> concentrations or reduced the number of days per year when air quality levels are exceeded. (Possible) changes in these concentrations cannot be solely attributed to this measure. For a more detailed description of measurements (locations and methodologies) see the following link in Swedish: <http://www.malmo.se/miljohalsa/luftvattenmark/> and then choose “luft” (air) in the menu. Because of the discussions about air quality in Malmö, the complexities of changes in various factors that influence air quality and the obvious but tenuous link between this measure and these two factors, they will not be used as indicators for this measure.

**C1.1b Data collection****For evaluation task A: heavy vehicle movements**

Data collection involved registration of license/registration plates for all heavy vehicles moving past specific points. The evaluator originally chose the first Tuesday morning between 8-10 am in October each year for data collection. The goal was to collect data in 2005 for a baseline and then in 2006 and 2007 to help determine effects. Changes in the measure led to a postponed date for zone implementation. As a result data collected on 4 October 2005 and 3 October 2006 became the baseline and data collected on 23 October 2007 fell within actual implementation of the measure. It would have been desirable to collect data during October 2008 as part of SMILE but results from this collection would have been too late for evaluation deadlines imposed by the CIVITAS programme. Data was collected on the third Tuesday in October in 2007 instead of the first Tuesday during previous years because 1) the new zone came into effect on 1 September 2007 and some smaller organisations might not have been fully prepared in time which suggested an additional amount of time (two weeks) and 2) last-minute changes in personnel at the Department of Streets and Parks during the summer of 2007 meant that the organisation of the data collection was delayed.

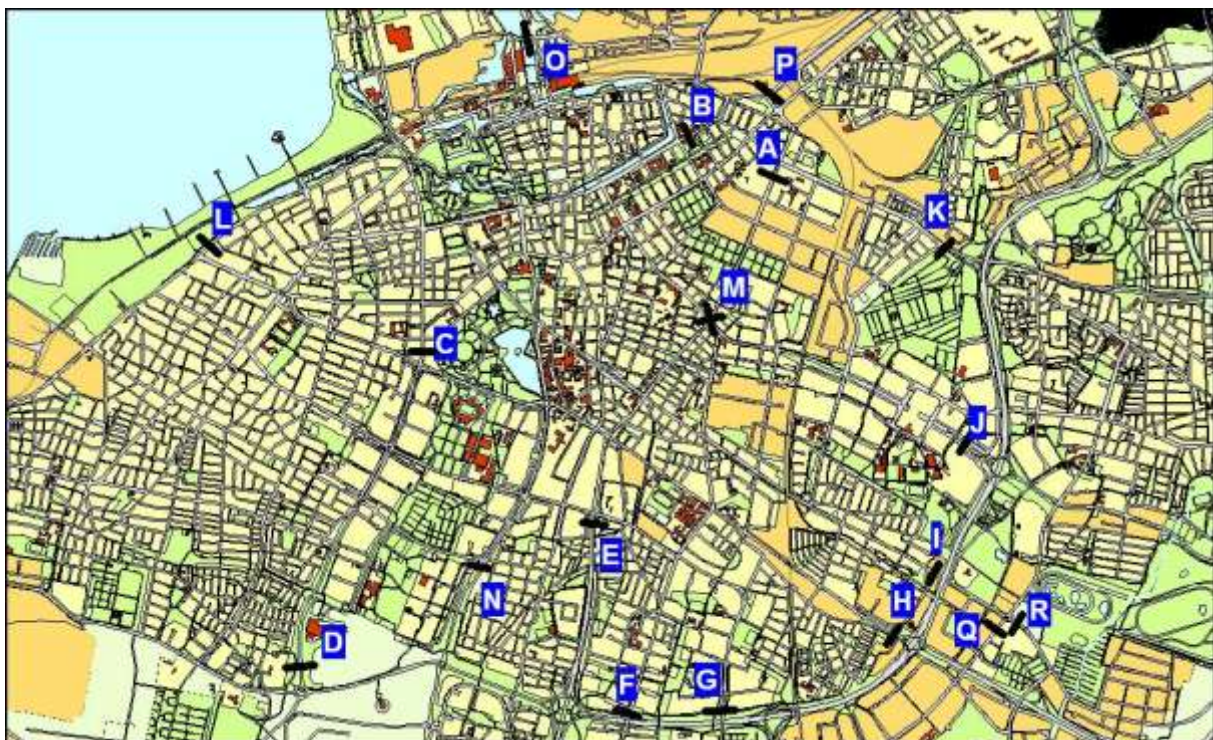
The Department of Streets and Parks simulated the traffic movement of heavy vehicles in Malmö and provided these statistics, both number of vehicles on routes and the total vehicle km per 24 hour period. Using this it was possible to estimate the percentage of daily traffic that the above data collection exercise captured and relate this to the total amount of traffic of heavy vehicles. Knowing the approximate amount of vkm for heavy traffic in Malmö, and in particular inside the zone, it was possible to scale up the Tuesday morning two hour observations into daily estimates.

Maps below show the locations of the zones and the sections of roads where passing heavy vehicles were counted and vehicle registration numbers recorded.





Map 1: Location of the old zone (blue dotted line) and the new zone (red solid line)



Map 2: Data collection points for heavy vehicles crossing the specific section. Points A-M were used in 2005. Points A-R were used in 2006 and 2007.

Table3: List of the data collection locations and their use during 2005-2007

Data Collection Date	Within Old Zone	Within New Zone	Outside Zones
4 October 2005	A, B, C, M	D, E, F, G, H, I, J, K, L	
3 October 2006	A, B, C, M	D, E, F, G, H, I, J, K, L, N	O, P, Q, R
23 October 2007	A, B, C, M	D, E, F, G, H, I, J, K, L, N	O, P, Q, R

Using this stepwise data collection methodology we could determine in 2005, as a baseline, compliance and emissions in the existing old zone as well as compliance and emissions in the future new zone if this area had been part of the zone already. This was repeated in 2006 with the addition of an additional data collection location (N) in the area that was to become the new zone but also at four locations (O, P, Q, R) outside all zones. The rationale behind determining vehicle traffic and types outside the zone was an attempt to gauge the effects of the introduction of the new zone on vehicles and their emissions outside the future zone.

Unfortunately, because of personnel changes at the Department of Streets and Parks, some of the data in the 2006 data collection has been lost and/or is difficult to interpret so in the interest of expediency this data will be left out of this report and further analysis and evaluation.

### **For evaluation task B: opinions of drivers and freight companies in Malmö**

During 2005 the Department of Streets and Parks distributed 200 questionnaires to stakeholders (drivers/owners of lorries whose vehicles were registered in Malmö) to obtain their opinions about the (then) old zone, how they were effected, their awareness, problems that they wanted to bring to the Departments attention. This was part of the preparation for zone expansion.

Because of an insufficient response rate, the Department chose to conduct telephone interviews with an additional 200 people. Out of a total population of 400 people the Department reached 133 individuals either by letter or telephone.

Ideally a similar survey should have been conducted after the introduction of the new zone. Perhaps the Department will conduct such a survey in the post-SMILE period when the new zone is not quite as new. A survey conducted rather soon after introduction of the new zone would, perhaps, given an overrepresentation of observations and opinions just after the changes which might not be entirely representative of long term experiences and knowledge.

The technical evaluator has had occasional informal discussions with representatives of freight interests during 2007 and 2008 to unofficially gauge awareness and acceptance after the introduction of the new zone.

### **For evaluation task C: awareness and acceptance of the zone by the general public**

As part of the SMILE General Public Survey conducted during April and May 2008 over 3000 responses to a questionnaire were received on various issues and about a number of the SMILE measures implemented in Malmö. The delivery and collection method was as follows:

1. A pilot questionnaire was distributed and collected in a number of public locations (shopping malls, public squares, and bus and train stations). University students were enlisted to distribute, provide assistance in completion, and collect on-site all distributed questionnaires.
2. Based on the results of this pilot study, the questions were modified and the choice of public locations adjusted accordingly. The main questionnaire was distributed and collected in a similar manner to the pilot study.

While it may have been of interest to have conducted a similar study prior to the introduction of the new zone in September 2007, when looking at the results of the spring 2008 study one can question what additional relevant materials could have been collected in this way. Furthermore, evaluation funding would not have been able to support two public surveys of this type. Therefore, as part of a general strategy, the public survey was conducted at a time when most of the SMILE measures in Malmö were complete or were nearing completion.

## C1.2 Establishing a baseline

The baseline is a description of the situation prior to the implementation of the measure. Originally the intention was to determine traffic flows and emissions in the old zone and the geographical extent of the new (future) zone to judge to what extent lorry operators and drivers were already respecting the coming regulations in the area that was to become part of the new zone. See Map 3 for a picture of the old zone. This is discussed elsewhere in this evaluation.

Traffic flow simulations for heavy vehicles used in the baseline come from data prior to 2005 which is otherwise taken to be the baseline. The Department of Streets and Parks polled relevant stakeholders in an attempt to judge some form of awareness and acceptance prior to the start of the new zone.



Map 3: The Extent of the Old Zone

## C1.3 Building the business-as-usual scenario

As with other SMILE measures we have to ask ourselves what the situation would be if the measure was not all implemented. In this case we have several options to consider where Map 4 can be consulted:

1. The measure is not implemented. However, since 6.1 is one of a number of efforts undertaken by the Department of Streets and Parks to improve air quality in central Malmö and the City is under very strong pressure from regional and national authorities to improve air quality the City decides **on other SMILE measures** with a similar intended effect and implements these instead. This could have lead to similar reductions in emissions as those in 6.1 or perhaps even greater reductions.
2. The measure is not implemented. However, since 6.1 is one of a number of efforts undertaken by the Department of Streets and Parks to improve air quality in central Malmö and the City is under very strong pressure from regional and national authorities to improve air quality the City decides **to accelerate or put much more emphasis on other on-going activities**. This could have lead to similar reductions in emissions as those in 6.1 or perhaps even greater reductions.
3. The measure is not implemented. Despite very strong pressure from regional and national authorities to improve air quality the City decides to “do nothing” and risk fines and other sanctions.



Map 4: On the left is the location of worst air quality at street level in central locations in relation to, on the right, the old zone (dotted blue line) and the new zone (solid red line). The map on the left fits into the map on the right as shown with the solid purple line. The red lines in the map on the left represent areas with the most frequent violations of air quality norms and the yellow lines represent areas with less frequent violations.

Here we are faced with a dilemma in terms of evaluation. In all likelihood, given 1) the air quality problems, 2) that these problems stem primarily from traffic emissions, 3) the city is under strong pressure to meet air quality norms, it is **extremely unlikely** that the city would choose to “do nothing” as suggested as a possible business-as-usual scenario number 3. On the other hand what the city would do instead would probably be a combination of scenarios 1 and 2 above which would have the goal of reaching similar levels of improvement in air quality.

We, as SMILE technical evaluators, are faced with a fourth, scenario to consider, namely:

4. That the city might have chosen to implement a project separate from SMILE, but run in parallel, that would be very similar to 6.1 and in all practical purposes could be considered identical to 6.1 in terms of goals, tasks, implementation and results. In other words, it is very likely that Malmö would have implemented the new zone even without SMILE funding.

This means that while GUARD methodology requires the establishment of a business-as-usual scenario where the measure is not implemented, in actual practice this is a fictional construct for SMILE measure 6.1 since the city of Malmö would probably have implemented something like 6.1 regardless of SMILE funding or not. However, in the interest of conforming to the theoretical evaluation methodology of GUARD the business as usual scenario could be considered to be a similar level of emissions (and air quality) to that which would have existed prior to the start of the implementation of 6.1 i.e. the baseline.

## C2 Measure results

### C2.0 Observed vehicles and relations to modelling/simulation

Prior to the presentation of results based on the indicator headings, information about the observed vehicles and the relation of these observations to the simulation of traffic volume must be considered. There is some uncertainty about how representative the vehicle movement data is since this data was collected in two hour snapshots (which is about 0.02% of all hours in a year).

There have been several assumptions made to link observations in October 2005 and October 2007 with total driven km by heavy vehicles in Malmö. There are some inconsistencies in the traffic volume simulation and the actual observations for October 2005 and 2007. Where the

modelling and observations deviate a lot, it would be reasonable to assume that the observations are more reliable. Representatives of the Department of Streets and Parks have said that the modelling results they use are good for cars but since there are fewer lorries compared with cars this leads to a poorer result.

During the 2 observation hours in October 2007 a total of 701 lorries were observed at all data collection points. Some of these were not diesel lorries and thus not subject to regulations in the zone. The three data collection points into and out of the new zone which had the highest traffic volumes in October 2007 (E, P and H) have been used to estimate how much the traffic volumes recorded represent a typical weekday and thus what percentage of all heavy vehicle traffic volume has been collected. Based on this and assumptions and modelling carried out by the Department, we will assume that lorries travel 7000 km/day within the new environmental zone.

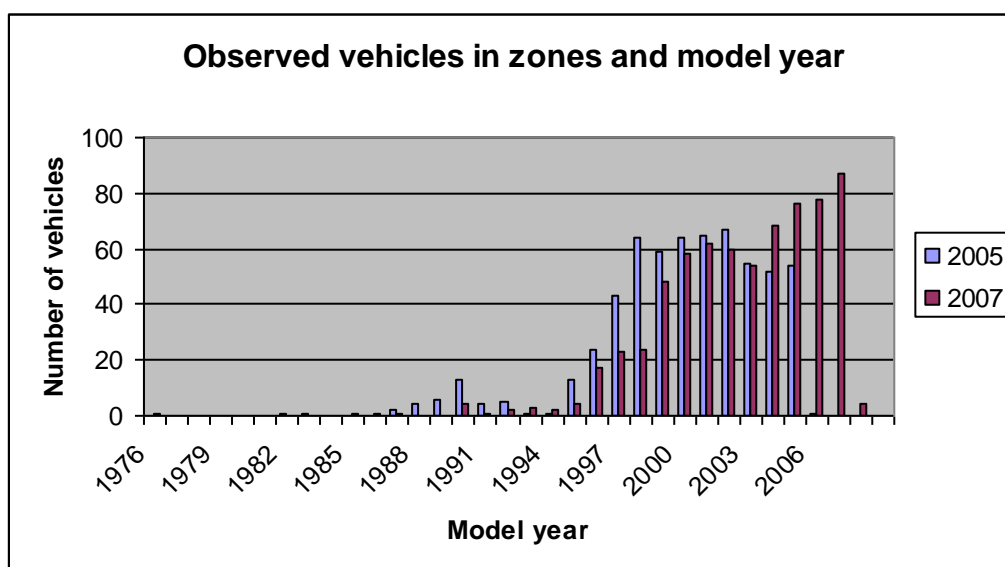


Diagram 1: The registration years for observed heavy lorries at all observation points during October 2005 and October 2007.

## C2.1 Economy

There are no revenues for this measure. Cost figures are difficult to establish but are on the order of 700 000 – 800 000 SEK during the duration of SMILE. Task 6, enforcement, is left out of the costs of this measure since police costs are external to SMILE.

## C2.2 Energy

The overwhelming majority of heavy lorries used in and around Malmö have diesel as their fuel. In 2005 less than 1% of heavy vehicles observed in the geographical extent of the new (2007) zone ran on gas. In 2007 this figure had increased to almost 2% which may be, in part, thanks to measures 5.2 and 5.3. Often the remaining lorries used petrol as fuel. A total of about 4% of all observed lorries in 2007 were registered as non-diesel powered.

While encouraging, the use of gas in heavy vehicles is still a very marginal phenomenon and the retirement of diesel heavy lorries in favour of heavy lorries powered by other fuels should not be directly attributed solely to SMILE measure 6.1. It is very likely that the new zone has influenced decisions to switch to non-diesel lorries but it appears that 6.1 has had a greater effect on retiring older diesel lorries to newer diesel lorries, as can be seen in Diagram 1 and Diagram 2, than a switch in fuels. We will simplify the calculations concerning the environment and count all lorries running in the new zone as diesel powered in the evaluation of this measure.

## C2.3 Environment

Emissions of CO<sub>2</sub> are not simply a conversion of km driven times an emissions factor of g CO<sub>2</sub>/km since the CO<sub>2</sub> emissions are largely a function of amount of fuel used. Fuel use depends on traffic and driving conditions, the weight of the load and the fuel efficiency of the motor. Of course some of the drivers may have taken an eco-driving course like the ones provided within SMILE in Malmö, but here we will assume that the effects of eco-driving cannot be measured as part of measure 6.1

We will assume in this evaluation that all lorries are 50% fully loaded and that 30% of all lorries driven in Malmö have an articulating trailer attached while 70% are just a single lorry. The latter assumption is based on information provided by the Department of Streets and Parks as part of the modelling system used. In some central parts of Malmö most lorries are probably shorter because of space constraints in the street network but we will retain the 30-70 assumption from the Department. Emissions factors used in the calculations appear in table 4 on the following page. For emissions of NO<sub>x</sub> and PM<sub>10</sub> we will use a distribution of Euro class engines based on data collection in October 2005 and October 2007 and vehicle registration information where the Euro class is known or can be inferred. This is shown in diagram 2 below.

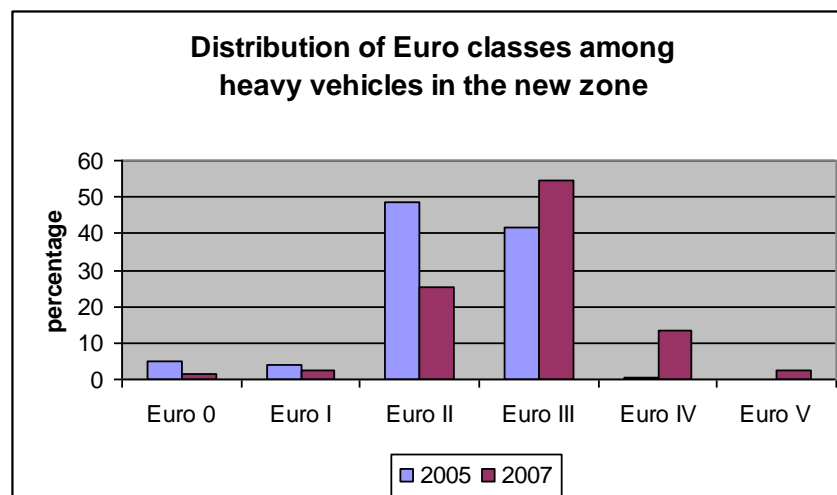


Diagram 2: Distribution of engine Euro classes among heavy vehicles. The 2005 distribution covers the geographic extent of the future new zone while the 2007 distribution covers the actual new zone.

The number of kilometres driven by heavy vehicles in the new zone will vary from day to day. Greater economic activity would tend to increase the number of lorries using the street network and thus increase the total traffic volume from lorries. The number of observed lorries in October 2005 to October 2007 increased. Furthermore, during SMILE work has commenced on the City Tunnel rail project which is a major infrastructure improvement. Large construction projects have started in parts of southern Malmö in conjunction with the City Tunnel and construction has accelerated in the Western Harbour. This may have also contributed to the increase in traffic volumes for heavy lorries.

In 2001 traffic models suggested that the total traffic volume for heavy vehicles in what would become the new zone in 2007 totalled 6637 km per two hour observation period. In this evaluation we will assume that this figure would have been 7000 km during 2005 and 2007. We believe that these figures will tend to decline in coming years as construction on the City Tunnel nears completion and the effects of a global economic downturn may be felt during 2009 and 2010.

The following table contains the assumed emissions of the vehicles.

Euroclass	0	I	II	III	IV	V
CO <sub>2</sub>	912,6	806,9	806,9	806,9	806,9	806,9
NO <sub>x</sub>	16,372	9,098	7,958	5,572	3,903	2,231
PM <sub>10</sub>	0,7	0,349	0,142	0,098	0,0196	0,0196

Table 4: Emissions factors used to calculate total emissions in a baseline, business as usual (BAU) scenario and the 6.1 measure (expansion of zone). Figures are in grams per km driven. For Euro 0 the emissions of PM<sub>10</sub> are not known but assumed to be about twice those of Euro I (appears in pink).

Table 5, below, shows the results of the calculations for the two hour observation period on a yearly basis (multiplied by 365 days).

Time	Observation	CO <sub>2</sub>	NO <sub>x</sub>	PM <sub>10</sub>
Baseline	Two hours Oct 2005 x 365 days	2 075 673 kg	18 975 kg	409 kg
BAU	Two hours Oct 2007 x 365 days	2 075 673 kg	18 975 kg	409 kg
6.1	Two hours Oct 2007 x 365 days	2 065 950 kg	15 659 kg	285 kg
Result		9 723 kg	3 316 kg	124 kg

Table 5: Emissions during observation scaled up to one year, two hour periods.

The total results should be about ten times greater i.e. the measure led to reduction of about 97 tonnes less kg CO<sub>2</sub>, some 33 tonnes less NO<sub>x</sub> and some 1.2 tonnes less PM<sub>10</sub>.

## C2.4 Transport

Compliance with the zone and its regulation is the principle indicator within the transport heading. Given that data collection has been of “snap-shot” quality the figures presented below are approximations.

### Compliance prior to SMILE (i.e. compliance with the old zone)

Within the old zone (i.e. data collection locations A, B, C, M) the degree of compliance was 89% during October 2005. Compliance levels varied considerably between data collection points.

Within the area that was to become the new zone the degree of compliance (i.e. if the regulations in the OLD zone area had been suddenly expanded to cover the geographic extent of the NEW zone) the degree of compliance was 88% during October 2005. As with data collection points located in the old zone, the compliance levels varied considerably among collection points.

It is interesting to note the similar degree of compliance in the old zone and the area that was to become the new zone in 2007. **This suggests that the old zone had a significant effect on the use of heavy vehicles in large parts of Malmö outside of the old zone.**

### Compliance after expansion of zone

The degree of compliance varies greatly in the new zone. In the October 2007 compliance levels were between 87-100% depending on the data collection point. In some cases, low traffic volumes at some collection points (that were, however, necessary to reduce the number of entry points to/from the zone that were not covered) led to very high rates of compliance. We can say that the compliance rate was approximately 94% for the new zone in the fall of 2007. This can sound very high and successful but as a SMILE partner said “This also means that perhaps as many as 10% of my competitors are breaking the law and putting me in an unfair situation.”

**Compliance outside the new zone.**

In the October 2007 study compliance outside the zone (i.e. if the zone had covered these data collection points) was approximately 90-91%. This figure is a) less reliable than the others since only four data collection points were used and b) not very representative of all areas in Malmö outside the new zone since the four data collection points were located right on the edge of the new zone. Future study of “compliance” outside the new zone should include collection points located in Malmö but at a much greater distance from the edges of the new zone.

Nevertheless, these results suggest that in at least parts of Malmö close to the new zone, compliance is slightly lower but similar to the level of compliance within the new zone established on 1 September 2007. **Further, this suggests that the effects of the new zone (geographic coverage and emissions standards) can be felt outside the geographical extent of the new zone.**

**Where are the lorries that are not in compliance with the zone?**

The following table shows the geographic distribution of lorries that were registered passing data collection points in the zone during October 2007 but which were not permitted according to zone regulations (essentially they were too old or had no exemption). Note that almost 40% are registered to people living in or companies active in Malmö. Combining “Malmö” and “southwestern Skåne” close to 2/3 of all violators of the zone cannot claim ignorance about the zone. See the following map for locations. This shows that it should be relatively easy to get in contact with the owners/operators of these lorries and work to change their behaviour.

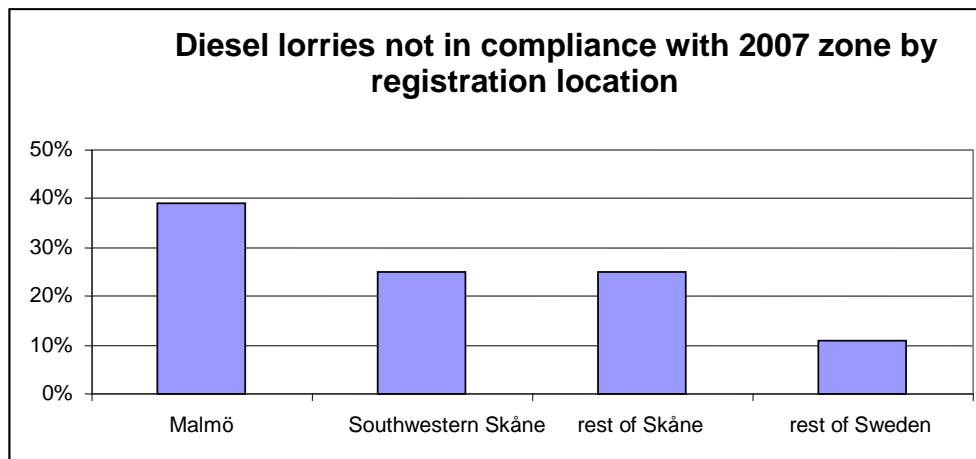
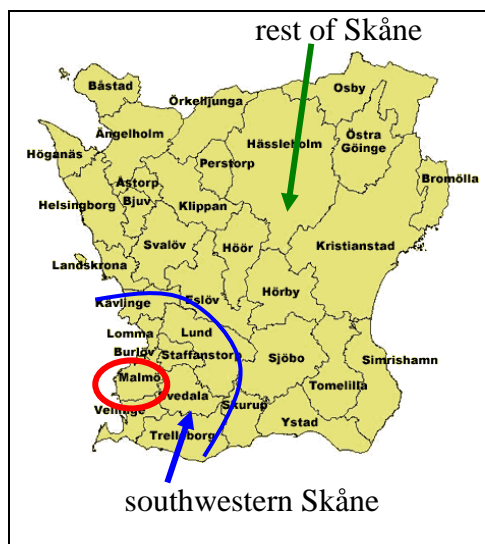


Diagram 3: Location of non-compliant lorries in the new zone during October 2007 data collection





Map 5: Registration locations of lorries used in Diagram 3

### Summary about compliance

The degree of compliance appears to have increased by 5% from 89% in 2005 to 94% in 2007. This is significant but cannot be explained fully by the methodology in this study. Possible explanations are: 1) the success of information activities that were part of SMILE 6.1, 2) that the measuring of compliance in 2007 was less than two months after the introduction of the new zone which means we are measuring the effects of owners and drivers reacting to changes – when the new zone is less “new” then this might lead to a more relaxed attitude and lower compliance levels, 3) insufficient sample size or similar problems with the study design and execution.

Many vehicles moving around areas just outside the zone have emission levels similar to heavy vehicles moving around in the new zone. This suggests that zones in Malmö (both the old and the new) have positive effects outside the zone. This requires further study after SMILE with data collection at new points located at some distance from the edges of the present zone.

## C2.5 Society

### The general public

Results of questions about the zone asked as part of the SMILE General Public Survey conducted during April and May 2008 are presented here. Respondents were asked first if they knew what an environmental zone for heavy traffic was and then their opinion about a zone in Malmö.

1691 individuals responded to the question concerning knowledge about environmental zones and the results are shown in diagram 4. As can be seen in the diagram together about 53% of respondents claimed that they knew what a zone was (but their self-assessed level of knowledge varied) and about 47% did not know what a zone was.

Fewer people replied to the second question where more than one answer was possible. In total 1148 responses were marked. Over half of the responses were that the respondent knew too little to answer.

That Malmö has had an environmental zone since 2002 does not seem to have generated a lot of awareness on the part of the general public given that only 165 of the responses claim that there is a zone in Malmö and that is about 14% of all responses. While by a factor of 15:1

more people think an environmental zone is needed in Malmö than those who think one is not needed, this should be interpreted with caution since the majority of respondents do not know what a zone is or feel that they know too little to answer.

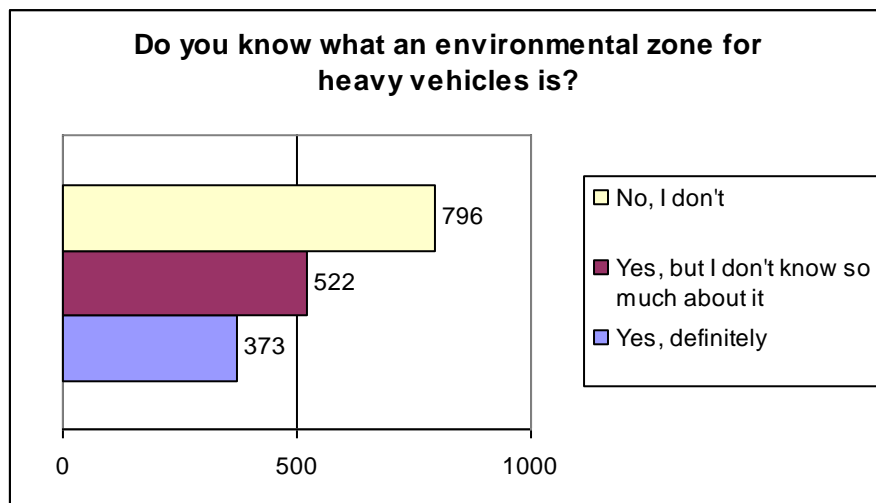


Diagram 4: Question about environmental zone posed to the general public during 2008

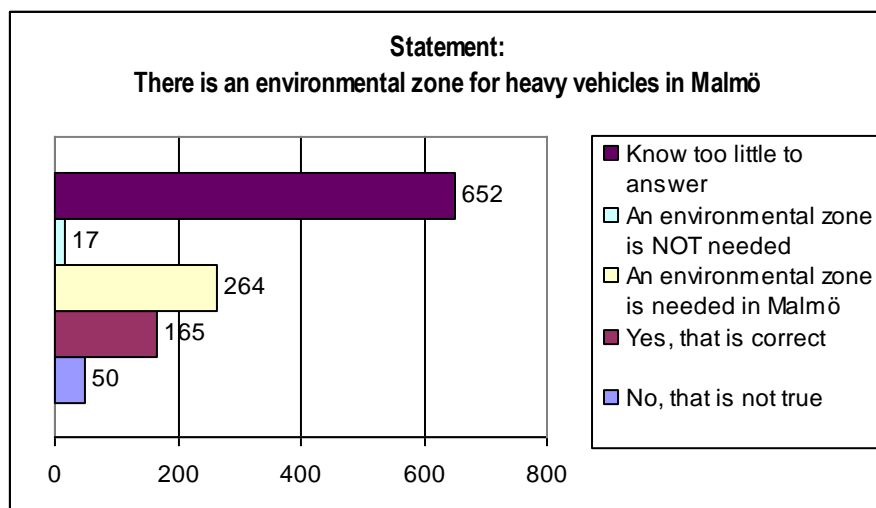


Diagram 5: Question about the zone in Malmö posed to the general public during 2008

Answers to both questions, when taken together, show that while a majority of respondents believe that they know what an environmental zone is, in practice many respondents might know less about what an environmental zone is than their own self-assessment. Good awareness of existence of the zone on the part of the public probably lies somewhere between 14% (percentage who answered “yes” in the second question) and 22% (percentage who answered “Yes, definitely” to the first question).

**Lorry owners and operators**

When we turn to awareness and acceptance measurements of those people and organisations directly affected by the measure there is information from prior to the establishment of the new zone but no information from the time after the new zone.

During April 2005, the Department of Streets and Parks distributed some 200 questionnaires among owners and operators of heavy vehicles based in Malmö. Few responses were received. To increase the response rate the Department attempted to conduct telephone interviews with an additional 200 owners and operators. In total 133 out of a population of 400 people or

organisations participated. However, the respondents sometimes wished to avoid answering certain questions which means that depending on the question as few as 86 respondents may have answered.

The majority of respondents claimed knowledge of the old zone but their self-assessment varied with some considering themselves very knowledgeable while others felt they knew very little. Some respondents were of the opinion that foreign (ie non-Swedish registered) heavy vehicles were exempt from the zone. This idea that such vehicles are exempt is a rumour that has had wide currency among drivers. The evaluator has heard actors in the freight sector repeat this rumour on several occasions during SMILE.

Some 55% of respondents said that they had heavy lorries in use that were not permitted for the old zone. The survey did not ask where these lorries were used.

The survey asked what respondents thought was the result of the start of the (old) zone in 2002 with regard to air quality in Malmö. Some 40% felt that this was somewhat positive and some 40% felt that there was no result. 10% felt that the zone was very positive. Comments that followed from this question about the old zone suggest that for some the purpose of the old zone was unclear.

Respondents were told about the geographical extent of an expanded zone (that which became the new zone in 2007). The question, as posed, assumed that the emission requirements would be unchanged. Over 60% claimed that this would not affect their activities.

Compliance with the old zone was, at the time, considered by many respondents to be a problem.

Some 60-70% of respondents claimed that during 2005 they worked with environmental issues in a concrete way that resulted in reduced environmental impacts from their transportation. 80% said that they took environmental impacts into consideration when purchasing new heavy vehicles.

It is also possible to see that there are several different types of respondents based in part on the results of the 2005 survey and in part on discussions with lorry owners and operators during SMILE:

1. Some have accelerated their retirement of older vehicles and consider the environment when buying new lorries in large part because of the old zone but also because of the new zone that was not yet decided upon at the time.
2. Some will retire older vehicles and will make sure that replacement lorries met zone requirements but will do so at the very last minute, these might also be more inclined to replace the motor or add particle filters as a way to comply with the new zone.
3. Some will attempt to keep their lorries that do not comply with the zone outside of the new zone but instead use these in other locations.
4. Some will act as if the zone does not exist, either because of the perceived lack of zone enforcement and/or a business strategy that ignores environmental concerns, and thus violate the zone.

Generally speaking, a handful of larger operators lead the way as part of type 1. In all likelihood there is a connection between size of operation and which type of response which is chosen. This means that the smaller the operator the more likely the response will be type 3 or type 4.

In all likelihood awareness and acceptance tend to be greater in larger organisations. Small operators, as well as Swedish operators based at some distance from Malmö are probably overrepresented among vehicles that are not complying with the zone. Foreign registered vehicles were noted during data collection in October 2005, 2006, and 2007 but they were not studied for information about compliance or emissions. It is therefore not possible to analyse compliance among foreign lorries. Furthermore, foreign drivers were not asked about their awareness and acceptance.

### C3 Achievement of quantifiable targets

From A1 recall that there were six objectives. The fulfilment of each objective is commented upon briefly in the table below.

Objective	Fulfilment
1: to extend the old zone's geographical coverage and thus establish a new zone.	Achieved in full
2: to change Swedish laws and regulations concerning zones so that the enforcement monopoly held by the police is lifted.	Not achieved
3: to educate and inform all stakeholders and the public about these changes	Completed but not evaluated <i>per se</i>
4: to start enforcement by parking guards.	Not achieved because of failure of 2
5: to evaluate the results and use the findings of the evaluation for possible changes in the future	Done
6: to promote stricter regulations for heavy vehicles.	Achieved in full

Table 6: Overview of Objective fulfilment of measure 6.1

From A2 recall that there were six tasks. The fulfilment of each task is commented upon briefly in the table below.

Task	Fulfilment
1: Planning for a larger zone	Achieved in full.
2. Stricter regulations for heavy vehicles	Achieved in full. More collaboration with other Swedish cities than <i>perhaps</i> initially planned. Malmö probably compromised with other organisations to achieve greater effect nationally.
3. Information campaigns...	Difficult to assess but various tasks completed.
4. Actual establishment of the new zone	Achieved in full after some delay.
5. Influence the law to change enforcement	Not achieved.
6. Enforcement after establishment of the new zone	During 2007 and apparently especially 2008 measure leaders in contact with police but unclear how rigorous and frequent police enforcement activity may be. Not assessed directly. Compliance assessed instead.

Table 7: Overview of Task fulfilment of measure 6.1

This measure has no quantitative targets to achieve according to sections A and B of this report or according to the original DMP from April 2005. But changes can be qualitatively assessed based on C2.1-C2.5 and tables 6 and 7 that appear immediately above. This is summarized in Table 8.

Objective/Task	Target	Rating
Task 1	Planning for a larger zone	**
Objective 2/Task 5	Influence and change Swedish laws concerning environmental zones to permit others than the police to enforce compliance	0
Objective 6/Task 2	Promote stricter regulations	**
Objective 3/Task 3	Educate and inform stakeholders/Information Campaigns	*
Objective 1/Task 4	Extend old zone to new zone with stricter regulations	**
Objective 4/Task 6	Start enforcement by parking guards/Cooperation with police	0 / *
Objective 6	Evaluate results and use finding for possible future changes	**
<b>NA = Not Assessed 0 = Not achieved * = Substantially achieved (&gt; 50%)</b> <b>** = Achieved in full *** = Exceeded A – No T = Assessed but no target to compare with</b>		

Table 8; Summary of measure fulfilment. Since there were no objectives for air emissions and no targets, these are not included in this table. Refer instead to sections above or section C6 below.

## C4 Up-scaling of results

Measure 6.1 could be up-scaled by one or more of the following:

1. Increasing the geographical extent of the zone to include more of Malmö.
2. The Department of Streets and Parks, with backing from upper management of the City of Malmö, could support the interest on the part of other cities in Sweden to implement a similar zone system based on the same regulation “Swedish Road Traffic Ordinance” where the national basis for a zone is established.
3. Malmö, in collaboration with other cities in Sweden, Denmark and Germany could work to spread similar zones in other countries. Here the regulatory history and legal structures might not afford the exact same construction.
4. Work to extend the zone to cover an entire region or county like Skåne were Malmö is located. There is a large volume of lorry traffic between other places in Sweden and parts of Norway which passes through Skåne on the way to Denmark, Germany, Poland and elsewhere (plus reverse). Lifting the zone up to the regional level would have enormous impacts on lorry traffic not just in an around Malmö but in several other locations in northern Europe and beyond. This up-scaling might lead to somewhat similar effects, but on a much smaller scale, that have resulted from the Swiss approach to lorry traffic through their country.

This is, at present, politically impossible because there are politicians at the regional level that would be very much opposed. Indeed one of the leading politicians has very publically and forcefully called for and spoke warmly about a large increase in lorry transit traffic through Skåne because this will lead to additional employment in the region.

5. Extend the zone’s coverage to include other vehicles. According to the new measure leader at the lessons learned workshop in September 2008, one of the politicians on the political board in Malmö that decides upon the future of the environmental zone has spoken favourably about working to extend the zone coverage to lighter vehicles i.e. cars. However, this is only one of many political voices that have a say in the matter.
6. More rigorous and more frequent enforcement combined with more effort with information. Presently police enforcement is irregular at best and only occurs upon the urging of the measure leader. Enforcement could be coupled to letting the measure leader know about which companies regularly violate the zone and then direct information activities as well as other lobbying efforts at repeat offenders.
7. Change the national regulation to make it stricter and thus reduce emissions in the zone.

8. Change in enforcement so that parking guards and others can enforce the zone, as originally intended as part of this measure: objective 4 and task 5.
9. Enforcement of compliance among drivers of foreign lorries on par with enforcement of domestic lorries as under up-scaling strategy 6.
10. Combinations of the above possibilities, perhaps together with other activities not yet considered.

The technical evaluator deems strategies 2 and 6 to be most likely and most easily pursued by the Department of Streets and Parks during the coming 1-2 years.

## **C5 Appraisal of evaluation approach**

There are two shortcomings with regard to the technical evaluation of this measure.

First, loss of data and/or the difficulties in data interpretation for 2006 means that some information about what was happening outside the then future new zone has not been included in this evaluation. The reason for this can be found in the change of measure leaders at the time coupled with unclear communications between the technical evaluator of this measure and the then measure leader. Essentially, the measure leader left the Department during the summer of 2007 without sufficient provision of data access to colleagues or the evaluator.

Second, it would have been of value to the SMILE evaluation to have repeated the 2005 survey among lorry drivers and owners at some point in time after the establishment of the new zone. Ideally this survey should have been completed approximately one year after the establishment of the new zone, at a time when possible changed behaviour etc just after the establishment of the new zone would have had a chance to “settle”. It would therefore be important to hold this survey not too close in time to the zone establishment. This would have meant that such a survey could have been conducted during September 2008. However this conflicts with deadlines for report submission: i.e. the SMILE evaluation framework required complete technical evaluations at times somewhat prematurely in relation to actual measure implementation. (NB. At that stage the project extension was not foreseen.)

## **C6 Summary of evaluation results**

The key results are as follows:

- **Key result 1 – The environmental zone led to an acceleration of vehicle retirement.** Lorry owners and operators have clearly accelerated their retirement of vehicles since the compliance rate increased by approximately 5%. The pattern of new vehicle registration also clearly demonstrates a change caused by 6.1
- **Key result 2 – Emissions of NO<sub>x</sub> and PM<sub>10</sub> fell because of 6.1.** For NO<sub>x</sub> the reduction is on the order of 33 tonnes per year (17%) and for PM<sub>10</sub> this is estimated to be just over 1 tonne per year (30%). However, because of a general increase in traffic volumes in and around Malmö, the impacts of these reduced emissions cannot be found in the ambient air quality and the levels of NO<sub>x</sub> and PM<sub>10</sub> measured in the air quality measurement stations run by the City of Malmö.
- **Key result 3 – Impacts beyond the zones.** Since compliance levels outside the old zone in 2005 and outside the new zone in 2007 are just a little lower than within the then existing zone, it is clear that areas of Malmö outside the zone enjoy benefits from the zone. It was not

part of the original evaluation methodology to gauge these impacts and therefore any discussions about this include uncertainty but it would appear that a significant part of Malmö outside the zone has a majority of the traffic volume in compliance with the zone regulations.

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## D Lessons learned

### D1 Barriers and drivers

#### D1.1 Barriers

- **Barrier 1, no change in national level policy/law about who can enforce the zones** – Inertia in national level organisations and defence of vested interests combined with, perhaps, a not entirely unified negotiation front on the part of the four “environmental zone” cities led to no change in the enforcement mechanism, i.e. the failure of task five.
- **Barrier 2, slow start of and irregular enforcement** – Enforcement appears to lag or occur very irregularly. This requires more discussions between the police and the Department of Streets and Parks as well as incentives, funding, etc.
- **Barrier 3** – The relatively short survey time of 2 hours per year has an effect on the robustness of data and the quality of data analysis.
- **Barrier 4** – Changes in management has led to some data being lost, difficulties in data interpretation and delay to the implementation of the measure.
- **Barrier 5** – Exemption of foreign drivers from evaluation can also affect the results of already limited data collection.

#### D1.2 Drivers

- **Driver 1 – Air quality** – Insufficient improvement of air quality in some places in Malmö and in particular in central locations was a strong driver for this measure. See section C1.3 for more discussion about this.
- **Driver 2** – Development of National Regulation provided an impetus for the measure and external co-operation in its definition.

### D2 Participation of stakeholders

- **Stakeholder 1** – City of Malmö Streets and parks department has a leading role in the project
- **Stakeholder 2 – Other municipalities in Sweden** – Göteborg, Stockholm, Lund, participated in discussions with ministries and authorities concerning the changes in the provisions of the “Swedish Road Traffic Ordinance”.
- **Stakeholder 3 – Firms in and around Malmö** – Some freight companies participated in discussions with the Department of Streets and Parks about the new zone. These were either informal and one-on-one or in a more formal setting with several representatives participating at a time.
- **Stakeholder 4 – National level political organisation** – Police, government ministries at the national level.

## D3 Recommendations

- **Recommendation 1 – Enforcement and information.**

Regular enforcement of the zone has not yet occurred. The City of Malmö, as opposed to for example Göteborg, does not want to put up signs that show where the zone starts. This may send a signal to drivers that, together with the very irregular enforcement to date, it is acceptable to nip into and out of the zone with lorries that do not comply with zone regulations. In the long term this will probably lead to reduced compliance and increasing irritation on the part of lorry drivers and owners that have hitherto complied with the zone regulations. The city has to develop a strategy where enforcement and information provisions, perhaps in conjunction with the police and even involving visits to offender institutions, are linked and mutually reinforcing. Possible inspiration from successful approaches, campaigns, activities in SMILE 11.1 can be considered when the strategy is under development.

While previously information to non-Swedish drivers and freight firms has been addressed (information materials in German and English), this should be extended to additional languages (Polish ? French ?). Furthermore, perceived zone legitimacy on the part of Swedish actors will be enhanced if real, practical enforcement of zone regulations is extended to foreign based lorries and their drivers. It is of great importance, in this context, that information about this enforcement be communicated to relevant local actors since it is unlikely that local freight firms and their drivers will perceive that a police stop of a foreign registered lorry was because of enforcement of the environmental zone.

Why is this important? The reason is that Swedish drivers and the companies that they drive for are part of an informal network and share a common working language. When police enforce zone regulations and Swedish drivers are affected, news about this would travel in the informal network among Swedish drivers and companies. Enforcement where foreign drivers' experiences are involved would not tend to become known among Swedish drivers because of being parts of different informal networks. Preventative effects arising from enforcement news in an informal network might lead to greater compliance levels among domestic drivers. However, without tangible evidence and knowledge of enforcement among foreign drivers the rumour among Swedish drivers that foreign drivers are exempt from the zone regulations will continue, despite information pamphlets sent to domestic firms.

- **Recommendation 2 – Up-scaling.**

Once the interlinked enforcement and information strategy is decided, approved and funded as a regular feature in Malmö, attention should be placed on up-scaling. The combination of up-scaling options listed under C4 may be consulted. To ensure that enforcement and information activities can also be up-scaled to the new level will require consideration of the realisation of recommendation 1 in light of the probably changes resulting from up-scaling in recommendation 2.

- **Recommendation 3 – Collaboration outside Malmö.**

The Department and other relevant actors in the city administration as well as others, should consider which other municipalities near Malmö and located at strategic locations within the rest of Sweden and in neighbouring countries should be invited to Malmö to hold a conference about environmental zones. The goal is to spread information and interest about the zone methodology, intended results etc so that the likelihood of other cities or towns adopting similar zones would increase. With greater and greater numbers of similar zones in cities where lorries -- that travel close to Malmö or have errands in the Malmö zone – are based, this will lead to increased compliance in Malmö in the short-term. In the long-term a network of « zone cities » may result, which would be beneficial locally as well as establishing a regional or perhaps even EU-wide best practice which would make it easier for international freight operators to comply with uniform regulations and practice throughout a larger area.



- **Recommendation 4 - Evaluation matters**

In preparation for possible future changes in the zone in Malmö, it would be very advantageous if the Department of Streets and Parks, either themselves or in conjunction with others, conduct regular monitoring of traffic flows of the type conducted each October as part of SMILE. In this way it would be possible for the Department to follow flows, compliance issues, and estimate changes in emissions in the existing zone, areas outside the zone but in Malmö where a future zone might be expanded to but even in areas on the outskirts of Malmö and in surrounding municipalities. This information would prove vital for the planning of changes in the zone, the establishment of a baseline, and the ability to find and evaluate changes in flows and emissions stemming from future changes in the zone. It is the technical evaluator's understanding that the Department has taken a first step in this regard by planning to repeat the October study during October 2008.

Furthermore: while not part of SMILE per se because of deadlines in the process of the technical evaluation, it would be advantageous if the Department of Streets and Parks, either themselves or in conjunction with others, conduct a study about driver/owner awareness and acceptance issues. This study would be a follow-up of the study conducted by mail and telephone during 2005. The delivery mechanism should be by sending an initial mailing by post with maps and similar materials and warning the recipient that a telephone interview would take place during the coming days. In this way the interview could include references to the printed material that would otherwise be difficult to manage during a regular telephone interview. The goal should be to have 200 complete responses to make the result comparable with the 2005 study.

- **Recommendation 5 – Establishment of an environmental zone for light vehicles**

Cars and similar light vehicles make up the majority of traffic volume in Malmö. The city might consider an environmental zone for cars corresponding to the geographical coverage of the old zone for heavy vehicles which could later expand to the same geographical coverage as the new environmental zone for heavy vehicles.

- **Recommendation 6 – Regulation**

To ensure better zone enforcement it is recommended to introduce and implement stricter regulations for heavy vehicles. These can be achieved by discussion with ministry of industry and EU and communication with other involved municipalities and concerned state departments.

- **Recommendation 7 – Information campaigns**

It is worth considering an information campaign promoting larger environmental zone and informing the public and companies about stricter regulations for heavy vehicles to achieve better compliance and environmental benefits.

## **D4 Future activities relating to the measure**

No such activities have come to the technical evaluator's attention over and above those already mentioned and/or discussed in previous sections.

In all likelihood the ability to meet air quality norms in Malmö will steer future activities. If air quality in the areas in red and yellow in the left map in Map 4 continues to be poor and there is no improvement trend there will be great pressure on the city to adopt one or more up-scaling strategies listed under C4 or follow one or more recommendations under D3. If air quality does improve then there is less likelihood that the recommendations and strategies will be followed during the near future.