Air Implementation Pilot:

Management practices (update 2013)

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Cyclist and dense traffic in the city of Oslo. Picture by Stein Manø.

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Air Implementation Pilot description

In his address to the European Environment Agency (EEA) Management Board on 23 June 2011, Commissioner Potočnik stated the following:

… [*W*]*hile I don't think the EEA is equipped for such a role* [in inspections]*, we do need to strengthen our knowledge base on implementation. We cannot continue to have a situation on implementation where the Commission and Member States are looking at different data. We both need a body we trust to provide us with accurate data and state of the art, science-based assessments. We need an independent assessor if needed. This neutral and common information base for compliance monitoring should in my view be provided by the Agency. I suggest we develop a joint analysis of what such a reinforced role would imply, on the basis of one or two pilot cases e.g. on waste and on air. We need to start this process as soon as possible and I will be looking forward to develop it together with you.*

The Commissioner subsequently invited the European Commission's Directorate General for Environment (DG ENV) and the EEA to explore an enhanced EEA role in support of EU environment policy implementation, by way of pilots on air and waste.

To provide a public profile for the air implementation pilot and to prepare for the Integrated Projects proposed for air under the new LIFE+ regulation, EEA and DG ENV has mobilised a sample of cities (12) across the EU to take part in the pilot actions. Through 2012/2013 the air pilot actions have be taken forward with close involvement of these "sample" cities for the purpose of sharing both "successful" and "unsuccessful" experiences and to develop proposals for improved implementation that can be shared with a wider set of cities potentially via the LIFE+ mechanism.

The work has involved EEA, DG ENV, the European Thematic Centre for Air pollution and Climate change Mitigation (ETC/ACM), and the cities themselves, under the coordination of Alberto González Ortiz, EEA project manager for air quality data and policies assessments.

The present report refers exclusively to one of the tasks that were conducted under the Air Pilot. The complete list of key actions agreed upon by DG ENV and EEA and that were presented to the cities are described below:

1. Selection and engagement of cities
2. Assessing the emission inventories at the local level
3. Assessing modelling activities
4. Assessing monitoring station density and location
5. Assessing air quality trends
6. Assessing management practices
7. Assessing public information practices
8. Coordination, overall management and follow up

1. Introduction

The objective of the Air Pilot Task: Assessing trends in concentrations and management practices, is **to identify and create an inventory of effective policies and measures undertaken in the pilot cities**.

To complete this task an analysis of the *plans and programmes (P&Ps[1]) questionnaires* and *time extension notifications (TEN[2])* was carried out. This analysis also takes into account the *help of cities* and its feedback in the management process (problems faced, measures beyond city control, effects outside the city, further guidance, etc.). A parallel analysis will examine if detected changes in time series can be attributed to specific policies and measures that were put in place.

The analysis presented in this document is based on the information that the cities reported to the European Commission (see Table 1) undertaken with the assistance of cities. This Technical paper is an update of chapter 4 of the ETC/ACM 2012/10 Technical paper[3]. Complementary to this document is the Technical paper *Air Implementation Pilot – Workshop on measures*[4] where the feedback from the cities focusing on the management process (e.g. method/process leading to the choice of measures, estimation of the expected effect and/or achieved effect of a measure, evaluation of the costs, problems faced in the implementation, measures beyond city control, effects outside the city, further guidance, etc.) has been described.

2. Plans and Programmes and Time extensions

Article 11 of the old Framework Directive (96/62/EC) and article 23 of the current Air Quality Directive (AQD) 2008/50/EC, require Member States to submit their Plans and Programmes (P&Ps) to the European Commission. While the P&Ps would be drafted according to the specific administrative requirements in each Member State, the information submitted to the Commission should be harmonised. The reporting of P&Ps to the Commission is given as an Excel form that includes:

(1) General information;

(2) Description of the exceedance situation addressed by the P&Ps;

(3) Analysis of the causes of exceedance;

(4) Summary descriptions of individual measures.

Article 22 of the AQD 2008/50/EC allows the Member States to postpone the attainment deadline for the limit values (LV) for nitrogen dioxide and benzene and to be exempt from the obligation to apply the LV for PM_{10} if certain conditions are met. Member States have to notify the Commission where these postponements and exemptions apply, using the TEN format, as defined in the "Commission Staff Working Paper concerning guidance on preparing a notification of a postponement of the deadline for attaining the limit values for

[1] http://cdr.eionet.europa.eu/

[2] http://ec.europa.eu/environment/air/quality/legislation/time_extensions.htm

[3] *Progressing to cleaner air: Evaluating non-attainment areas.* ETC/ACM Technical Paper 2012/10

[4] *Air Implementation Pilot – Workshop on measures,* ETC/ACM Technical paper 2013/5

NO_2 under Directive 2008/50/EC on ambient air quality and cleaner air for Europe" (SEC(2011) 300 final). Furthermore, according to the "Communication from the Commission on notifications of postponements of attainment deadlines and exemptions from the obligation to apply certain limit values pursuant to Article 22 of Directive 2008/50/EC on ambient air quality and cleaner air for Europe" (COM/2008/0403 final), notifications must be accompanied by an air quality plan for the zone or agglomeration concerned.

Eight out of the twelve cities taking part in the Air Pilot project have sent their P&Ps to the European Commission (i.e. Berlin, Dublin, Milan, Ploiesti, Prague, Antwerp, Paris and Vilnius; Table 1).

Time extensions have been submitted by Berlin, Madrid, Milan, Ploiesti, Prague, Vienna, Antwerp, Plovdiv and Paris (Table 1). The applications for time extension include information similar to that in the P&Ps, such as the summary of the measures implemented or to be implemented for compliance purposes. In addition, the applications include information concerning expected concentrations in the year of extension of the deadline of compliance.

The city of Madrid provided the Time Extension Notification with the description of the measures upon request for this assessment. The city of Malmö has not submitted P&P or TEN. Malmö has not registered exceedances in the last five years, what explains the lack of reporting.

The information concerning compliance with limit values, reasons for exceedances and proposed measures is directly comparable between the cities if they have submitted the P&Ps or have applied for a time extension. Therefore, the evaluation in this ETC/ACM technical paper is performed for the eleven cities together (all except Malmö).

Table 1: Summary of cities that take part in the Air Pilot project and overview of the sent Plans and Programmes (P&Ps) and time extensions notifications (TEN). *Source: P&Ps and TEN.*

City	AQZ name (code)	P&P (year)		Time Extension (year)	
		NO_2	PM10	NO_2	PM10
Berlin	Ballungsraum Berlin (DEZBXX001A)	YES (2002)	YES (2002)	YES (2009)	NO
Dublin	Zone A (IE001)	YES (2009)	(-)	NO	NO
Madrid	Madrid (ES1301)	YES(b)	YES(b)	YES (2010)	NO
Malmö	Malmö (SW6)	NO	NO	NO	NO
Milan	Agglomerati urbani (A1) (IT0301)(a)	YES (2009)	YES (2009)	YES (2008-2009)	YES (2005)
Ploiesti	Ploiesti (RO0302)	(-)	YES (2009)	NO	YES (2007)
Prague	Praha (CZ010)	YES (2004)	YES (2004)	YES (2010)	YES (2006)
Vienna	Wien (AT_09)	NO	NO	YES (c) (2010)	YES (2005)
Antwerp	Agglomeratie Antwerpen	YES	NO	NO	YES (2010)

City	AQZ name (code)	P&P (year)		Time Extension (year)	
		NO_2	PM10	NO_2	PM10
	(BEF02A)	(2008)			
Plovdiv	Пловдив (BG0002)	NO	NO	YES (2010)	YES (2007)
Paris	Ile-de-France (FR04A01)	YES (2010)	YES (2010)	YES (NA)	YES (2005, 2006, 2007)
Vilnius	Vilnius (LT0100)	NO	YES (d) (2010)	NO	NO

(year): the reference year. The 'reference year' refers to the year for which the exceedance has been assessed.
(-): the city has not reported exceedances for that pollutant.
(a) changed to IT0306 in 2011
(b) In the year 2006 the document "Estrategia Local de Calidad del Aire de la Ciudad de Madrid 2006-2010" was submitted compiling measures to reduce levels of NO_2 and PM_{10}. However the excel file was not submitted so the P&P has not been analyzed for Madrid.
(d)Vienna submitted the first TEN for NO2 and PM10 in 2005.
(c) Vilnius submitted the first P&P for PM10 in the year 2006. The measures contained in the second and third P&Ps submitted after the first one are general and will help to reduce the ambient levels not only of PM_{10} but also NO_2 among other pollutants.

3. Exceedances of the limit values reported in the P&P and TEN

Table 2 shows the exceedances reported in the P&P and TEN of the limit values (LVs) for protecting human health for the twelve cities. The information in the table only considers those exceedances reported in the P&P or TEN for the reference year; note also that the reference year is not the same for each city (see Table 1).

The LV for $PM_{10,}$ as defined in the Directives 1999/30/EC and 2008/50/EC, has already been in force since the 1st of January 2005, but some of the cities did not attain the annual or daily PM_{10} limit values in the reference year. For instance, the cities of Milan, Ploiesti, Prague, Vienna, Antwerp, Plovdiv, Vilnius, Berlin and Paris reported exceedances of the PM_{10} LV for the reference year in the P&P or TEN.

According to the European Directive 2008/50/EC, the annual and hourly limit value due date for NO_2 was 1st of January 2010. Berlin, Dublin, Madrid, Milan, Prague, Vienna, Antwerp, Plovdiv and Paris reported exceedances of the LV for NO_2 in the reference year (Table 2).

Table 2: Summary of compliance of the LV (µg/m^3) for protection of human health by the cities in the reference year (reference year is indicated in Table 1). *Source: Time Extension Notifications and Plans and Programmes*

LV	**LV**	**Berlin**	**Dublin**	**Madrid**	**Malmö**	**Milan**	**Ploiesti**
A. NO_2	40	NO	NO	NO		NO	
H. NO_2	200 (<18 t/y)			NO		NO	
A. PM10	40					NO	
D. PM10	50 (<35 t/y)	NO				NO	NO
LV	**LV**	**Prague**	**Vienna**	**Antwerp**	**Plovdiv**	**Paris**	**Vilnius**
A. NO_2	40	NO	NO	NO	NO	NO	
H. NO_2	200 (<18 t/y)		NO		NO	NO	
A. PM10	40	NO	NO		NO	NO	
D. PM10	50 (<35 t/y)	NO	NO	NO	NO	NO	NO

t/y stands for times per year. Empty cells means that the city has not reported exceedances of the LV. A: annual; H: hourly; D: daily.

Table 3 shows the concentrations and number of exceedances, respectively, reported by the cities in the P&P and TEN. In the case of exceedance of the annual LV for NO_2 and PM_{10}, concentration ranges are given, in the case of exceedance of the hourly and daily limit values of NO_2 and PM_{10}, the number of exceedances is indicated in the table. The cities reported the expected concentration or number of exceedances by the date when the LV has to be met according to the new extended deadline (see table 3).

Dublin and Madrid are the only cities that do not need additionally measures to comply with the limit values stipulated by the European Directive. The other cities have indicated that it will be necessary to adopt additional measures beyond those in the current legislation to meet the LV for NO_2 or PM_{10}.

Berlin has estimated an annual NO_2 concentration between 36 and 42 µg/m^3 by the extended deadline, meaning that some of the stations will still present exceedances of the annual LV for NO_2. The estimation for Berlin was based in the models applied at 6 automatic stations, assuming than speed limit of 30 km/h could be enforced at these spots with optimised traffic light synchronisation and smooth traffic flow; however as commented by the city this measure was only seen as potentially feasible and thus not considered yet in the TEN questionnaire in the estimation for 2015. The city of Madrid expects to comply with both the annual LV and the hourly LV for NO_2 by the year 2014. Also, those estimations are based on modelling. In the case of Madrid the estimated value corresponds to the model cell where the station is

located, employing a model horizontal resolution up to 1 km^2. It needs to be noted that the model estimations have always associated a certain level of uncertainty and there are also real limitations when comparing the model values with the actual values gathered at monitoring stations.

The cities of Ploiesti, Antwerp, Plovdiv and Paris did not reported the expected concentration or number of exceedances estimated in the years when the limit value has to be met (extended deadline), taking the additional measures for PM_{10} and NO_2 into account. However, all of them have indicated that additional measures will be necessary in order to meet the limit value. Milan has reported the estimated values for NO_2 indicating that the annual concentrations are expected in the range between 28 and 55 $\mu g/m^3$, meaning that some of the stations will register exceedances by the extended deadline; but the expected number of exceedances of the hourly LV for NO_2 is zero, taking into account the additional measures. For PM_{10} Milan has indicated in the TEN that compliance for the annual and daily LV are expected.

Prague has reported that, with additional measures, the estimated level for the NO_2 annual concentration will be lower than the limit value. The expected values for PM_{10} are also below the hourly and annual LV according to the estimated values by the city of Prague. Vienna has reported that the expected value for the annual LV of NO_2 will still be higher than the LV in some of the stations by the year 2015. However for the daily LV of PM_{10} Vienna expects that with the additional measures the concentrations will be below 50 $\mu g/m^3$, and therefore no exceedances are expected by the extended deadline year. Antwerp expects to reduce NO_2 concentrations from 45µg/m3 in the reference year to 42.8 $\mu g/m^3$ in the new extended deadline. The cities of Plovdiv and Paris have not indicated the expected concentrations nor the number or exceedances estimated in the year of the extended deadline.

Table 3: Concentration ranges (for annual LVs) and number of exceedances (for hourly and daily LVs) in the reference year in the case of LV exceedances for NO_2 and PM_{10} and concentrations (in $\mu g/m^3$) expected for the year when the LV comes into force (new extended deadline). *Source: Time Extension Notifications and Plans and Programmes*

LV	**Unit**	**Berlin** (TEN)			**Dublin** (P&Ps)			**Madrid** (TEN)		
		Ref.	*Exp.*	*M*	*Ref.*	*Exp.*	*M*	*Ref.*	*Exp.*	*M*
Annual NO_2	$\mu g/m^3$	44-62	36-42	Y	40	NA	N	41-68	20-37	N
Hourly NO_2	no. exc.							*33-76*	*0*	N
Annual PM10	$\mu g/m^3$									
Daily PM10	no. exc.									
LV	**Unit**	**Milan** (NO_2:TEN; PM_{10}:P&Ps and TEN)			**Ploiesti** (A:TEN, D: P&Ps)			**Prague** (TEN)		
		Ref.	*Exp.*	*M*	*Ref.*	*Exp.*	*M*	*Ref.*	*Exp.*	*M*

Annual NO_2	µg/m^3	45-56	28-55	Y				41-67	<40	Y
Hourly NO_2	no. exc.	*19-86*	*<10*	Y						
Annual PM10	µg/m^3	41-48	Compliance	Y	60	NA	NA	40-61	40	Y
Daily PM10	no. exc.	*45-130*	Compliance	Y	*38*	NA	Y	*36-164*	*35*	Y
LV	**Unit**	**Antwerp (**NO_2:P&Ps;PM_{10}:TEN**)**			**Plovdiv (**TEN**)**			**Paris (**P&P**)**		
		Ref.	*Exp.*	*M*	*Ref.*	*Exp.*	*M*	*Ref.*	*Exp.*	*M*
Annual NO_2	µg/m^3	45	42.8	Y	53.5	NA	Y	44-96	NA	
Hourly NO_2	no. exc.				*33*	NA	Y	*36-104*	NA	
Annual PM10	µg/m^3				67.9	NA	Y	42-52	NA	
Daily PM10	no. exc.	*55*	*NA*	Y	*202*	NA	Y	*36-168*	NA	
LV	**Unit**	**Malmö**			**Vienna** (TEN)			**Vilnius (P&P)**		
		Ref.	*Exp.*	*M*	*Ref.*	*Exp.*	*M*	*Ref.*	*Exp.*	*M*
Annual NO_2	µg/m^3				42-58	37-52	Y			
Hourly NO_2	no. exc.									
Annual PM10	µg/m^3									
Daily PM10	no. exc.				*46-92*	*0*	Y	*41*	*41*	Y

Ref.: concentration (µg/m^3) and number of exceedances of the LV (in italics), respectively, in the reference year expressed in relation to the limit value plus margin of tolerance (LV+MOT) if applicable.
Exp.: concentration (µg/m^3) and number of exceedances (in italics), respectively, estimated in the years when the limit value has to be met (extended deadline), taking the additional measures into account.
M: Yes (Y) if there are any measures beyond those resulting from existing legislation needed to ensure that the limit value will be met by the compliance date.
TEN: information from the application for time extension;, P&Ps: information from plans and programmes; NA: not available;no.exc: number of exceedances

4. Causes of exceedance of the limit values reported in the P&P

Table 4 and Table 5 show the order of importance of local sources to exceedances of the limit values of NO_2 and PM_{10}, respectively, as reported in the P&Ps. The cities identify traffic as the primary source for both, high NO_2 and high PM_{10} levels. The cities with NO2 exceedances have identified NO2 sources in the same order of importance: i.e. 1) traffic, 2) commercial and residential and 3) industrial sources. All cities identify NO_2 as an urban problem.

Regarding PM_{10}, there are differences in the importance of source contributions between the six cities that have reported the contributions of sources to PM_{10} exceedances. All of them indicate traffic as the main source, but, for instance, Paris and Ploiesti identify industry as a main contributor to PM_{10} levels, while Prague identifies industry as the lowest contributor to PM_{10} levels. Milan and Paris also consider natural sources, however evaluate it as the smallest contributor.

Table 4: Importance of the contributions of local sources to exceedances of the limit value of NO_2 as reported in the P&Ps. The importance of the contributions is the same for hourly, and annual limit value**.**

Local sources NO_2	**Berlin**	**Milan**	**Prague**	**Antwerp**	**Paris**
Traffic	1	1	1	1	1
Industry	3	3	3		3
Agriculture	-	-	-		
Commercial and residential	2	2	2		2
Natural	-	-	-		
Other	-	-	-		

Table 5: Importance of the contributions of local sources to exceedances of the limit value of PM_{10} as reported in the P&Ps. The importance of the contributions is the same for daily and annual limit value.

Local sources PM_{10}	**Berlin**	**Milan**	**Ploiesti**	**Prague**	**Paris**	**Vilnius**
Traffic	1	1	1	1	1	1
Industry	3	3	2	4	1	
Agriculture		2		-	4	
Commercial and residential	2	2		3	3	2
Natural		4		-		
Other				2		3

5. Overview of the measures reported to the EC

This section shows an overview of the measures proposed by the different cities (a more extensive overview of measures is included as Annex 1). The overview of the measures is presented on the basis of information provided by the cities concerning:

- the administrative level at which the measure could be taken (i.e. local, regional and national);
- the type of measures (i.e. economical/fiscal, technical, education/information, other);
- the time scale of the concentration reduction achieved by the measure (i.e. short term, medium term, long term);
- the source sector affected by the measure (i.e. transport, industry heat and power production, agriculture, commercial and residential sources, others);
- the spatial scale of the sources affected by the measure (i.e. local sources, urban area, region, country, more than one country).

The information is evaluated and presented in the form of tables. It is important to highlight that some of the measures are classified under several subcategories of the same type. For instance, a measure may be economical and technical at the same time.

In addition, the measures have been divided according to six different groups: Every measure has been assigned to a unique group and the percentages of measures classified in every group are presented in pie charts.

Detailed information is presented in Annex I. The six groups are as follows:

(I) Industry: this category includes measures that are directly related (or apply exclusively) to the industry sector. Examples of these measures are the increase of efficiency of a power plant, the voluntary reduction of emission at specific refineries and industries (e.g. Schwechat), both in Vienna and implemented in 1999 and 2007, respectively.

(II) Buildings: Similarly, the measures taken by the cities concerning energy efficiency of buildings and the use of environmentally friendly fuels for heating are included in this category. Examples are the ban of coal heating and the reinforced measures for heat insulation of old buildings, both implemented in Vienna.

(III) Traffic: Technological and Infrastructure: this group is composed of measures which address reduction of traffic emissions via technological improvement of the means of transport, 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.

(IV) 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 lower speed limit on urban motorways (80 km/h) and in the city (50 km/h; e.g. Vienna), toll increase, etc.

(V) Campaigns: This category includes soft measures such as those implemented to create awareness, to encourage the population towards practices 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.

(VI) Agriculture: This category includes measures related to the agricultural sector, aiming at reducing the impact of agriculture on air pollution. Examples of such measures include the ban of waste burning or the implementation of technological measures to eliminate agricultural waste (e.g. Madrid).

6. Summary of measures

All the cities, with the exception of Malmö, have reported the measures implemented or to be implemented in the city to reduce the concentrations of NO_2 and/or PM_{10} and to comply with the limit values to the European Commission. The number and characteristics of the measures applied vary from city to city. For instance, the percentages of measures for reducing NO_2 and PM_{10} ambient levels affecting traffic emissions vary from 31% and 37 % for NO_2 and PM_{10} in Plovdiv to 74% and 72% for NO_2 and PM_{10} in Prague.

The city of Prague represents a good example of measures implemented to address specifically the main source of NO_2 and PM_{10} exceedances. 74% of the measures implemented or to be implemented for compliance with the NO_2 LV are related to traffic, most of them directly limiting the traffic emissions (32%), others addressed to reduce traffic emissions via technological improvement of the means of transport, improvement of infrastructures or extension of public transport. In relation to the measures for reducing PM_{10} levels, also traffic related measures constitute the largest group, accounting for 72% of measures.

The city of Berlin also has the biggest group of measures dedicated to reduce emissions from traffic in order to comply with the LV for NO_2. Berlin includes 37 measures, 68% of them deal with limiting traffic emissions (30%) and the improvement of technology and infrastructure (38%). Another city with a large number of measures targeted on limiting the traffic emissions is Vienna, with 25% and 37% for reducing NO_2 and PM_{10} concentrations, respectively.

In the city of Vilnius, the measures are mainly related to reduce traffic emissions (72%), followed by measures to create awareness in the population through campaigns (14%).

The cities of Milan, Madrid and Ploiesti have only 4%, 5% and 9% of the measures oriented towards the reduction of traffic emissions via reduction of traffic volume or reduction of activities. The three cities focus on traffic measures that involve technological development and changes in infrastructures which represent 36%, 46% and 46%, respectively, of the measures that have been implemented or will be implemented for reducing NO_2 emissions in these cities. In the city of Dublin, none of the measures can be classified as limiting traffic emissions. The measures for reducing traffic emissions in this city are related with technology and infrastructure.

Some 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 ambient concentrations of NO_2 and PM_{10} are:

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.

The commercial and residential sector has been identified as the second largest contributor to NO_2 exceedances in all the cities and in all but one to PM_{10} exceedances. The city of Ploiesti has not identified this sector as a contributing to PM_{10} exceedances.

Milan and Prague have implemented or are going to implement a large number of measures dealing with energy efficiency of buildings and environmentally friendly fuels for heating with the aim to comply with the LV for NO_2 (24% and 21%, respectively).

In the city of Berlin, 3% of the measures are related with buildings, while in Paris none of the measures for NO_2 has been classified as affecting buildings, but 6% of the 18 measures for PM_{10} are related with energy-efficiency of buildings.

The city of Ploiesti identified the industrial sector as the second largest contributor to PM_{10} exceedances, but from the 11 measures reported, only one relates directly to limiting the

emissions from industry. Industry is also identified as a main contributor to PM10 exceedances in Paris, and 4 out of 19 measures implemented or to be implemented in the city affect this source sector. Berlin, Vienna, Milan, Madrid and Paris have also reported measures affecting industrial sources to reduce NO_2 ambient levels.

All cities have implemented or plan to implement campaigns to create awareness, to encourage the population towards behaviours that help to reduce emissions promoting low emission activities. For instance, in the cities of Paris and Plovdiv the campaigns represent an important group, with a percentage over 30%. Those measures are important to make sure that the air quality problems are well understood among the population of the cities in order to promote the adoption of the initiatives.

Measures related to agriculture are not as present as measures related to other sectors described in the P&P and TEN submitted by the cities. The most probable reason behind that is that measures concerning agriculture are usually undertaken at regional or national level, and, although emissions from agriculture can impact on air quality in the cities, these emissions generally are emitted outside the administrative boundaries of the cities and thus outside the city authority's jurisdiction. However, it does not mean that there are no agricultural measures considered at national level. From the 12 cities considered in the study, only Milan has identified agriculture as one of the main sectors contributing to PM_{10} exceedances. The cities of Antwerp, Vienna and Madrid also reported measures dedicated to reduce emissions from agriculture. In Vienna and Madrid, they only represent 1% of the total reported measures, but in Antwerp, they represent 5% of the total measures to reduce ambient PM_{10} levels.

From the analysis of the Plans and Programmes and of the Time Extension Notifications, it is unfortunately not possible to identify which are the most efficient measures in each city, as not all the cities have reported the expected local impact of the measures on ambient concentration. The analysis is then only based on the number of measures that have been applied for limiting emissions directly from the sources.

It is very important to get the input from the cities themselves on how they evaluate the effectiveness of the measures, together with a list of the key measures that have been implemented in the city (e.g. Milan and Madrid reported more than 100 measures). In this sense, a workshop with the cities was arranged to get direct feedback from them. The objectives were: to understand how expected effects are estimated (before implementation) and how aimed effects are calculated (after); estimation of costs; challenges in implementation; and need for further guidance. The results of the workshop are presented in the Technical paper ETC/ACM 2013/5 *Air Implementation Pilot – Workshop on measures*.

Annex I: Overview of measures in Time Extension Notifications of Air Pilot cities

Berlin

Berlin has included 37 measures in the time extension notification regarding compliance with the limit value of NO_2. Most of the measures are taken at local administrative level (i.e. 95%; Table 1) and they affect local sources (i.e. 95%; Table 1). The expected time for the concentration reduction as a consequence of each measure varies from short term to long term, where most measures are expected to have medium-term effect (Table 1).

Table 1: Summary of number of measures implemented or to be implemented in Berlin and reported in the application of time extension to comply with the limit value for NO_2. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	35	2	7		
Type of measure	12	31	17	1	
Time scale of the concentration reduction	17	31	20		
Source sector affected	35	4	0	4	0
Spatial scale of the sources affected	7	26	5	5	2

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

The measures implemented or to be implemented in Berlin in order to comply with the limit values for NO_2 are mainly related to technological improvement or associated with infrastructures (38%; Figure 1) addressed to reduce traffic emissions. For instance, some of the measures are 1) emission improvements of the municipal vehicle fleet, trucks, taxis and driving school vehicles; 2) reorganization of the bus traffic network; 3) conversion of the bus fleet to Euro 5 or 6; 4) testing of hydrogen/electric buses in regular services or retrofit buses; and 5) implementation of the tighter EU emission standards for vehicles.

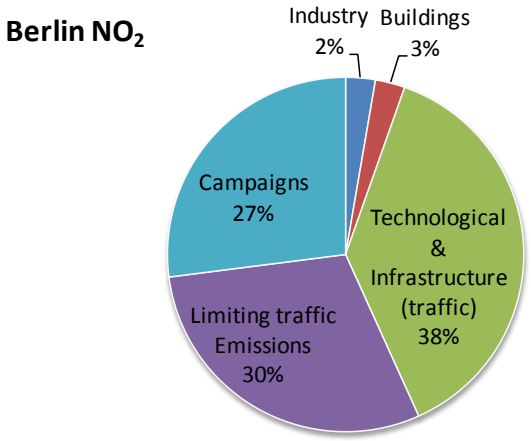

Figure 1: Overview of the types of measures implemented or to be implemented by Berlin in order to comply with the limit values established for NO_2. Classification according to the six categories defined in section 5, where every measure is classified in only one category.

The second biggest group of measures is the one dealing with limiting traffic emissions (30%; Figure 1), via reduction of traffic volume or reduction of activities, followed by measures promoting environmentally friendly means of transports and/or activities (i.e. campaigns: 27%; Figure 1), such as cycling, Euro 6 vehicles, natural gas vehicles, pedestrian traffic and car sharing. The measures implemented to limit traffic emissions are mainly those defining environmental zone levels, reduce traffic congestion, parking management and reduction of speed limit to reduce harmful emissions from the traffic sector. Only 2 and 3% of the 37 measures implemented in Berlin are related with the industry and building sector, respectively. Most of the measures (68%) implemented in Berlin are not regulatory.

Berlin also reported P&Ps for NO_2 and PM_{10} in the year 2002, including 21 measures for both NO_2 and PM_{10}. 19 of these measures were also reported in the TEN for NO_2 and are included in the analysis shown above. However, the P&P included two measures specific to decreasing PM_{10} levels: i) enhanced wet cleaning of roads to reduce the resuspension of road dust during dry weather periods and ii) reduction of dust emission caused by construction activity. The wet cleaning of the roads is expected to have a short term impact on PM_{10} reduction, while for the second measure the expected impact is considered to be ineffective and was not implemented at the end. Measure (i) can be classified as reduction of traffic emissions via technological and infrastructure improvement.

Vienna

Vienna has implemented 65 and 76 measures to comply with the exceedances of the limit value for NO_2 (Table 2) and PM_{10} (Table 3), respectively. Most of the measures for both NO_2 and PM_{10} compliance are taken at local level and the expected time for concentration reduction for most of the measures (about 70%) is about a year, i.e. medium-term (Table 2 and Table 3). The sector mainly affected by these measures is transport (A) for both NO_2 and PM_{10} compliances (63%; Table 2), followed closely by industry (including heat and power production) in the case of the group of measures implemented to comply with PM_{10} limit value (29%; Table 3).

Table 2: Summary of the number of measures implemented or to be implemented in Vienna and reported in the application of time extension to comply with the limit value for NO_2. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	48	3	17		
Type of measure	14	33	26	6	
Time scale of the concentration reduction	19	46	43		
Source sector affected	41	15	1	14	5
Spatial scale of the sources affected	47	1	1	16	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

Table 3: Summary of the number of measures implemented or to be implemented in Vienna and reported in the application of time extension to comply with the limit value for PM10. Some of the measures are classified on more than one group. For A, B, C, D and E in each category see Table 2.

	A	B	C	D	E
Administrative level	61	3	15		
Type of measure	10	51	27	2	
Time scale of the concentration reduction	23	53	42		
Source sector affected	45	22	3	19	6
Spatial scale of the sources affected	57	62	9	17	0

The evaluation of the measures and their classification in groups indicate that most of the measures can be classified as related with technological improvement or modification of the infrastructures aiming at the reduction of traffic emissions (Figure 2). Some of the measures included in this group are those related with public transport and cycling, involving the extension of the public transport network in Vienna and the extension of the bike path, in addition, a change of the bus fleet to pure LPG and modernization of the fleet have been carried out, and the relocation of traffic along the Danube River, among other measures.

Most of the measures have been implemented to comply with the limit values for both pollutants, NO_2 and PM_{10}. The city of Vienna has implemented one measure related to the agricultural sector; it is named Nitrates Action Programme.

Most of the measures taken to reduce traffic volume in specific areas, and therefore limiting traffic emissions, involve speed limit reduction, extension of calm traffic zones, increase of toll or ban for high emitting vehicles (e.g. Euro 0 and Euro 1 trucks). These measures constitute 25% and 37% of the measures implemented to comply with the value limit for NO_2 and PM_{10}, respectively.

Measures to reduce industrial emissions have been reported for both NO_2 and PM_{10} as for instance retrofitting of installations with enhanced abatement technology'.

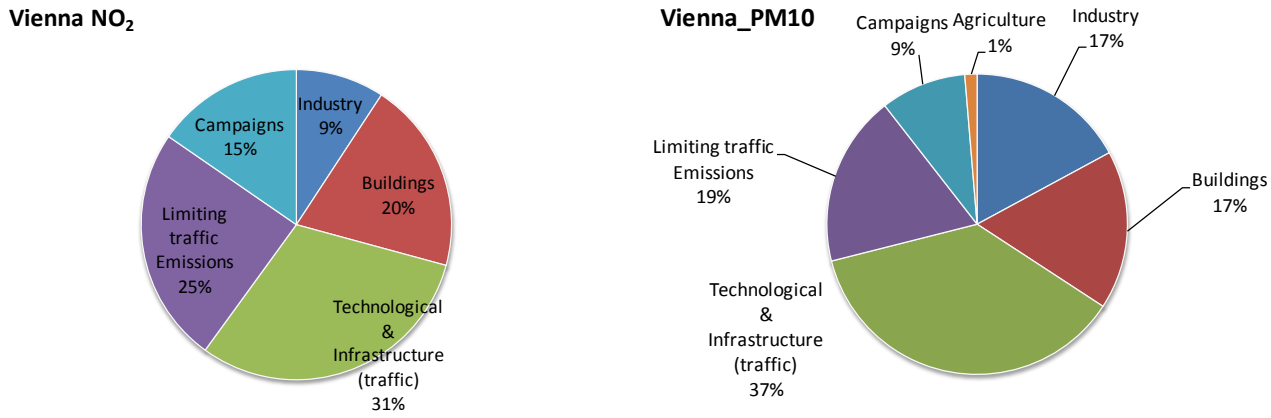

Figure 2: Overview of the types of measures implemented or to be implemented in Vienna to comply with the limit values established for NO_2 (left) and PM_{10} (right). Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Milan

In the TEN, Milan reported 109 measures implemented or to be implemented to achieve compliance with the LV for NO_2 (Table 4). Most of the measures are taken at regional level (i.e. 94%), have a technical character (i.e. 75%;), a long term concentration reduction is expected for 75% of the measures and traffic and industry are the sectors most affected.

Table 4: Summary of the number of measures implemented or to be implemented in Milan and reported in the application of time extension to comply with the limit values for NO_2. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	10	103	4		
Type of measure	60	82	4	9	
Time scale of the concentration reduction	19	67	81		
Source sector affected	48	38	12	26	16
Spatial scale of the sources affected	11	19	89	1	1

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.

Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

Most of the measures implemented in Milan are technological or involve an improvement of the infrastructures of the city (i.e. 36%; Figure 3). Some of the measures are the establishment of bicycle paths, intervention programs of urban transports, the development of emission inventories or actions for planning the urban traffic. The second biggest group of measures are those affecting buildings (24%; Figure 3), closely followed by the measures affecting the industry sector (23%; Figure 3). Some examples of the measures affecting the building sector involve establishing district heating plants, plans for energy saving in hospitals and schools or the use of energy performance certificates for buildings. Examples for measures affecting the industry sector are limitation of the emissions of power plants and energy production facilities. In the city of Milan, 8% of the measures are related with the agriculture sector. An example for those measures is the implementation of a regulation for nitrates via economic, administrative and technological aspects or the nitrogen load reduction in manure.

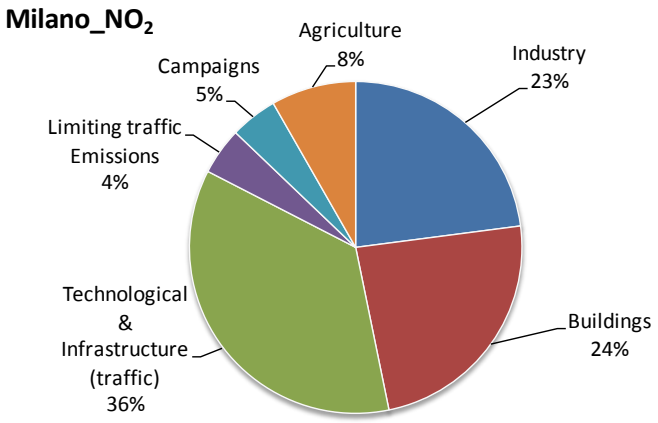

Figure 3: Overview of the types of measures implemented or to be implemented in Milan in order to comply with the limit values established for NO_2. Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Traffic was identified as the primary source for both NO_2 and PM_{10} (Table 4) in the city of Milan, and that corresponds with the percentage of measures that the city has implemented or will implement related to traffic emissions. A total of 40% of measures are related to traffic, and specifically 4% of them are related to limiting traffic emissions (Figure 3). As it was indicated previously, the category “limiting traffic emissions” in this report includes measures such as LEZ, low speed limits, toll increase, etc. In the case of Milan, the measures taken to limit traffic emissions involve pricing and access restriction of vehicles to specific areas or opening a call for funding projects aiming at reducing emissions from the distribution of goods in urban areas.

Prague

Prague has reported 19 and 22 measures to reach compliance with the LVs for NO_2 and PM_{10}, respectively. All measures were taken at both local and regional administrative level (Table 5

and Table 6). The sources affected by the measures to achieve compliance with LV for NO_2 are mainly located in urban areas (Table 5), whereas local, urban and regional sources are affected by the measures implemented to reach compliance with LV of PM_{10} (Table 6). Most of the measures in the P&P are classified as technical (B) (i.e. 63%; Table 5 and Table 6). Education/information measures (C) are the second most important type of measures to reduce PM_{10} levels. The time scale expected for concentration reduction varies slightly between measures for NO_2 and PM_{10} reductions; a short/medium term time scale is mainly expected for reduction of NO_2 concentrations whereas reduction of PM_{10} levels are expected mainly on the medium term time scale.

Table 5: Summary of the number of measures implemented or to be implemented in Prague and reported in the application of time extension to comply with the limit value for NO_2. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	19	19	0		
Type of measure	3	12	0	12	
Time scale of the concentration reduction	8	8	3		
Source sector affected	15	0	0	4	0
Spatial scale of the sources affected	5	15	0	0	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

Table 6: Summary of the number of measures implemented or to be implemented in Prague and reported in the application of time extension to comply with the limit value for PM10. Some of the measures are classified on more than one group. For A, B, C, D and E in each category see Table 5.

	A	B	C	D	E
Administrative level	22	22	0		
Type of measure	7	19	11	0	
Time scale of the concentration reduction	0	22	1		
Source sector affected	18	4	2	7	5
Spatial scale of the sources affected	22	22	22	0	0

Figure 4 shows a detailed subdivision of the types of measures taken to reduce ambient NO_2 and PM_{10} levels. Most of the measures, 42% for NO_2 reduction and 54% for PM_{10} reduction, are classified as technological and affecting traffic infrastructures. Some of these measures involve the operational control of emission parameters of vehicles, the development of an integrated transport system, the support of alternative fuels for transport or the construction/improvement of public transport routes.

The second most prominent group of measures includes those limiting traffic emissions, about 32% and 18% of the measures for NO_2 and PM_{10} reduction, respectively. The introduction of toll systems, the definition of low emission zones and the restriction of heavy vehicles in the city are some of the main measures in this group. Measures to increase the attractiveness of public transport and to promote it have also been taken in Prague (campaigns; Figure 4). The measures affecting the building sector constitute about 21% and 14% of the total number of measures implemented for reduction of NO_2 and PM_{10} levels, respectively (Figure 4). Some examples of measures affecting the building sectors are support to renovate the heating systems in homes and the efficient use of energy.

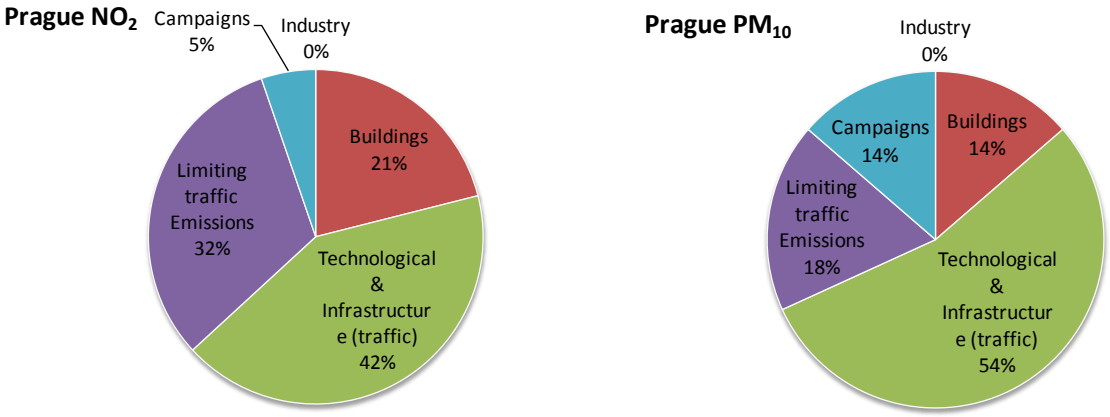

Figure 4: Overview of the types of measures implemented or to be implemented in Prague to comply with the limit value established for NO_2 (left) and PM_{10} (right). Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Madrid

Madrid has reported 121 measures to attain compliance with the LV for NO_2. Most of the measures are taken at local level (74%), and correspond to technical type of measures (84%) affecting mainly local sources. The expected time scale for the concentration reduction is mostly from medium term to long term. A short term impact is expected for 35% of the measures (Table 7).

Table 7: Summary of the number of measures implemented or to be implemented in Madrid and reported in the application of time extension to comply with the limit value for NO2. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	84	42	20		
Type of measure	35	95	58	4	
Time scale of the concentration reduction	39	79	102		
Source sector affected	87	19	14	35	20
Spatial scale of the sources affected	108	104	21	22	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

The measures implemented or to be implemented in Madrid are mainly related to technological or infrastructure improvements (46%) addressed to the reduction of traffic emissions. Examples for the measures are 1) Renewal of the vehicle fleet or 2) The Air Quality and Climate Change Strategy of the Community of Madrid. The second biggest group of measures implemented by Madrid is related to campaigns as, for instance, 1) tax measures to promote the use of less polluting fuels or 2) promoting pedestrian mobility. 13% of the measures are related to industry and they include measures like the renewable energy plan, valid throughout Spain, or the Energy Plan for the Community of Madrid. The measures related to buildings represent 11% of the total number of measures. These include, for example, several measures concerning the renovation of heating systems, parts of the buildings, such as windows, etc. The measures concerning the limitation of traffic emissions only represent 5% of the measures implemented or to be implemented. Examples for such measures are 1) creation of low emission zones or 2) ban of idling. Finally, the city of Madrid also describes one measure related with the agricultural sector. This measure is contained in the National Plan, and therefore managed outside of the administrative limits of the city.

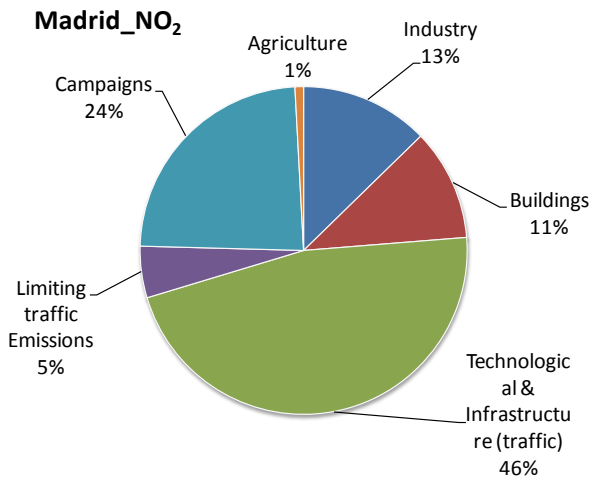

Figure 5: Overview of the types of measures implemented or to be implemented in Madrid in order to comply with the limit value established for NO_2. Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Ploiesti

The city of Ploiesti has submitted both P&Ps and a TEN to the EC regarding compliance with the PM_{10} limit value. The TEN refers to the reference year 2007 and contains only the description of three measures, while the P&Ps refer to the reference year 2009 and include 11 measures. The analysis is based on the 11 measures described in the P&Ps.

All the measures implemented or to be implemented in Ploiesti correspond to the local administrative level, and mainly affect the transport sector (64%), followed by commercial and residential sources (18%) and other sources (18%). The expected time scale for concentration reduction is long term, although some of the measures are foreseen to have also a short term impact (18%) or a medium term impact (55%) on PM_{10} concentrations.

Table 8: Summary of the measures implemented or to be implemented in Ploiesti and reported in the P&Ps to comply with the limit value for PM_{10}. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	11	0	0		
Type of measure	6	8	3	7	
Time scale of the concentration reduction	2	6	11		
Source sector affected	7	1	1	2	2
Spatial scale of the sources affected	6	9	1	0	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.

Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

Most of the measures implemented in Ploiesti can be classified as related with technological improvement and infrastructure modification aiming to reduce traffic emissions (46%; Figure 6). These measures include, for instance, 1) construction of bypass roads; 2) rehabilitation, upgrading and maintenance of urban road infrastructure and utilities or 3) cycle and pedestrian paths. The next biggest group of measures is related to campaigns (27%) and includes measures as 1) promotion of public transport or 2) public awareness on the importance of measures to reduce air pollution. There is only one measure taken to reduce traffic volume, one measure concerning energy efficiency of buildings and one measure directly related with the industrial sector.

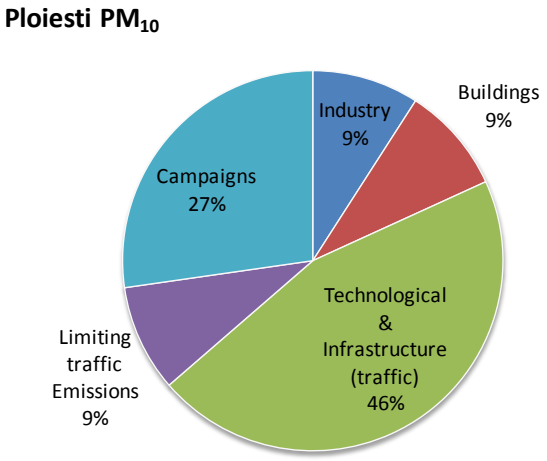

Figure 6: Overview of the types of measures implemented or to be implemented in Ploiesti in order to comply with the limit value established for PM_{10}. Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Dublin

The city of Dublin has not applied for time extension to reach compliance with the limit value for NO_2, but has reported plans and programmes to the EC. The city of Dublin reported 13 measures implemented or to be implemented to achieve compliance with the LV for NO_2. Most of the measures are taken at national level though (54%; Table 9) and they only affect the transport sector. The expected time scale for concentration reduction is long term for 85% of the measures.

Table 9: Summary of the measures implemented or to be implemented in Dublin and reported in the P&Ps to comply with the limit value for NO_2. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	3	3	7		
Type of measure	2	10	1	0	
Time scale of the concentration reduction	1	1	11		
Source sector affected	13	0	0	0	0
Spatial scale of the sources affected	2	0	4	7	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

As commented before, all measures implemented in Dublin are related with traffic and most of them are technological or involve an improvement of the infrastructures in the city (85%; Figure 7). Some of the measures are integrated public transport fares and ticketing, real-time air quality monitoring by traffic control systems, local emission taxes, strategic logistics or school and workplace travel planning. Two of the measures can be classified as campaigns: 1) Car clubs; 2) Promoting health benefit of active travel. None of the measures reported by Dublin are measures for limiting the emissions from traffic.

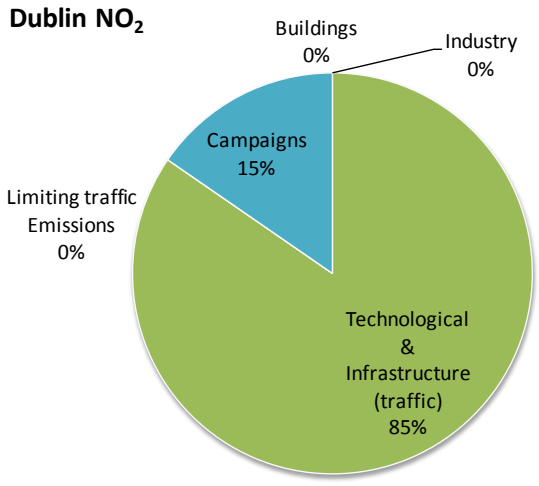

Figure 7: Overview of the types of measures implemented or to be implemented in Dublin in order to comply with the limit value established for NO_2. Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Antwerp

The city of Antwerp has applied or will apply 39 measures to attain compliance with the PM_{10} limit value defined in the European Directive. 12 of these measures affect the air quality zone of Antwerp, while the other measures also apply to other air quality zones. The measures are mostly regulatory (64%). The technological measures represent 38%. Similarly, the economic and educational measures represent around 30% of the total number of measures. Traffic is the most affected sector (64%), followed by the commercial and residential sector (28%) and the industrial sector (23%).

Table 10: Summary of the measures implemented or to be implemented in Antwerp and reported in the P&Ps to comply with the limit value for PM_{10}. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	5	29	5		
Type of measure	11	15	10	11	
Time scale of the concentration reduction	24	8	12		
Source sector affected	25	9	2	11	0
Spatial scale of the sources affected	9	0	20	12	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

The evaluation of the measures for PM_{10} reduction and their classification in groups indicate that most of the measures can be classified as related with technological improvement or modification of the infrastructures aiming to reduce traffic emissions (49%; Figure 8). Some of the measures included in this group are related to public transport and cycling, but also to the establishment of the tighter EU emission standards for vehicles (e.g. Euro 5 truck and premium retrofit cars with particle filter). The city of Antwerp has also documented measures implemented to reduce traffic emissions, for instance, speed limitation in those places where the population is exposed to levels exceeding the LVs. Antwerp is also conducting pilot projects to optimize the traffic signs and driving dynamics to achieve two goals, better traffic flow and air quality benefit.

Other measures implemented affect the industrial sector as, for instance, more stringent general emission limit values for dust or VOC and the residential and commercial sector as, for instance, the prohibition of the use of solid fuels during official smog episodes. One measure related to agricultural emissions has also been reported. The aims of the measure are to create awareness of open fires (illicit burn) and to educate in the correct use of stoves.

Finally, the city of Antwerp has included measures like the cooperation agreement between the Flemish government and cities and municipalities and the research and health action plans.

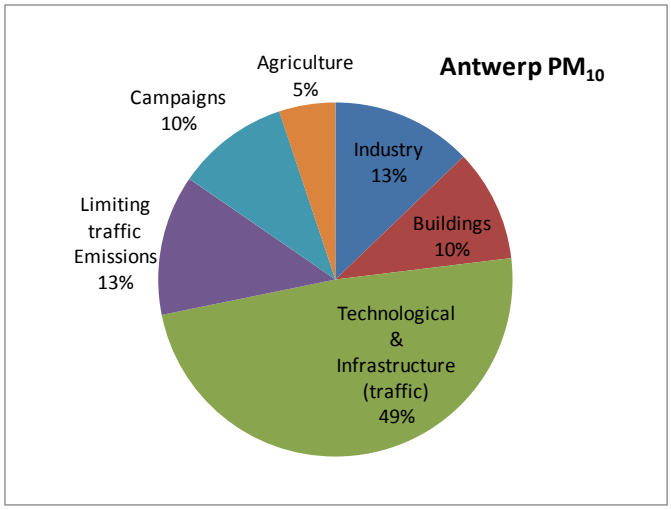

Figure 8: Overview of the types of measures implemented or to be implemented in Antwerp in order to comply with the limit value established for PM_{10}. Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Plovdiv

Plovdiv has implemented measures to reach compliance with the limit values for NO_2 and PM_{10}. A total of 36 measures has been or will be implemented for NO_2 at local administrative level and a total of 62 measures have been reported for PM_{10}, also at local administrative level. Most of the measures for reducing NO_2 ambient levels correspond to technological (42%) and educational (53%) measures, and the time scale for expected reductions is between short and medium term, although 39% of the measures will have long term impact. For PM_{10}, most of the measures can be classified as technological (60%) and they affect the sectors of transport, and commercial and residential sources. More than 40% of the measures reported for PM_{10} are regulatory. For NO_2, more than 53% of the measures are regulatory.

Table 11: Summary of the measures implemented or to be implemented in Plovdiv and reported in the TEN to comply with the limit value for NO_2. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	36	0	0		
Type of measure	3	15	19	1	
Time scale of the concentration reduction	23	21	14		
Source sector affected	14	0	0	20	3
Spatial scale of the sources affected	36	0	0	0	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

Table 12: Summary of the measures implemented or to be implemented in Plovdiv and reported in the TEN to comply with the limit value for PM_{10}. Some of the measures are classified on more than one group. For A, B, C, D and E in each category see Table 11

	A	B	C	D	E
Administrative level	62	0	0		
Type of measure	7	37	19	2	
Time scale of the concentration reduction	62	62	62		
Source sector affected	62	0	0	62	62
Spatial scale of the sources affected	62	0	0	0	0

The measures implemented or to be implemented in Plovdiv for reducing NO_2 concentrations are mainly related to campaigns and improvement of the existent knowledge about the origin of air pollution in the city (46%). For instance, some of the measures in this category are: development of programmes to promote commuting, increasing the attractiveness of public transport, but it also includes measures as the creation of a database for the rate of intensity of traffic on the main boulevards or collaboration with other institutes on specific projects in the area of improving ambient air quality and compliance with NO_2 limit values. The second biggest group of measures are those to reduce emissions from traffic (31%), including measures such as upgrading the bus fleet of the urban public transport to conform to the EURO 4 standard, optimization of public transport activities, introduction of priority corridors for in-city transport buses or restricting the access of high-emitting vehicles in the city of Plovdiv.

In order to reach compliance with the PM_{10} limit values, the city of Plovdiv has implemented a set of measures that can be classified as campaigns (43%), reduction of traffic emissions (37%) and reduction of residential emissions (20%). Some of the campaigns that the city of Plovdiv has implemented are intended to promote the use of better quality fuels and more efficient heating. Some of the campaigns, such as the development of programmes to promote commuting or the introduction of movement plans in schools are common for both pollutants, NO_2 and PM_{10}. Some of the measures affecting traffic are also common for both pollutants. Others are specific for PM_{10} as they involve road dust resuspension, such as, for instance, plans to reduce dust levels during cleaning and sanding or replacement of sand with chemical substitutes in the central urban part and restriction of the use of sand in other parts of the city. Some of the measures concerning energy efficiency of buildings and the use of environmentally friendly fuels for heating have also been implemented by the city of Plovdiv to reduce PM_{10} levels, such as, for example, replacement of heating operating on liquid fuels (gasoil) in municipal buildings and provision of assistance for voluntary transition to more environmentally friendly fuels for use in hotels and commercial establishments.

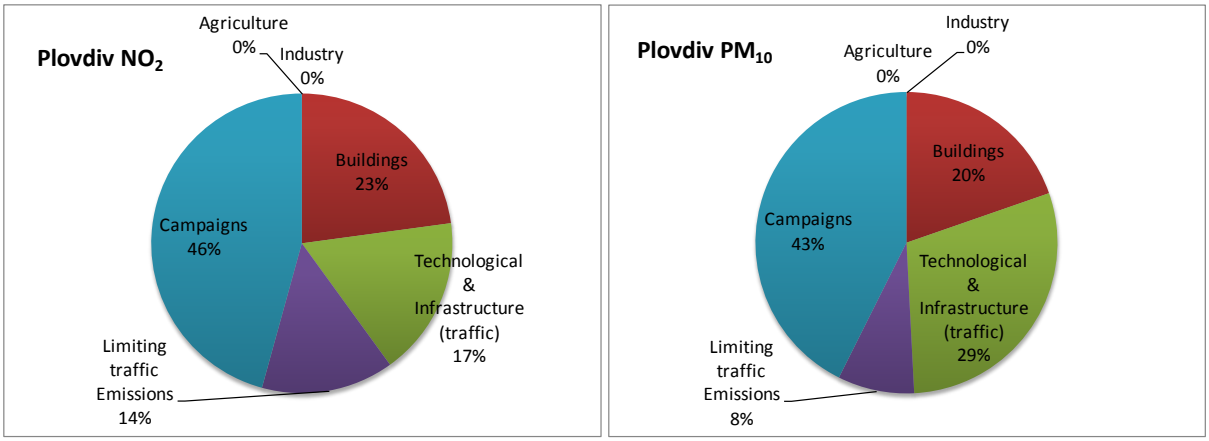

Figure 9: Overview of the types of measures implemented or to be implemented in Plovdiv in order to comply with the limit value established for NO_2 and PM_{10}. Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Paris

Paris has implemented 13 and 18 measures to achieve compliance with the exceedances of the limit value for NO_2 (table 13) and PM_{10} (table 14), respectively. Most of the measures are taken at local administrative level, although for PM_{10} some of them involve both local and regional administrative levels. Technical measures represent 69% and 56% for NO_2 and PM_{10}, while educational measures are the second largest group (38% for NO_2 and 50% for PM_{10}) as most of the measures are comprehensive including not only technical or economical aspects but also educational aspects. The major part of the measures addresses traffic sources, and affects the agglomeration and the regional area. Most of the measures are expected to achieve concentration reductions in medium term (about a year).

Table 13: Summary of the measures implemented or to be implemented in Paris and reported in the P&Ps to comply with the limit value for NO_2. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	9	3	1		
Type of measure	4	9	5	3	
Time scale of the concentration reduction	2	8	2		
Source sector affected	10	4	1	2	2
Spatial scale of the sources affected	2	6	5	0	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

Table 14: Summary of the measures implemented or to be implemented in Paris and reported in the P&Ps to comply with the limit value for PM10. Some of the measures are classified on more than one group. For A, B, C, D and E in each category see Table 13

	A	B	C	D	E
Administrative level	11	7	2		
Type of measure	5	10	9	3	
Time scale of the concentration reduction	5	8	4		
Source sector affected	10	4	3	4	3
Spatial scale of the sources affected	2	8	8	0	0

The evaluation of the measures and their classification in groups indicates that in Paris, most of the measures can be classified as related to traffic, including technological and infrastructure measures as, for instance, increasing the supply of transport or the harmonization of delivery of goods transport, and limiting traffic emissions as, for instance, limitation of traffic speed to 20 km/h during peak pollution events.

Most of the measures have been implemented to reach compliance with limit values for both pollutants, NO_2 and PM_{10}, apart from the measures involving agriculture, which exclusively seek to reduce PM_{10} concentrations in the atmosphere. An example of these agricultural measures is the limitation of the exceptions to the prohibition of open burning of green waste. Another measure exclusively dedicated to improve PM_{10} levels in the city is the ban of wood burning in Paris.

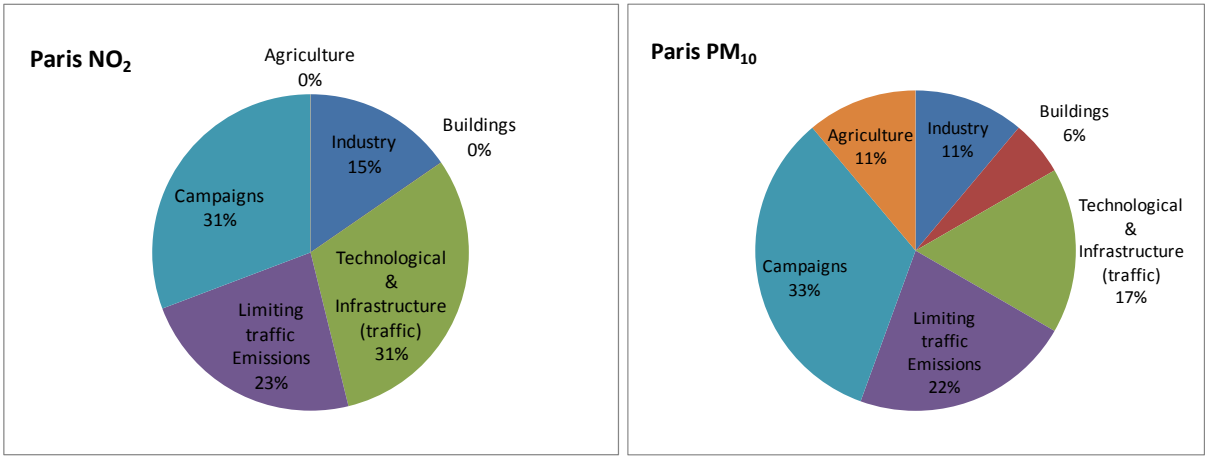

Figure 10: Overview of the types of measures implemented or to be implemented in Paris in order to comply with the limit value established for NO_2 and PM_{10}. Classification according to the six categories defined in section 5, where every measure is classified in only one category.

Vilnius

The city of Vilnius reported 21 measures implemented or to be implemented to attain compliance with the PM_{10} limit value. The levels belong to a common program for reducing air pollution, and will not only help to reduce PM_{10} ambient levels but also to improve air quality in the city. Most of the measures are taken at local level and correspond to technical measures affecting the source sectors of traffic (86%), industry (24%) and commercial and residential (19%). The expected time scale of the concentration reduction is mainly long term (62%). Most of the measures are not regulatory (18 out of 21).

The measures implemented or to be implemented in Vilnius in order to reach compliance with the limit values for PM_{10} are mainly related to technological improvement or associated with infrastructures (62%) addressed to reduce traffic emissions. Additionally 10% of the measures are specifically directed to reduce traffic volume or activity as, for instance, car traffic restrictions in the city's central streets. The city of Vilnius has also implemented measures affecting the residential and industrial sectors as, for instance, removing the most pollutant enterprises from the city centre or local boiler modernization.

Table 15: Summary of the measures implemented or to be implemented in Paris and reported in the P&Ps to comply with the limit value for PM_{10}. Some of the measures are classified on more than one group.

	A	B	C	D	E
Administrative level	19	1	2		
Type of measure	5	16	2	1	
Time scale of the concentration reduction	4	4	13		
Source sector affected	18	5	0	4	2
Spatial scale of the sources affected	2	19	0	0	0

Administrative level at which the measure could be taken: A: local; B: regional; C: national.
Type of measure: A: economic/fiscal; B: technical; C: education/information; D: other.
Time scale of the concentration reduction achieved by the measure: A.: short term; B: medium term (about a year); C: long term.
Source sector affected by the measure: A: transport; B: industry including heat and power production; C: agriculture; D: commercial and residential sources; E: other.
Spatial scale of the sources affected by the measure: A: local source(s) only; B: sources in the urban area concerned; C: sources in the region concerned; D: sources in the country; E: sources in more than one country.

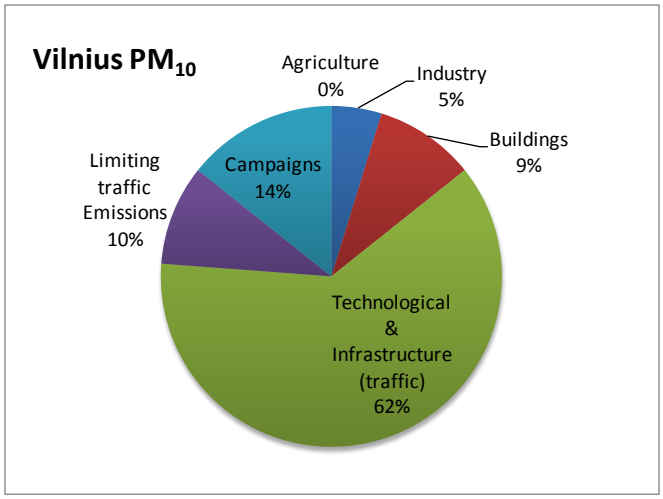

Figure 11: Overview of the types of measures implemented or to be implemented in Vilnius in order to comply with the limit value established for PM_{10}. Classification according to the six categories defined in section 5, where every measure is classified in only one category.