



TRANSPHORM
Transport related Air Pollution and Health impacts –
Integrated Methodologies for Assessing Particulate Matter

Collaborative project, Large-scale Integrating Project
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List of Mitigation Measures and Policies

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Preface

This deliverable provides a list of mitigation measures and policies that are being considered for developing scenario bundles of measures for modeling of particulate matter reduction potential in the TRANSPHORM project. It is based mainly on work done by USTUTT (team leader: **prof. Rainer Friedrich**, team members: **Ulrike Kugler, Manfred Wacker, Isaak Yperman and Christian Schieberle**). The measures are further analyzed and described in subsequent deliverables, such as D5.1.2, D5.1.3, D5.2.1.

Introduction

TRANSPHORM (**Transport related Air Pollution and Health impacts - Integrated Methodologies for Assessing Particulate Matter**, www.transphorm.eu, 2009-2013) is an EU FP7 R&D funded collaborative research 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 goal of TRANSPHORM is to develop an effective tool to support policy making in the transport sector for maximizing the protection of public health and to use this tool in the analysis of policies and measures. This is done on the backdrop of European level activities related to Air Policy Review and the White Paper on Transport¹. Transphorm may serve as a complement of such activities, focusing on a set of measures and analyzing them in five cities: Athens, Helsinki, London, Oslo and Rotterdam. Scenarios using different implementations of these measures are being modelled to assess their impact on air quality in the near future (2020, 2030 and outlook for 2050). This work complements research that aims to identify contribution of transport to particulate matter levels through e.g. source apportionment studies, exposure assessment using a combination of modelling and other assessment tools, and development of new concentration-response functions. This information will feed into assessment tools allowing investigating and analyzing the whole chain of processes leading to health impact, and will thus contribute to development of effective mitigation and adaptation strategies from local to European level.

Twenty-six transport policies and measures that are relevant mainly at urban scale are presently under evaluation with respect to their potential to reduce the impact of transport activities on human health. Two measures affect air transport, three shipping and 21 road transport. 11 of the 21 measures have an influence on modal shift, i.e. one transport mode is replaced by one or several others. The measures are relevant to urban areas with > 50 000 inhabitants (9 measures), > 100 000 inhabitants (2 measures) and > 500 000 inhabitants (3 measures) and on all roads (6 measures) or only on non-urban roads (3 measures).

This document gives a short overview of the measures. It is meant to document the basis for discussion and further guidance to Transphorm on priorities for modelling and assessments.

¹ COM(2011) 144 final

Tables of Measures and Policies

Table 1. List of measures considered in TRANSPHORM

	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	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 <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 The strictness of these restrictions is in line with current implementation of LEZ over Europe (cf. 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	Area-wide parking management scheme in high pollution areas. Parking of

	Short name	Description
	management	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	Tyres, 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.

	Short name	Description
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 behind this

Table 2. TRANSPHORM mitigation measures and policies applicable in cities

No	Short Name	Affecting Emission Factors	Affecting Stock	Affecting Activity	Affecting Modal shift	Impact on other emission sectors	Applicable in city size
1	Enhanced use of bicycles in cities		x	x	x	Fuel supply (incl. refineries)	>50.000
2	Enhanced use of public transport		x	x	x	Electr. prod., Fuel supply	>50.000
3	Car pooling/ sharing		x	x	x		>50.000
4	Low emission vehicles (E-cars)		x	x		Electr.prod., fuel supply	>50.000
5	Traffic management	x				Fuel supply	>50.000
6	Low emission zones		x	x	x	-	>500.000
7	Ban of through traffic of trucks			x		Fuel supply	>50.000
8	City toll			x	x	Electr. prod., fuel supply	>500.000
9	Parking management			x	x	Electr. prod., fuel supply	>50.000
10	Bus fuel switch (fuel cells, electr.)		x	x		Electr. Prod., H2 prod., fuel	>50.000
11	E logistics commercial vehicles			x		Fuel supply Electr. Prod	>100.000
12	E & I city transport concept		x	x		Electr. Prod., fuel supply	>500.000

Table 3. TRANSPHORM mitigation measures and policies applicable on all roads

No	Short Name	Affecting Emission Factors	Affecting Stock	Affecting Activity	Affecting Modal shift	Impact on other emission sectors	Applicable in city size
13	Lower speed limit (motorways)	Motor-ways	x				Fuel supply
14	Lower speed limit (rural)	Non-urban roads ex. motor-ways	x				Fuel supply
15	Low emission cars	All		x	x	x	Electricity prod.
16	Enhanced use of biofuels	All		x	x		Agriculture, Fuel prod.
17	CargoCap	All		x	x	x	Electr. Prod., Fuel supply
18	Road pricing	Non-urban		x	x	x	Fuel supply
19	Increased fuel tax	All		x	x	x	Fuel supply
20	EURO 7	All		x	x		
21	Tires, brakes and road surfaces with minimized abrasion	All	x				

Table 4. TRANSPHORM mitigation measures and policies applicable for non-road transport

No	Short Name	Affecting Emission Factors	Affecting Stock	Affecting Activity	Affecting Modal shift	Impact on other emission sectors	Applicable in city size
22	Tighter emission limits for inland shipping	Inland water-ways	x				
23	Kerosene tax for aviation	Air			x	x	Electr. Prod., fuel supply
24	Shift from air to rail	Air			x	x	
25	Emission Control Areas (SECA/NECA)	Maritime	x				
26	Electric operation harbours	Maritime/ Harbours	x				Electr. Prod., fuel supply