

TRANSPHORM DELIVERABLE



D5.1.2. Report on policy feedback on the list of measures

Due date of deliverable: project month 24
Actual submission date: project month 35

Start date of project: 1 January 2010
Organisation name of lead contractor
for this deliverable:

Duration: 48 months

NILU

Scientist responsible for this deliverable:

Alena Bartonova

Preface

This report identifies transport policies and measures that are presently under evaluation by five large European cities and by selected European-level stakeholders, in order to reduce the impact of transport activities on human health. It provides a summary of the discussion with these stakeholders.

It has been prepared as part of the TRANSPHORM project (Transport related air pollution and health impacts) and constitutes its deliverable D5.1.2.

The report has been made with contributions from:

Rainer Friedrich (USTUTT/IER), Ulrike Kugler (USTUTT/IER),
Christian Schieberle (USTUTT/IER), Manfred Wacker (USTUTT/ISV),
Isaak Yperman (TML)

Dick van den Hout, TNO

The Helsinki team (led by Jaakko Kukkonen, FMI)

The Rotterdam team (led by Menno Keuken, TNO)

The Athens Team (led by Zissis Samaras, AUTH)

The London team (led by Ranjeet Sokhi, UH-CAIR)

The Oslo Team (led by Leonor Tarrason, NILU)

Alena Bartonova, Leonor Tarrason, NILU (editors)

Contents

	Page
Preface	1
Summary	5
1 Introduction and objectives of the report	7
2 Contacts with city stakeholders	7
3 Mitigation measures applicable in the core cities – summary of feedback from the cities	7
4 Feedback from stakeholders: Oslo	12
4.1 Responses to TRANSPHORM questionnaire	13
4.1.1 Which measures are already implemented in Oslo to control PM from traffic?	13
4.1.2 Are there any additional measures already identified for the future and decisions are made to implement them in your city?	13
4.1.3 Are there any impact assessment studies already available for the measures identified above?	13
4.1.4 Are there any measures in Annex I that are obviously not effective /acceptable /relevant in your city and thus should be omitted?	13
4.1.5 Which measures are more relevant for your city?	14
4.1.6 For which measures can you provide relevant input data to facilitate the analysis to be done in TRANSPHORM?	14
4.2 Summary of Oslo Response	16
5 Feedback from stakeholders: Rotterdam	18
6 Feedback from stakeholders: Helsinki	20
6.1 Land use planning and transport	20
6.2 Street dust	21
6.3 Communications and education:	21
7 Feedback from stakeholders: London	22
7.1 Measures already implemented or planned for implementation	22
7.2 Policies and proposals	22
8 Report on European-Level Stakeholder Feedback	24
8.1 Promoting walking as a mode of transportation	25
8.2 Use of cargo bikes in combination with freight consolidation centers for intra-urban delivery and transport of goods	25
8.3 Lower speed limits in urban areas or traffic management reducing the speed of cars	25
8.4 Differentiated taxation of different fuels	26
8.5 Harmonized speed limit on motorways over all the EU	26
8.6 Downsizing engine power and/or weight of passenger cars	26
8.7 Retrofitting particulate filters and NO _x reducing SCR for diesel passenger cars and diesel buses	26
8.8 Measures to reduce emissions from non-road mobile machinery	27
8.9 Enhanced use of pedelecs	27

8.10 Liquefied Natural Gas or biogas as an alternative fuel for ships	27
8.11 Shore-side electricity to vessels while at berth	27
8.12 NO _x control to existing ships	27
8.13 Introducing speed limits for ships	28
9 Discussion and conclusion	28
Annex 1 Summary of TRANSPHORM measures.....	31
Annex 2 Questionnaire to cities.....	35

Summary

This report is a summary of stakeholder consultation regarding measures to reduce particulate matter from traffic. The consultation included stakeholders of the cities where TRANSPHORM will model particulate matter concentrations resulting from different transport-related scenarios. Five cities will be modelled (Athens, Helsinki, London, Oslo, Rotterdam). Further, European-level stakeholders were consulted.

A first list of over 30 measures was developed by the TRANSPHORM team and presented to the urban stakeholders, to assess to what extent do they are considered by the Cities in the shorter or longer term. This led to a short list of measures (Table S1) to be considered for each city. These measures are well in line with measures considered in other European activities and policy frameworks, such as the Thematic Strategy for Air Pollution currently under revision, or the Roadmap for the Single European Transport Area.

Table S1. Summary of measures to be implemented for the TRANSPHORM modelling exercise, cities that provided feedback.

No	Measure	Oslo	Helsinki	Rotterdam	London
1	Enhanced use of bicycles in cities	x	x	-	x
2	Enhanced use of public transport	x	x	-	x
3	Car pooling (car sharing)	x	x	x	x
4	Low emission vehicles (E-cars)	x	x	x	x
5	Traffic management	x	x	-	x
6	Low emission zones	x	x	x (for pass. cars)	x (for pass. cars)
7	Ban of through traffic for trucks	x (ban for diesel cars)	x	x	x
8	City toll	-	x	-	-
9	Parking management	x	x	-	x
10	Bus fuel switch (fuel cells, electr.)	x	x	-	x
11	Freight consolidation center / E-logistic for commercial vehicles	x	x	-	x
12	E & I city transport concept	x	-	-	x
26	Electric operation in harbours	-	x	x	-

Report on policy feedback on the list of measures

1 Introduction and objectives of the report

TRANSPHORM (Transport related Air Pollution and Health impacts - Integrated Methodologies for Assessing Particulate Matter) is an EU FP7 funded project aiming to develop and implement an integrated methodology to assess the health impacts of particulate matter (PM) resulting from transport related activities. The project compiles advanced knowledge on the impact of transport emissions on human health in Europe, covering the whole chain from emissions to disease burden.

The ultimate goal of TRANSPHORM is to develop an effective tool to support policy making in the transport sector with respect to the protection of public health.

This report identifies an initial list of transport policies and measures that are presently under evaluation at urban scale to reduce the impact of transport activities on human health. It summarises the discussion with urban, national and European-level stakeholders on relevant measures to be investigated.

The list of mitigation measures and policies, with response from cities, is presented here in four chapters, for four of the five cities (Helsinki, London, Oslo and Rotterdam). In each chapter, the specific policy measures identified to be studied in different scenarios for 2020, 2030 and 2050 at the five test cities in TRANSPHORM are to be presented. In addition, the mitigation measures are assessed by European-level stakeholders.

2 Contacts with city stakeholders

TRANSPHORM has organized a series of bilateral meetings with city stakeholders to gather their views on the most relevant measures and policies in the pipeline to control particulate matter emissions from urban traffic.

The bilateral meetings were held for four of the five TRANSPHORM cities, namely: Helsinki, London, Oslo and Rotterdam. In Athens, due to specific situation related to social and economic situation, the process was informal only. The meetings between the city stakeholders and TRANSPHORM city partners in charge to carry out model calculations on the PM concentrations chemical transport were carried out in the period from March 2012 to September 2012. They had approximately the same structure using as a guidance a questionnaire (Annex 2) developed and fully implemented in Oslo, and all covered the same set of issues, but had to accommodate the existing relationships of the project team to the city authorities, and the existing plans and priorities of the city authorities.

3 Mitigation measures applicable in the core cities – summary of feedback from the cities

Table 1 (for more explanation on measures, see Annex 1) provides an overview of bundles of mitigation measure applicable in the five core cities in 2030.

Mitigation measures were only excluded when the city had stated “not planned” explicitly. Regional measures will be treated within the regional analysis and have therefore not been taken into account.

According to this analysis, four measures would be applicable in four out of five cities (there has not been any feedback from Athens):

- #3 Car Pooling
- #4 Low emission vehicles (E-cars)
- #6 Low Emission Zones
- #7 Ban of through traffic of trucks (ban for diesel cars)

Another four measures would be applicable in three out of five cities (Oslo, Helsinki, London):

- #5 Traffic management
- #9 Parking management
- #10 bus fuel switch
- #11 Freight consolidation center/ E logistics for commercial vehicles

The rest of the measures (seven in total) would be applicable in two or one out of five cities (London and Oslo).

Table 1. Mitigation measures applicable for 2030

No	Measure	Oslo	Helsinki	Rotterdam	London	Athens
1	Enhanced use of bicycles in cities	x	x	-	x	
2	Enhanced use of public transport	x	x	-	x	
3	Car pooling (car sharing)	x	x	x	x	
4	Low emission vehicles (E-cars)	x	x	x	x	
5	Traffic management	x	x	-	x	
6	Low emission zones	x	x	x (for pass. cars)	x (for pass. cars)	
7	Ban of through traffic for trucks	x (ban for diesel cars)	x	x	x	
8	City toll	-	x	-	-	
9	Parking management	x	x	-	x	
10	Bus fuel switch (fuel cells, electr.)	x	x	-	x	
11	Freight consolidation center/E-logistic for commercial vehicles	x	x	-	x	
12	E & I city transport concept	x	-	-	x	
26	Electric operation in harbours	-	x	x	-	

Table 2. Summary of city stakeholder consultation

No	Measure	Planned for implementation in Oslo?	...in Helsinki?	...in Rotterdam?	...in London?	...in Athens?
City based measures						
1	Enhanced use of bicycles in cities	Yes (2025)	Yes (citybike concept, further developing biking paths, biking and walkin journey planner, park and ride, bike center (service, advice))	No (already in place, but being extended)	Yes	No feedback
2	Enhanced use of public transport	Yes (2025)	Yes (raise modal share or keep it at current level)	No (already in place, but being extended)	Yes	No feedback
3	Car pooling (car sharing)	No feedback	No feedback	No feedback	Yes (together with E-cars)	No feedback
4	Low emission vehicles (E-cars)	Yes (2025)	Yes (promote low emissions)	Yes	Yes	No feedback
5	Traffic management	unclear	Yes (developing cross-city lines; mobility management centre)	No (already in place)	Yes (Signal timing reviews)	No feedback
6	Low emission zones	Yes (2025)	Yes (one study ongoing)	Partly (already in place for HDV, planned for PC)	Partly (already in place for NO _x from HGV/busses, planned for PC)	No feedback
7	Ban of through traffic for trucks	Yes (as ban for diesel cars in 2030)	Yes	Yes? (one study ongoing)	No feedback	No feedback
8	City toll	No (already in place)	Yes (one study on pricing mechanisms done)	Not planned	No (already in place)	No feedback
9	Parking management	unclear	Yes	No (existing P&R scheme not very effective)	Yes (no unnecessary idling)	No feedback

10	Bus fuel switch (fuel cells, electr.)	unclear	No feedback	Not planned	Yes (hybrid and fuel cell buses)	No feedback
11	Freight consolidation center / E logistics for commercial vehicles	unclear	Not planned/ Yes? (study ongoing on mobility management services)	Not planned	Yes? (Freight delivery and servicing plans)	No feedback
12	E & I city transport concept	unclear	Yes (plug for charging electric vehicles)	No (pilot study stopped due to technical problems)	No feedback	No feedback
26	Electric operation harbours	unclear	Yes (under introduction)	Yes (pilot implemented)	Not relevant?	No feedback
Regional measures						
13	Speed limit (motorways)	No (already in place)	Yes (in use)			No feedback
14	Speed limit (rural)	No (already in place)	Yes (in use)			No feedback
15	Low emission cars	No (already in place)	Yes (already in use)		Yes (E-cars)	No feedback
21	Tires, brakes, road surfaces with minimized abrasion	unclear	Yes (reduce studded tires, street maintenance)		Yes (tire + brake pads for taxis)	No feedback

4 Feedback from stakeholders: Oslo

TRANSPHORM partners have met with representatives from city authorities in Oslo (BYM) in three different occasions in 2011 and 2012. This is the report from the third meeting that took place at NILU headquarters in Kjeller, Norway, on Friday 22nd June 2012.

The meeting participants were: Christine Oppegaard and Åsne Loseth from the Environmental City Council from the city of Oslo (BYM) and Ingrid Sundvor, Alena Bartonova and Leonor Tarrasón from NILU, TRANSPHORM partner dedicated to the city of Oslo.

The purpose of the meeting was to identify a set of transport control measures and scenarios relevant for the city of Oslo. These are intended to be used as input for a health impact assessment of PM emissions from traffic to be carried out under the TRANSPHORM project.

The meeting began with a presentation of the TRANSPHORM project. The EU FP7 project TRANSPHORM offers to carry out a scenario analysis for the Oslo city authorities to help elucidate the effect of selected control measures in the transport sector beyond 2020. This will hopefully inform BYM on the health benefits that may be expected from the selected control measures.

The selection of the Oslo scenarios to be studied by TRANSPHORM was carried out following the structure of the TRANSPHORM questionnaire. The questionnaire was circulated previous to the meeting and the answers from the Oslo city authorities were discussed during the meeting. The answers to the TRANSPHORM questionnaire from Oslo follow at the end of this meeting report.

The meeting chose a pragmatic approach to the identification of scenarios for the TRANSPHORM analysis. It was chosen to rely on existing activity data and existing information on projections to 2025 to define the scenarios for TRANSPHORM. Oslo has already carried out a study on vehicle fleet composition up to 2025. The projections for 2025 take into account the traffic development in Oslo with use of enhanced public transportation, use of bicycles and the distribution of vehicle fleet in Euro classes, diesel, gasoline, hybrid and electric cars. The resulting emission projections are at present only calculated for nitrogen dioxide (NO₂).

It is proposed to use the existing activity data and projections for 2025 and use the TRANSPHORM emission factors for PM, PNC, Heavy metals and PAH to calculate the emission projections for the city of Oslo for these other components. These emission projections will then be used by NILU to carry out the TRANSPHORM PM health impact assessment for the city of Oslo. The TRANSPHORM impact assessment is expected to provide insight in such particular components and characteristics from PM (PNC, Heavy metals, PAHs) that have not been studied before and therefore the TRANSPHORM introduces an added value to previous assessment work carried out for the city of Oslo.

4.1 Responses to TRANSPHORM questionnaire

4.1.1 Which measures are already implemented in Oslo to control PM from traffic?

There have been a series of measures implemented in Oslo to reduce air pollution from particles and other air pollutants as well as for reducing greenhouse gas emission. Oslo follows the Action for Future Cities and the Urban Ecology Program. By 2010 Oslo was no. 8 finalist in European Green Capital competition with regard to airborne dust/PM₁₀. In the European Green City Index Oslo was however only moderately good, as No. 15 of 30 capitals.

The main measures implemented in Oslo to control PM from traffic are:

1. Introduction of tolls for use of studded tires (since 1999)
2. Cleaning and wetting of roads
3. Environmental speed limits
4. City Tolls

4.1.2 Are there any additional measures already identified for the future and decisions are made to implement them in your city?

The following measures are in the pipeline:

1. Enhanced use of bicycles
2. Enhanced use of public transport
3. Incentives for use of low emission vehicles
4. Low emission zones
5. Ban of specific traffic vehicles in the city centre (diesel, in particular)

4.1.3 Are there any impact assessment studies already available for the measures identified above?

There are studies concerning the efficiency of implemented measures (1 to 3) in Q1. These show the efficiency of the use of tolls to change citizen behaviour especially with respect to restrict the use of studded tires. Oslo has been very effective reducing the effect on re-suspension in PM emission, by considerably reducing the use of studded tires below 20% and by regulating the frequency of cleaning and wetting of the streets.

For future measures, there is a recent study from Sundvor et al (2011)¹ that analyses the effect of the composition of the vehicle fleet in Oslo with respect to NO₂ emissions. The emission projections are valid for the year 2025. The analysis has been done so far only for NO₂ emissions, but not for PM.

4.1.4 Are there any measures in Annex I that are obviously not effective /acceptable /relevant in your city and thus should be omitted?

Number 22 “Emission limits for inland water shipping” is not relevant in Oslo, because we simply have not inland water shipping.

¹ Sundvor I., Tarrasón L., Walker S. E. og Tønnesen D., (2011) NO₂ beregninger for 2010 og 2025 i Oslo og Bærum – Bidrag frå dieselbiler og mulige tiltak, NILU OR 62/2011

4.1.5 Which measures are more relevant for your city?

There are a series of measures that are mentioned in the TRANSPHORM questionnaire Annex I that are relevant to control PM emissions from Traffic in Oslo. These include:

1. Enhanced use of bicycles
2. Enhanced use of public transport
3. Incentives for use of low emission vehicles
4. Low emission zones
5. Ban of diesel PC vehicles in the city centre

However it is difficult to estimate the effect that these measures are expected to have on the actual traffic volume for 2025 or 2030.

NILU asked BYM to work in the future to gather information on how the planned specific measures identified above are expected to affect the traffic volume evolution for future years. Present projections on traffic volume carried out to facilitate the study of NO₂ are only based on general assumptions on an overall increase in the traffic volume by 1.4% per year, and an increased turnover rate of 10% (instead of the current 4.5%).

As part of measure 5, it is important to note that Oslo is presently considering the effect of light heavy vehicles and commercial traffic with the view of introducing restrictions to these type of vehicles if appropriate. However, the information on the emission share from commercial vehicles in Oslo is still under discussion and therefore is still premature to consider such emissions separately in the TRANSPHORM study.

In addition to measures to control PM emissions from transport, the Oslo City Council recognises the need to work with measures to reduce PM emission from residential heating. The emission data and projection information concerning residential emissions and wood burning from Oslo is still very preliminary. Further efforts should be addressed to improve the estimates of PM emissions from residential sources in Oslo.

4.1.6 For which measures can you provide relevant input data to facilitate the analysis to be done in TRANSPHORM?

Air pollutant emissions from traffic for the city of Oslo are at present reasonably well estimated, especially for passenger cars. The information on emissions from passenger cars is considered to be well documented and a considerable effort has been dedicated in recent years to improve and update the information on emission factors from passenger cars. There is also good overview of the expected future evolution of transport related emissions. As a result, and in particular for NO₂, the emission information basis for Oslo is adequate to carry out emission scenario analysis and projection calculations.

TRANSPHORM has made an effort to improve emission factors for different vehicle classes and fuel uses at European level. These emission factors involve PM₁₀, PM_{2.5}, PNC, HM and PAHs and represent an added value to the work already carried out at NILU to improve the NO₂ emission factors.

It is proposed to use the TRANSPHORM emission factors to extend the study on 2025 emission projections for Oslo for NO₂ to the PM components. The activity data and emission information for the TRANSPHORM health impact study will be the same as in Sundvor et al. (2011). The vehicle fleet distribution will be considered as in Table 3. It is recommended to use scenario 2 in Table 3 as basis for the TRANSPHORM scenario runs for 2025. In this case, the measures considered are expected to generally include the enhanced use of bicycles and public transport, the use of incentives for low emission vehicles (hybrids and electric cars) and the establishment of low emission zones.

Table 3. Percentage distribution of passenger car classes for different scenarios as estimated for NO₂ in the study by Sundvor et al, 2011².

PASSENGER CAR CLASSES G=Gasoline D=Diesel	REFERENCE 2025 projection	Proposed TRANSPHORM scenario 1	Proposed TRANSPHORM scenario 2
<i>Euro class older than 4 (G or D)</i>	3.7%	3.7%	0.9 %
<i>EURO 4 G</i>	1.3%	1.3%	0.20%
<i>EURO 5 G</i>	4.0%	7.8 %	1.0 %
<i>EURO 6 G</i>	18.9 %	56.6 %	70.4 %
<i>EURO 4 D</i>	2 %	2%	0.30%
<i>EURO 5 D</i>	13.1 %	9.7 %	2.8 %
<i>EURO 6 D</i>	56.6 %	18.9 %	1.2 %
<i>Hybrid car</i>	0 %	0 %	14.2 %
<i>Electric cars</i>	0 %	0 %	9.5 %
<i>Total diesel share</i>	72.1 %	30.0 %	4.3 %

² Sundvor I., Tarrasón L., Walker S. E. og Tønnesen D., (2011) NO₂ beregninger for 2010 og 2025 i Oslo og Bærum – Bidrag frå dieselbiler og mulige tiltak, NILU OR 62/2011

4.2 Summary of Oslo Response

An overview response to the TRANSPHORM questionnaire for the city of Oslo is given in Table 4.

Table 4. Overview responses to the TRANSPHORM questionnaire for the city of Oslo.

No	Measure	Q1 Already in place	Q2 In the pipeline	Q3 Already assessed for PM	Q4 Not relevant	Q5 Most relevant	Q6 Can be used for scenario analysis in TRANSHORM
1	Enhanced use of bicycles in cities		X 2025			X	Only in general terms
2	Enhanced use of public transport		X 2025			X	Only in general terms
4	Low emission vehicles (E-cars)		X 2025			X	Only in general terms
5	Traffic management		For 2030				
6	Low emission zones		X 2025			X	Only in general terms
7	Ban of through traffic trucks		For 2030			X	Only for diesel passenger cars
8	City toll	X					No, data missing
9	Parking management						
10	Bus fuel (fuel cells, electr.)		For 2030				
11	Freight consolidation center; e-logistic for commercial vehicles		For 2030				

12	E & I city transport concept		For 2030				
26	Electric operation harbours		For 2030				
The following measures will also be analysed in TRANSPHORM, however are not implemented on city levels.							
13	Speed limit motorways	X					Used in Oslo also
14	Speed limit (rural)	X					Used in Oslo also
15	Low emission cars	X					Used in Oslo also
16	Enhanced use of biofuels		For 2030				
17	CargoCap		For 2030				
18	Road pricing		For 2030				
19	Increased fuel tax		For 2030 ?				
20	EURO 7/8		For 2030				
21	Tires, breaks, road surfaces with minimized abrasion		For 2030				
22	Emission limits for inland water shipping				X		
23	Kerosene tax for aviation		For 2030				
-	Tighter emission limits for maritime ships		For 2030				

5 Feedback from stakeholders: Rotterdam

The results of an evaluation of the TRANSPHORM measures (see Annex 1) by the Rotterdam stakeholders is provided in Table 5, giving comments on the individual measures, and suggesting additional ones.

Table 5. Results of the Rotterdam consultation (The first column identifies the measure in the TRANSPHORM system).

Enhanced use of bicycles	
1	Rotterdam already has a lot of bicycles though on average slightly less than the national average. Biking is further promoted by extending the number of safe parking places at various locations, by improving/extending bicycle lanes along major routes (e.g. from the central station to the university, etc.) and by education on primary schools aimed at both parents and children. Cost and effects available after summer.
Enhanced use of public transport	
2	Public transport is being promoted and the past years have seen extended tram lines east-west (Vlaardingen east-Rotterdam), an extension of the subway system (5 years ago) and the introduction of a light rail connection to the Hague (2 years ago). Everything is expected to be full in 10 years from now hence we focus on 1.
Low Emission Cars (E-cars)	
4	E-cars are being promoted. More info should be available in a few weeks
Traffic management	
5	Traffic management, several ITS schemes, and a few green waves.
Low Emission Zone	
6	Existing LEZ for heavy duty, a LEZ for private cars is being considered A LEZ for the western port area is under consideration (2016?), this might reduce emissions on the ring road as well.
Ban of through traffic	
7	A study on a road ('s Gravendijkwal) is on-going
City toll	
8	Not considered

Parking management	
9	There are several park & ride facilities with signposts along the main motorway showing how much space is still available and the waiting time until the next public transport connection to lure drivers towards them. But they are considered expensive and they yield little improvements. Extension is not expected.
Bus fuel	
10	The latest public transport contract didn't specify requirements in this field so not expected in the near future. Rotterdam has been experimenting with innovative clean vehicles on a small scale.
Freight consolidation centre	
11	There is a rail centre south of the city. This was mainly built for logistical reasons.
E logistics commercial vehicles	
11	We work with city authorities (e.g. in Schiedam) to make transport plans for the private sector trying to optimise their BAU. Very moderate scale, pilots only
E&I city transport concept	
12	Rotterdam had a pilot with automatic guide e-vehicle commuting between a Parking area and a business centre. The pilot was stopped due to technological problems.
Electric operation in harbours	
26	First pilot recently implemented. We published some work on it in Tijdschrift Lucht.
	The port still considers, and is promoting, a wider use of LNG in the port
Tighter emission limits for maritime ships	
	Rotterdam will stick by IMO regulation
	Green award certificate for clean ships (based on a mixture environmental cleanliness issues). Port of Rotterdam was/is one of the driving forces behind this.

6 Feedback from stakeholders: Helsinki

6.1 Land use planning and transport

The objective is to pay more attention to air quality requirements in land use planning. This includes emissions and people's exposure to pollutants. Public transport's share will be raised or at least kept at the present level by making it more attractive. Traffic is increasing fastest on cross-city routes, so developing cross-city lines is important. In Helsinki metropolitan area there are ongoing action plans (since 2008) to improve air quality. One strategically important measure in the action plan is to promote low emissions. Different traffic management and pricing mechanisms are in use around the world to promote the share of low-emission vehicles and the competitiveness of public transport. These mechanisms include low-emission zones, incentives to purchase low-emission vehicles and congestion charges. The first mentioned actions are already in use in Helsinki. Official criteria have been defined for low-emission vehicles. The best solutions for Helsinki, how they can be introduced and what impacts they will have need to be studied.

Promoting pedestrian and bike traffic is another strategically important measure in the action plans. The aim is to increase the share of biking from 9 % to 15 % by 2020. Biking and walking will be made more attractive by developing pedestrian zones in the city centre and by improving information and marketing.. New walking and biking paths, cycling and walking journey planner as well as park and ride for bikes have been introduced.

The research work is really important. Measures to reduce air pollutants often require background studies and other research.

The action plans also presents measures aimed at reducing ship emissions. This includes promoting low emissions, developing environmentally-based fairway charges and evaluating emissions from harbour activities and their impacts on air quality and health.

Current state of other measures of action plans in Helsinki metropolitan area:

1. Take air quality requirements into consideration in land use planning: in progress
2. Make public transport more attractive: continuous
3. Develop cross-city lines: partly implemented continuous development
4. Promote low emissions: criteria defined, advantages of low emission vehicles
5. Study possibilities to establish a low-emission zone: low emission zone for buses and waste collection vehicles have established
6. Study and introduce traffic management and pricing mechanisms suitable for Helsinki: feasibility of congestion charge has been studied
7. Develop possibilities to use public transport for leisure travel
8. Offer businesses advice on sustainable transport
9. Prepare transport plans: new Helsinki Region Transport System Plan (HLJ) is made every 4th year, the last one was accepted in 2011
10. Collect information on emissions from small-scale water traffic and work machines: emission study in 2013
11. Reduce ship emissions: electric operations in harbors, pilot system built
12. Introduce environmentally-based harbour and fairway: at planning state

13. Develop the evaluation of emissions from harbour activities and their impacts on air quality: emission evaluation has been developed, effects on air quality has been monitored and exposure and health effects has been evaluated.

6.2 Street dust

Street dust is one of the major air quality problems in Helsinki, mainly due to studded tires and salting and sanding of streets.

Current state of measures of action plans in Helsinki metropolitan area:

14. Manage street cleaning as a whole: continuous process, new methods has been developed
15. Participate in research aimed at reducing street dust: several R&D projects, at present Life+ Redust
16. Study and introduce means to reduce the use of studs on winter tires: Nasta project 2011-2013
17. Consider street maintenance requirements in planning
18. Consider dust formation properties in street construction: high quality minerals have been used in asphalt
19. Reduce dust from building sites and street construction: instructions and orders have been given
20. Improve the quality of the machinery used in reducing street dust: operation by PIMU (Scrubber with Captive Hydrology)
21. Improve the quality of sand used to prevent icing: the quality and quantity of sanding material and timing have been optimised
22. Develop the use of salt to prevent icing: salting materials have been studied, sand has been replaced with salt when possible
23. Develop dust binding in episodes: used effectively
24. Increase snow removal particularly near roads
25. Speed up street cleaning in the spring and start sooner: has been done as soon as possible
26. Develop work quality and quality assurance

6.3 Communications and education:

Current state of measures of action plans in Helsinki metropolitan area:

27. Increase information on street cleaning for different target groups: residents, properties, real estate companies: SMS service, real time air quality information
28. Increase campaigns to promote public transport and include information on air quality in them: several campaigns of various organizations, air quality displays in trams and metro
29. Provide information on recommendations concerning small-scale wood burning: leaflet distributed by chimney sweepers, communications campaigns going on
30. Reduce idling: regulated by legislation, information campaigns
31. Arrange education on driving economically: for the employees of the municipalities
32. Develop inter-city cooperation in environmental education

33. Increase residents' air quality awareness and promote sustainable transport options

7 Feedback from stakeholders: London

The stakeholder consultation results are based on the Mayor of London's Air Quality Strategy³.

7.1 Measures already implemented or planned for implementation

1. Ongoing investment in public transport through schemes including Crossrail, tube upgrades and significant increases in cycling and walking infrastructure, e.g. Barclays Cycle Hire scheme and twelve Barclays Cycle Superhighways.
2. Bus emissions programme – introduction of diesel-electric hybrid buses.
3. Encouraging and funding car clubs, especially those which provide plug-in hybrid and electric cars.
4. Maintaining roads in good repair.
5. Smoothing traffic through better traffic management and street works coordination.
6. Making it easier for boroughs to implement and enforce 20mph zones.
7. Operation of the London Low Emission Zone (LEZ) which reduces emissions from the oldest, most polluting diesel vehicles.
8. Continuation of the original central London Congestion Charging scheme which reduces traffic congestion and associated emissions and helps promote mode shift.
9. Promotion of electric vehicles – aim to reach 100,000 electric vehicles on London's roads by 2020.
10. 'Greening' of transport fleets, e.g. phased replacement for Dial-a-ride vehicles and the introduction of electric vehicles.
11. Freight delivery and servicing plans- being promoted by TfL to reduce unnecessary freight mileage³ and improve efficiency.

7.2 Policies and proposals

Policy 1

Encouraging smarter choices and sustainable travel – including promoting smarter travel, more efficient 'eco-driving' (e.g. bus drivers), no unnecessary idling, enabling more efficient freight movement, car clubs and car sharing, providing the right information to the public, spatial planning.

Predicted Outputs:

³ Available at: http://www.london.gov.uk/sites/default/files/Air_Quality_Strategy_v3.pdf and <http://www.london.gov.uk/sites/default/files/MAQS%20Appendices.pdf>, accessed January 2013

- Private car usage in Greater London will reduce by approximately 6% by 2031.
- Increasing cycling mode share from 2% to 5% by 2026 would remove a ton of PM₁₀ and nearly 50 tons of NO_x. Approximately 90,000 tons of CO₂ would also be saved.
- Eco-driving and better route planning can deliver reductions in vehicle fuel consumption by 5% - 10%, with the potential for associated reductions in emissions.

Policy 2

Promoting technological change and cleaner vehicles – including supporting the uptake of low emission vehicles and delivering a switch to electric vehicles, and scrapping or retrofitting older more polluting vehicles.

Predicted Outputs:

- Aim to get 100,000 electric vehicles on London's streets by 2020 (2% of total fleet) – “Significant” reduction in emissions.

Policy 3

Identifying priority locations and improving air quality through a package of local measures – including priority locations for PM₁₀, further identification of priority areas, major transport interchanges.

Predicted Outputs:

- A reduction of 2.5 µg/m³ of PM₁₀ at the priority locations can be expected (10 – 20% concentration reduction).
- Reduction in daily exceedances at the priority locations of up to 6 days.
- Cleaning of road surfaces/application of dust suppressants – expected PM₁₀ concentration reduction of 10 – 20%. Trial at Marylebone Road and Upper Thames Street began in 2010.
- Signal timing reviews every three to five years – achieve approximately a 6% reduction in stop/start delays at traffic signals.

Policy 4

Reducing emissions from public transport – including:

Buses - 300 hybrid buses by the end of 2012, Mayor to roll out ‘new bus for London’ (40% more fuel efficient than conventional diesel buses), by 2015 all buses to meet the Euro IV standard for NO_x, London Hydrogen Transport Plan (five hydrogen fuel cell buses in 2010/2011).

Taxis - All taxis under 15 years old from 1 January 2012, development of an affordable taxi capable of zero emissions by 2020, cost reduction of environmentally friendly taxis, taxi drivers must take an eco-driving course, two MOTs per annum for taxis by 2013, identification of tire and brake pads that will reduce emissions of PM₁₀ (35% reduction in tire/brake wear emissions).

Private Hire Vehicles (PHVs) – Licensing regime age-based limits, From 2012 new PHVs entering the fleet must meet Euro 4 standard and be 5 years old or newer, eco-training.

Rail – Electrification of the whole national rail network in London (no expected date given), diesel rolling stock for London over ground meets latest European standards for emissions.

River – Encourage the use of ultra-low sulphur diesel.

GLA, borough and public sector fleets – objective to obtain zero tailpipe emissions

Predicted Outputs:

- TfL estimates that achieving the Euro IV standard through retrofitting for NO_x across the entire bus fleet by 2015 will save around 800 tons of NO_x.
- Estimated that 1200 black cabs are likely to be more than 15 years old in 2012. A new taxi in 2012 will emit less than a quarter of the amount of PM₁₀ of a vehicle more than 15 years old. Age limits will save 8 tons of PM₁₀ in 2011.

Policy 5

Emissions control schemes – including:

Policy – Continued operation of LEZ for HGVs, buses and coaches and will tighten standards to include NO_x. The Mayor will introduce emissions standards for PM for heavier LGVs and minibuses, and a tougher standard for HGVs, buses and coaches.

Predicted Outputs:

- New LEZ standards for LGVs and minibuses in 2012 would reduce emissions of PM₁₀ in 2011 by around 22 tons and emissions of NO_x by around 270 tons.
- Tightening standards of the London-wide LEZ to include a Euro IV for NO_x in 2015 for HGVs and coaches is expected to save around 380 tons of NO_x in that year.

8 Report on European-Level Stakeholder Feedback

A list and description of measures and policies to reduce air pollution in transport has been presented to a number of stakeholder.

Feedback and suggestions have been given by the following persons/organisations:

- Benoit Blondel of the European Cyclists' Federation (ECF)
- Antonis Michail of the European Sea Ports Association

- Ivo Cré of POLIS (European Cities and Regions Networking for Innovative Transport Solutions)
- Christer Agren of AirClim
- Dirk Bosteels, Association for Emissions Control by Catalyst (AECC) AISBL

In the following we discuss how we will take these recommendations into account.

8.1 Promoting walking as a mode of transportation

It has been noted that the list of measures is missing walking as a mode.

The reason for that is that we do not promote walking by improving the utility of walking (broader boardwalks), but by changing the net utility of other modes, for instance by improving parking management (measure #9), by enhanced use of public transport (measure #2) and promoting low emission zones (measure #4).

8.2 Use of cargo bikes in combination with freight consolidation centers for intra-urban delivery and transport of goods

Measure #11 (“Freight consolidation center/ E-logistics for commercial vehicles”) focuses to consolidate freight at outer areas of a city (maybe with railway access) and continue the delivery for specific inner city areas using smaller trucks.

The stakeholders mentioned that the potential of cargo bikes for intra urban delivery and transport of goods has been demonstrated by the EU funded project CycleLogistics (www.CycleLogistics.eu) in which the ECF is a partner.

Cargo bikes are especially used for transporting small, but urgent packages, even at higher costs. As we think that the benefit of a freight consolidation center lies more in collecting goods to have a large enough size, so that as well environmental pollution as costs can be reduced, we do propose not to analyse this further.

8.3 Lower speed limits in urban areas or traffic management reducing the speed of cars

It was proposed that this measure could improve the competitiveness for cycling and public transport, thus indirectly improve air quality, too.

A measure promoting lower speed limits in urban areas has been discussed but it has been decided not to include it explicitly in the analysis due to the following reasons: Experiments have not been able to prove a reduction of air pollutant emissions due to lower speed limits in cities. Thus we consider the effect to be an artificial degradation of individual motorised traffic causing time losses, which may cause acceptance problems. We rather prefer to provide incentives to shift to other modes of transportation by increasing the costs of individual traffic by applying measures like city tolls (measure # 8) or parking management (measure #9). Also, enhanced use of public transport (measure #2) and enhanced use of bicycles (measure #1) are considered explicitly.

8.4 Differentiated taxation of different fuels

It was noted that a differentiated taxation of different fuels could be promising. It has been proposed that diesel, in particular, because of its higher impact on human health (and higher content of carbon and energy), should be more heavily taxed instead of more lightly as is currently the case.

In general, the amount of taxation should be based on the extent of damage caused. Thus, while greenhouse gas emissions are proportional to fuel consumption, emissions of air pollutants are more dependent on the technology used. Thus while we would consider the different CO₂-emissions per liter for different fuels in measure #19 (increasing fuel tax), technology-dependent increases in costs are included in measure #18 (road pricing). Furthermore, for modern Euro 5/6 diesel vehicles the difference in environmental pollution to gasoline cars is small.

8.5 Harmonized speed limit on motorways over all the EU

An alternative to lowering the speed limit on motorways by 10 km/h could be to investigate the impact of having the same speed limit all over the EU. This is indeed a reasonable approach and we will follow the proposal by implementing a uniform speed limit of 110 km/h on motorways and 80 km/h on other non-urban roads .

8.6 Downsizing engine power and/or weight of passenger cars

Arguments are that this would counter the trend since decades that car engines are getting more and more powerful, and would reduce fuel consumption and also air pollutant emissions (especially if combined with stricter speed limits on motorways).

While counteracting that trend is definitely a very good idea, we decided to give rise to the actual costs of emissions upfront since a direct relationship between engine power and resulting amount of emissions is not clear. Please note, that the plans of the EC to reduce the CO₂-emission factors for passenger cars are already included in the reference case.

8.7 Retrofitting particulate filters and NO_x reducing SCR for diesel passenger cars and diesel buses

Retrofitting PM traps to diesel passenger cars has been done in some countries, e.g. Germany. Additionally, retrofitting PM traps and NO_x-SCR to diesel-buses in cities was proposed which has been done in e.g. London and Copenhagen.

Retrofitting pre EURO-IV cars to EURO IV standards is less relevant, as pre-Euro 4 cars (Euro IV is mandatory from 2006 on) have only a marginal share in the projected stock of diesel passenger cars from 2020 onwards (2020 is the first scenario year investigated). For buses, life times are sometimes higher (up to 16 years and more), so this might be more relevant.

We take this implicitly into account in measure # 6 (low emission zones), where we allow only cars with standard Euro 5 or higher to enter the cities. This means,

that especially EURO 4 cars , busses and trucks have to be retrofitted to meet the Euro 5 standard.

8.8 Measures to reduce emissions from non-road mobile machinery

It has been proposed to develop measures to reduce emissions from non-road mobile machinery (NRMM) that are used in cities. This includes sources such as road building machinery, street cleaning machines, diesel generators used at building sites, etc. Possible measures include (public) procurement requirements (i.e. setting minimum emission requirements) and retrofitting of PM traps.

The share of non-road mobile machinery on PM emissions is indeed quite large. However the steering group of the project has decided not to assess effects on non-road mobile machinery within the scope of TRANSPHORM.

8.9 Enhanced use of pedelecs

A reference to ‘pedelecs’ has been proposed since they are ‘very low emission vehicles’ having the potential to replace conventionally motorised trips. This is well documented (see for instance TNO, “Rapport Elektrische Fiets”).

We will include pedelecs in measure #1 (enhanced use of bicycles), but not as proposed in measures #3 (car pooling) and #4 (low emission vehicles), as the latter are directed to replacing conventional cars with vehicles with similar comfort.

8.10 Liquefied Natural Gas or biogas as an alternative fuel for ships

Norway already has some 20-30 ships that run on LNG, and very recently a new big LNG-fuelled passenger ferry between Finland and Sweden was introduced. Even though the effects will be further investigated, preliminary analysis suggests that the costs would exceed those of using traditional fuels with reduced sulphur content. Furthermore, emission factors which are necessary for a detailed analysis are not available.

8.11 Shore-side electricity to vessels while at berth

This is already included in our list of measures as measure # 26.

8.12 NO_x control to existing ships

SCR and/or other NO_x-control measures can be retrofitted to most ships, and this has been done to a large number of ships, primarily around Norway and Sweden as a result of economic instruments – in Norway the combined NO_x-tax and NO_x Fund and in Sweden the environmentally differentiated fairway and port dues.

This is already covered by measure #25 that promotes lower NO_x emissions; a more detailed description of the deliverable and analysis of which measures are taken will be made.

8.13 Introducing speed limits for ships

It is proposed that a reduction in fuel consumption will in turn lower emissions of both CO₂ and traditional air pollutants – has been done in e.g. California. While being a reasonable proposition it is rather difficult to control the compliance of ships to such a measure. Also resulting economical effects, like loss of time for instance, need to be considered when imposing the speed limits. Therefore, we rather prefer technical measure to reduce emissions from ships at sea.

9 Discussion and conclusion

The TRANSPHORM analysis is being done at a time with heightened focus on urban air quality, with many activities that were initiated in order to analyze the reasons for the air quality in Europe often being low, and in order to suggest practical ways for improvement. Perhaps the most important ones are the Plans and Programmes that the responsible authorities were to submit to the Commission when not in compliance with the legislation, the Transport White Paper related work, and revision of the Thematic Strategy on Air Pollution.

Many European cities do not comply with the limits for particulate matter as set by European legislation, in the Directive 2008/50/EC. In the case of non-compliance, the Member States were to submit a Notification of Time Extension⁴ (NTE), and air quality Plans and Programmes for the non-compliant zones. The European Topic Centre for Air and Climate Mitigation is currently analyzing these notifications and Plans for European 12 cities⁵, none of them participating in TRANSPHORM. The transport-related measures considered in the Plans and Programs are as follows:

- (I) Traffic: Technological and Infrastructure: this group is composed of measures which address reduction of traffic emissions via technological improvement of the means of transports, improvement of infrastructures and/or extension of public transport network. Examples of the measures included in this category are the establishment of tighter EU emission standards for vehicles and funding (e.g. Euro 5/6 funding in Vienna), emission improvements in bus fleet, taxis and school vehicles (e.g. Berlin), support for testing retrofit buses, reorganization and extension of bus network, expansion of bike path (e.g. Vienna), among others.
- (II) Traffic: Limiting traffic emissions: this category includes all measures implemented to reduce emission from traffic at the source via reduction of traffic volume or activity, i.e. it does not include technological and infrastructure measures. Examples are the establishment of low emission zones (LEZ), ban of higher emitters or the management of new parking schemes, specific examples are those measures implemented to directly reduce the traffic in the inner city, the establishment of environmental zone levels (e.g. Berlin), the establishment of low speed limit on urban motorways (80 km/h) and in the city (50 km/h; e.g. Vienna), toll increase, etc.

⁴ http://ec.europa.eu/environment/air/quality/legislation/time_extensions.htm

⁵ ETC/ACM work plan, draft report being prepared; contact authors (F. De Leeuw, RIVM and N. Castell, NILU, ncb@nilu.no).

(III) Campaigns: This category includes soft measures such as those implemented to create awareness, to encourage the population towards practise that help to reduce emissions and promotion of low emission activities. Some of the measures taken along those lines are the promotion of car sharing, cycling or electric vehicles, information campaigns, or training campaigns in defensive driving.

The main types of the measures related to road traffic that have been applied by the cities (usually a combination of different measures is applied) to reduce the concentrations of PM₁₀ are well in agreement with the measures analyzed by TRANSPHORM:

- 1) Creation of Low Emission Zone (LEZ);
- 2) Improvement of public transport;
- 3) Promotion of cycling;
- 4) Management of traffic flow;
- 5) Change of speed limits;
- 6) Investment in technology to reduce emissions from public transport.

Recognizing transport as one of the main factors contributing to elevated levels of particulate matter, the White Paper on Transport⁶ “Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM(2011)0144 final. Policy measures that are suggested in this Communication include:

- better modal integration with multi-modal connection platforms for goods and passengers,
- improving truck efficiency through e.g., technology uptake and intelligent transport systems,
- higher share of collective transport in cities, facilitating walking and cycling
- smaller, lighter and more specialized road passenger vehicles in the cities;
- road pricing, taxation adjustments, introduction of alternative propulsions,
- reducing “ineffective” delivery systems.

The Communication also lists a number of initiatives towards achieving the goals of the Roadmap, that include technological as well as non-technological aspects of reducing transport-related emissions. A number of organizations have expressed their views on the Roadmap; relevant to TRANSPHORM is the Polis network (European Cities and Regions Networking for Innovative Transport Solutions). The POLIS position paper⁷ in broad terms of the suggested emission reducing activities agrees with the suggested proposal.

Another relevant activity on EU level is the Thematic Strategy for Air Pollution⁸, currently under revision. As one inputs to the revision, the transport emissions

⁶ http://ec.europa.eu/transport/themes/strategies/2011_white_paper_en.htm

⁷ http://www.polisnetwork.eu/uploads/Modules/PublicDocuments/2011_10_polis_position_whit_e_paper_final.pdf

⁸ http://europa.eu/legislation_summaries/environment/air_pollution/l28159_en.htm

were assessed by Borken-Kleefeld and Ntziachristos⁹. This analysis, providing input to a further modeling by GAINS, is concentrating on technical measures to reduce exhaust emissions, but also discusses the impact of differences between “real-life” exhaust emissions and the theoretical ones as assumed by implementing different EURO II - EURO V standards, which provides a sensitivity analysis for the results.

It can thus be concluded that the measures that are selected in TRANSPHORM are well in line with measures that are already being considered for implementation or implemented.

⁹ Borken-Kleefeld J and Ntziachristos L 2012, The Potential for further controls of emissions from mobile sources in Europe. TSAP report #4, ver. 1, available at <https://circabc.europa.eu/sd/d/c3225c45-1138-44ce-adbf-9d115f540f32/TSAP-TRANSPORT-20120612.pdf>, accessed February 2013.

Annex 1 Summary of TRANSPHORM measures

Measure number	Short name	Description
1	Enhanced use of bicycles in cities	The aim is to increase the use of bicycles in cities by shifting traffic demand from motorized private transport to the bicycle. The measure includes hard components (e.g. extension of infrastructure) and soft factors (e.g. awareness). The degree of realisation depends on the present situation in the respective city.
2	Enhanced use of public transport	The aim is to increase the use of public transport (PT) in cities by shifting traffic demand from motorized private transport to public transport. The measure includes hard components (e.g. extension of infrastructure, new vehicles, new lines, more trips) and soft factors (e.g. awareness). It is assumed that the measure will result in a certain 'target share' of PT passenger kilometers. The potential for this measure depends on the current share of public transport in a city.
3	Car pooling/ sharing	In car sharing, people do not own a car but have the access to car usage by car pools. Such car pools can be offered as commercial companies but also on the basis of private voluntary associations. The measure combines two elements: (1) The installation of car sharing services resp. the increase of the usage of existing services and (2) the introduction of environmental friendly cars like E-cars and hybrid vehicles to the car sharing fleets. The measure include hard components (e.g. extension of infrastructure, new vehicles) and soft factors (e.g. awareness raising).
4	Low emission vehicles (e-cars)	Electric vehicles will penetrate the vehicle fleet step by step. This measure focuses on passenger cars
5	Traffic management	The aim is to smooth the traffic flow by avoiding multiple braking and acceleration, e.g. by optimising and coordinating the traffic light control in an urban area. The degree of realisation depends on the present situation in a city.
6	Low emission zones	<p>Low Emission Zones (LEZ) are areas where the most polluting vehicles are restricted from entering. This means that vehicles are banned from LEZ when their emissions are over a set level. Restrictions are imposed based on Euro Standard classification of the vehicles. Two LEZ are considered, only for heavy duty vehicles, and LEZ for cars, vans, trucks and busses. Technological restrictions assumed implemented by 2020 are</p> <ul style="list-style-type: none"> • For heavy duty vehicles: required emission standard Euro 5 or higher • For cars/vans/trucks – diesel: required emission standard Euro 5 or higher • For cars/vans/trucks – gasoline: required emission standard Euro 2 or higher <p>The strictness of these restrictions is in line with current implementation of LEZ over Europe (cf.</p>

		http://www.lowemissionzones.eu). Furthermore, we assume that the LEZ covers both inner and outer city, and that the LEZ operates 24 hours a day, 365 days a year.
7	Ban through traffic for heavy trucks	Through-traffic of trucks is forbidden in those inner-city areas that have the highest pollution levels. This has a potential to reduce high concentration levels at hot-spots, but may increase the overall amount of both emissions and fuel consumption.
8	City toll	All motorized vehicles moving in a central, highly polluted area have to pay a city toll. To reduce the efforts of toll collection the vehicles have to pay each time when they pass a cordon (in and out) around an area. A daily ceiling to avoid too high costs for drivers who have to pass very often this cordon or consideration of a size, type of use or the actuation technology of the vehicle may be implemented.
9	Parking management	Area-wide parking management scheme in high pollution areas. Parking of commuters is not allowed/is expensive to push the use of public transport. For residents, parking allowed by special resident permits. Short term parking offered in such a way that no new trips to the parking management area are attracted.
10	Buss fuel switch (fuel cells, electr.)	To reduce exhaust emissions from buses by using a) hybrid buses and/or b) fuel cell buses. Cities throughout Europe are introducing schemes to renew their bus fleets or have tested hybrid or fuel celled buses.
11	Freight consolidation center/E-logistic for commercial vehicles	The idea of this measure is to bundle delivery in areas suffering from high air pollution and to avoid that heavy trucks enter such areas. Therefore it is necessary to implement freight consolidation centres at the edge of the city, ideally in combination with a railway access, where all the freight for the specific area will be collected. From there small trucks ensure the delivery to the area itself. These small delivery trucks should be equipped with environmental friendly technologies (e.g., electric engine, low fuel consumption). Improvement of the delivery by all means of telecommunication, mainly to bundle trips.
12	E&I city transport concept	A futuristic concept where people will call an autonomously driven car via IT systems (E= electric cars; I=IT systems/smart phones/etc). This concept is already being tested in small scale e.g. in Masdar city (Abu Dhabi).
13	Lower speed limits on motorways	All countries within the EU with the exception of Germany have a general speed limit on motorways. Harmonizing these speed limits to 110 km/h could lead to reductions in fuel consumption and exhaust emissions.
14	Lower speed limits on rural roads	All countries within the EU have a general speed limit for rural roads. Harmonizing these speed limits to 80 km/h could lead to reductions in fuel consumption and exhaust emissions.
15	Low emission cars	Introduction of certain percentages of low emission car types.
16	Enhanced use of biofuels	The EU Directive 2009/28/EC (Renewable Energy Directive) requires that a share of 10% in the fossil fuel mix by 2020 is to be reached. Depending on the production technology (e.g. Fischer-Tropsch-Synthesis), a part of the biofuels will also

		have lower exhaust emissions of air pollutants.
17	CargoCap	A transportation system on underground pipelines for freight transport in densely populated agglomerations. Each Cap is designed for the transportation of two euro-pallets, which represent the majority of the general inner-European cargo transportation, and can thus be directed through pipelines with a diameter of 2.0 m. (research project at the University of Bochum - http://www.cargocap.de/)
18	Road pricing	Price is depending on time of day, type of road, type of vehicle; based on GPS; effect proportional to travel amount – thus, reduces activity.
19	Increased fuel tax	Reduces activity and induces modal shift. Elasticities are used to reflect the effect of fuel price increase on public transport usage.
20	EURO7 standards	Considers a certain proportion of vehicles with this technology.
21	Tires, brakes, road surfaces with minimal abrasion	We may expect a reduction by 30% in 2030 in these non-exhaust emissions assuming the maximum technically feasible reductions, including (1) better brake pads and discs (2) reformulated rubber mixtures for tires (3) appropriate adjustment of pavement properties, and (4) use of dust suppressants to keep road surfaces wet.
22	Tighter emission limits for inland waterways	Emission limits for inland waterways. There have been made several proposals by stakeholders including retrofitting ships or using alternative fuels.
23	Kerosene tax for aviation	Estimates of elasticities are available from a German research project PAREST
24	Shift from air to rail	Shift from aviation can be encouraged by increasing the number of fast train lanes.
25	Emission control areas (SECA/NECA)	Implementation of emission control areas (SECA/NECA). There have been made several proposals by stakeholders including retrofitting ships or using alternative fuels.
26	Electric operation in harbours	Ships at berth are connected to an electric grid to avoid exhaust emissions from the ship engine – Rotterdam: First pilot recently implemented. TNO published some work on it in Tijdschrift Lucht. Green award certificate for clean ships (based on a mixture environmental cleanliness issues). Port of Rotterdam was/is one of the driving forces.

Annex 2 Questionnaire to cities

A) Background

TRANSPHORM (Transport Related Air Pollution and Health Impacts- Integrated Methodologies for Assessing Particulate Matter) is a FP7 project of the European Commission. “. The project brings together internationally leading air quality scientists and health experts with policy users. Its goal is to improve the knowledge of transport related airborne particulate matter (PM) and its impact on human health. TRANPHORM aims to develop and implement assessment tools on the impact of control measures on the transport sector to control PM and its adverse health effects, from city level to European scale.

As part of this work, TRANSPHORM is now contacting relevant stakeholders at selected cities. The purpose of this questionnaire is to establish a bilateral dialog between TRANSPHORM partners and city stakeholder on the efficiency of control measures to limit the health impact of particulate matter emitted from transport related air pollution.

TRANSPHORM offers to carry out a scenario analysis for the city authorities to help elucidate the effect of selected control measures in the transport sector for 2020 or 2030. This will inform city stakeholders on the health benefits that may be expected from the selected control measures. The TRANSPHORM research provides insight in particular components and characteristics from PM (PNC, Heavy metal, PAHs) that have not been studied before and therefore the TRANSPHORM introduces an added value to similar studies that may have been carried out at city level.

The control measures to be studied by TRANSPHORM for the city authorities are to be determined from the open dialog between TRANSPHORM partners and the city authorities. To help in the selection process, city stakeholders are kindly requested to consider the following questionnaire and the preliminarily list of policies/measures with a focus on city measures compiled by TRANSPHORM partners.

Thank you for your collaboration!

B) Main questions for city stakeholders

The first two questions intend to gather an overview over the status of city transport control measures already in place in the different cities with respect to Particulate Matter. For guidance on the type of measures that TRANSPHORM has in mind, please check Annex I.

The next four questions are intended to allow the identification of the scenarios for 2020 or 2030 for control measures of PM. They are intended to identify the main concerns of city stakeholders with respect to control measures for PM and to propose a pragmatic way to evaluate single possible control scenarios. These are the scenarios for which the TRANSPHORM teams will carry out a health impact analysis to inform the city stakeholders.

Q1) Which measures are already implemented in your city to control PM from traffic?

For these already implemented measures, we would kindly request information on the road map for their implementation and the given results, if evaluated.

Q2) Are there any additional measures already identified for the future and decisions are made to implement them in your city?

For these measures in the pipeline, we would kindly request additional information concerning a detailed description, the road map for their implementation, an analysis of the expect effect on emissions (especially reduction/change of number of trips, vehicle-km, passenger-km per vehicle category, both private and public transport), of the costs of implementing the measure and, where estimated, also changes in emissions of pollutants and greenhouse gases.

Q3) Are there any impact assessment studies already available for the measures identified above?

It would be very useful to know whether there have been already studies with i.e. an estimation of the effect and the costs of implementing the measure in the city.

Q4) Are there any measures in Annex I that are obviously not effective /acceptable /relevant in your city and thus should be omitted?

Please help us identify measures that are not relevant in your city and help us understand why these are not relevant.

Q5) Which measures are more relevant for your city?

It would be very useful to know which measures are most relevant for your city and determine also whether some of these measures are missing in the list given in Annex I.

Q6) For which measures can you provide relevant input data to facilitate the analysis to be done in TRANSPHORM?

For the most relevant measures identified in Q5, please help TRANSPHORM compile the available information on the measure, especially the estimated change in traffic volume, passenger-km, vehicle-km per vehicle category and the costs. In this way scenarios for 2020 or 2030 can be produced and the consequent health impact assessment can be carried out by TRANSPHORM partners for the benefit of the city stakeholders.

Remark: we need the information in English. Thus, if information is only available in other languages, the main findings should be translated into English.