Traffic and Air Quality

Contribution of Traffic to Urban Air Quality in European Cities

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Traffic in Oslo centre (Viktor Dahl, NILU-Norwegian Institute for Air Research)

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Preface

This report is the result of the work done in Task 2.10.2.3 of the Implementation Plan 2009 of the European Topic Center on Air and Climate Change (ETC/ACC): 'Review of the contribution of traffic to urban air quality in Europe'. This study was led by the Norwegian Institute for Air Research (NILU) with assistance from the Netherlands Environmental Assessment Agency (PBL) within the ETC/ACC. The study was commissioned to give the EEA better information regarding the actual contribution of traffic to the air quality problems found in large European cities. A secondary goal is also to give valuable insight to the cities regarding mitigation strategies being employed by other cities around Europe to combat air quality problems attributed to traffic.

The methods to complete the study goals initially included a questionnaire survey to major European cities, as well as an extensive literature and report search for relevant data and corresponding mitigation strategies. Further information sources were searched subsequently in order to expand and support the results obtained.

The authors would like to give a special thanks to David Delcampe at the EEA for his extraordinary assistance and insight throughout the term of this study and his active role in organizing the cities survey and collaborating with EUROCITIES and POLIS to encourage the cities' participation. The authors appreciate the cooperation of POLIS and EMTA, who provided details of contact persons and advertised the present survey to their members and readers.

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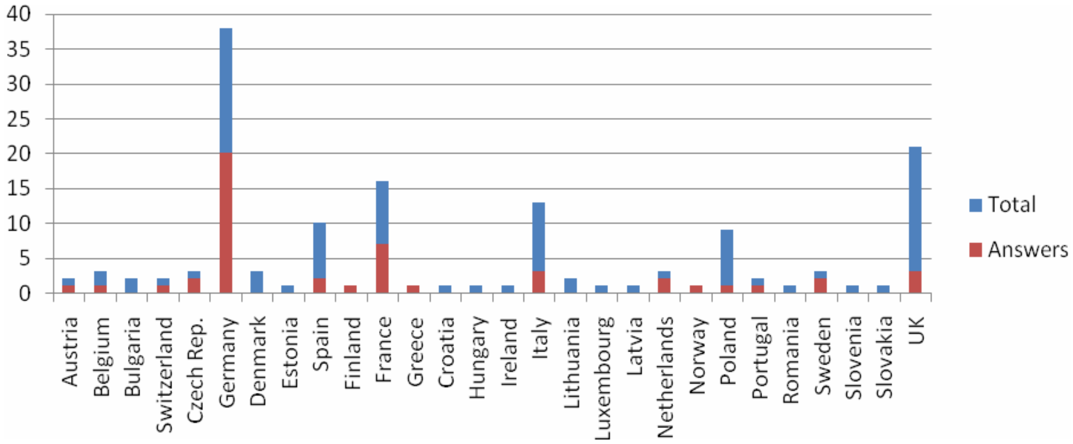
Summary

The primary goal of the study is to give better information regarding the actual contribution of road traffic to the air quality problems found in large European agglomerations. A secondary goal is to give valuable insight to the cities regarding mitigation strategies being employed by other cities around Europe in order to combat air quality problems attributed to road traffic. Methods to complete the study initially included a survey questionnaire to major European cities, as well as an extensive literature and report search for relevant data and corresponding mitigation strategies. The work methods employed to meet the study goals include:

- Collate and review available information that provides quantitative assessments of the current and future source contribution of road traffic related emissions to air quality in a sample of 144 major (i.e. population size larger than 250 000) European agglomerations.
- Collate and review available information that provides quantitative assessments of the measures (undertaken, planned and envisioned) to reduce the road traffic contribution to air quality in these cities.
- Analyze and summarize this information in an accessible and standardized form to provide the current extent and state of understanding of the traffic related contribution to the air quality in the major European cities.
- Provide an overview of the mitigation strategies, and their effectiveness where applicable, used to address traffic related contributions to air quality in these cities.
- Generate on this basis generic conclusions regarding the road traffic contribution to air quality and measures available to deal with these problems in major cities across Europe.

Data from the questionnaires and the literature study was compiled into altogether 49 city profiles which formed the basis for the first part of the study, whereof 32 provided a source apportionment. It should be noted that the representativity of the first part of the study was limited by a low survey participation and lack of available data. There may be numerous uncertainties that are associated with the data obtained from the survey study and the corresponding analysis, where the most critical uncertainties are pertaining to low sample sizes. Only 22 cities out of 144 filled in and returned the questionnaire. There was almost no contribution from Eastern European cities.



Number of cities per country addressed in the survey study (blue bars) and number of cities per country from which information was obtained (red bars).

The 144 cities addressed in the survey study were distributed over all Europe (see map in Section 2.4), however the eventual participation was biased. For most of the large countries (> 20 Mio. inhabitants), less than 50% of the scheduled cities are covered. Almost all countries with no response are located in Eastern Europe. Since also in the literature review no information was found for Eastern European countries, they were hardly represented in the first part of the study.

An extension of the study, using further information sources, broadened the information base and the distribution of cities became more balanced, but the total number of cities providing a source apportionment is with 68 still rather limited.

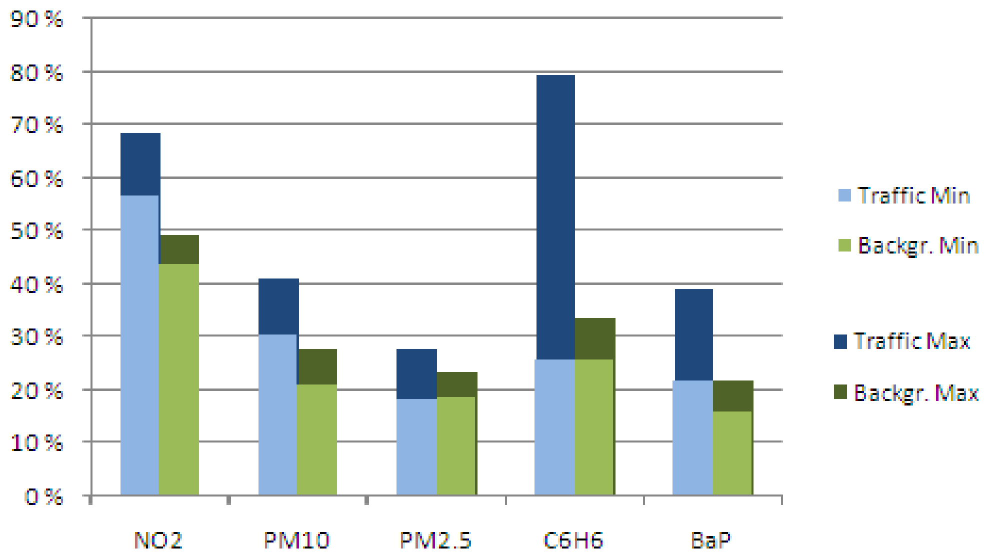
The results from both parts of the study can be generalized with the figures below and the following conclusions:

- Cities are most concerned with NO_2 and PM_{10} concentrations, while their responses suggest that they attach less importance to $PM_{2.5}$, benzo(a)pyrene, and benzene.
- Road traffic is by far the largest contributor to NO_2 concentrations, both at traffic stations (57-69%) and at background stations (40-49%).
- The average contribution from the cities' own road traffic to PM_{10} concentrations at traffic hot spots in European cities was assessed as 35% as an average for hot spots in close to 50 cities (range 7-71%). The top of the range includes traffic sites in Nordic countries, where the non-exhaust PM due to the use of studded tires and road sanding practices during winter can be large. When including also the road traffic PM_{10} contribution from regional traffic sources, the total road traffic contribution at urban traffic sites increases to up to 40-45%, depending upon the location of the city in Europe.
- At European urban background sites, road traffic was found to contribute on average 18% to the PM_{10} concentrations, as an average for such sites in about 40 cities (range 5-50%). Considering the regional road traffic contribution in addition, the total traffic contribution at the urban background sites is increased up to 25-30%, depending upon the location of the city in Europe.
- Thus, road traffic is a significant contributor to PM_{10} concentrations in urban air in Europe. However, its contribution is limited to an average of 25-30% of PM_{10} at the urban background level and 40-45% at the hot spot (traffic sites) level. Thus, other

source sectors are important as well. The contribution range at the UT sites depends, of course, upon the range of traffic volumes that is represented by the UT sites included, as well as their street geometry variation and distance to the curb. Traffic data for the streets by the UT sites is not given. However, the number of cities and UT sites involved is fairly large and should represent the range of European streets to a certain degree.

- Regarding $PM_{2.5}$, the number of cities providing assessments was very low (only 10 cities). It is not possible to conclude about the road traffic contribution to $PM_{2.5}$ at urban and street level sites.
- It should be mentioned that except for a few cities it is not always clear to what extent non-exhaust particulate matter (PM) is included in the contribution assessments. Non-exhaust PM includes tire and brake wear and suspended road dust. When non-exhaust PM is included for some cities and not for others, this would influence the range reported here.
- For 10 of the studied cities the non-exhaust contribution to PM_{10} concentrations was specifically reported. The average non-exhaust contribution at urban traffic sites (UT) was about 25% of the total PM_{10} concentration. For seven of the cities in the survey study, it ranged between 11% (Hamburg) and 43% (Rome). Additional assessments in Berlin, Copenhagen and Helsinki gave a range of 23-30% at UT sites, while in Stockholm is was much higher, 59%, due to extensive use of studded tires and sanding during winter. At urban background sites in those three cities, the non-exhaust contribution was lower and ranged 6-11%, while it was 24% for Stockholm. For these cities, the non-exhaust PM contributed with 50-68% of the traffic PM_{10} contribution, except for Stockholm where the assessment gave that the non-exhaust dominates completely (about 90% of traffic PM) over the exhaust PM contribution.
  The findings are consistent with the numbers above regarding the total road traffic contribution, and it can be indicated that a bit more than half of the road traffic contribution is associated with non-exhaust PM.
- The source apportionment methods used in the various assessments are predominantly dispersion modeling, positive matrix factorization (PMF) and principal component analysis (PCA). The quality of the assessments has not been evaluated in this work, except from the study of the detailed reports from the assessments for Berlin, Copenhagen, Helsinki and Stockholm and a few more cities. It has not been studied whether there is a relationship between assessment methodology and the results regarding the level of the road traffic contribution.
- In the majority of the cities responding to the survey, the compliance with $PM_{2.5}$, benzo(a)pyrene and benzene limit and target values does not seem to be considered a problem. Today's critical issues are the exceedance of the annual NO_2 limit value at traffic stations, which has been reported by all cities taking part in the survey and the exceedance of the daily PM_{10} limit value, which applies for 66% of these cities.
- All cities have implemented various measures in order to improve air quality, their success, however, was only evaluated by a few cities, so that no representative result can be drawn from the cities' experience.
- The most popular measures implemented by cities to reduce air quality problems are traffic reduction measures, involving the promotion of collective transport and cycling, and traffic calming. But also the encouragement of cleaner fuels and vehicles is frequently applied.

- Analysis of traffic contributions and mitigation measures considered shows that cities with low traffic contributions to measured concentrations implemented mitigation measures to the same extent as those cities with high traffic contributions.
- Some cities expect an average of 5-10% emissions reduction for NO_x and PM_{10} from 2005-2010, as well as 2005-2015; while an average for >10% reduction for NMVOCs are expected from 2005-2010, and from 2005-2015. The majority of cities, however, abstained from a prognosis on this topic.
- Most of the cities responding to the survey are rather confident in complying with EU air quality standards set for 2015, but many are concerned with meeting the standards in 2010, especially with the annual NO_2 standard.



Minimum and maximum contributions of road traffic to pollutant concentrations at traffic and urban background sites, averaged over all cities included in the survey study.

Contribution of Traffic to Urban Air Quality in European Cities

1 Introduction

Research over the past decade has established the indication that road traffic is a major source of air quality problems in urban areas and cities. This study was established by the EEA within the ETC/ACC with the clear purpose to investigate road traffic contributions to air quality problems in European cities and to provide an overview of the mitigation strategies used to address traffic related contributions to air quality in these cities.

This information should serve the European Commission and the European cities in their work on mitigation strategies to combat urban air quality problems attributed to road traffic.

The only previous study analyzing this issue at the European level is a EUROCITIES survey from 2007, *Analysis of EUROCITIES Air Quality Survey 2007*, which gives a good introductory snapshot of the traffic contribution to air quality problems and how cities are addressing the issue. The 2007 survey was used as a basis for this study to determine more concrete information that could be obtained from cities to meet the goals of the study.

The main objectives of the study are to:

- provide the current extent and state of understanding of the traffic related contribution to the air quality in the major European cities;
- provide an overview of the mitigation strategies used to address traffic related contributions to air quality in these cities.

To meet the above listed objectives, the study has compiled, analyzed and summarized available information regarding:

- Present and predicted future road traffic contribution to air quality in major cities throughout Europe,
- Measures implemented and planned to reduce the road traffic contribution to air pollution in these cities.

This study initially encompassed a questionnaire survey addressed to a selected number (144) of cities in Europe, combined with a separate literature study running in parallel. In this report, this initial part is referred to as the 'survey study'. It is introduced in Sections 2.1 to 2.3 and the results are presented in Section 3. Since the outcome was not representative due to poor participation of the cities addressed, further research was carried out, which is introduced in Section 2.4. The results of the additional research are discussed in Section 4. A comparison of the results from the different parts of the study is presented in Section 4.4.

2 Methods

144 European (EEA plus Switzerland and Croatia) city agglomerations with a population size greater than 250 000 residents[1] were targeted. A list of the targeted cities is shown in Appendix A (Survey Sheet 2). The targeted components were set as NO_x, NO_2, PM_{10}, $PM_{2.5}$, C_6H_6, benzo(a)pyrene (BaP), and CO_2. A simultaneous city survey and literature search was performed for the 144 cities based on the purpose and objectives of this study stated above.

The data collection work was divided into two separate simultaneous exercises:

A. A detailed city survey was developed (see Appendix A), which was divided into 6 different sheets for each part of the survey (Introduction, Targeted Urban Areas, Respondents, Transport & Emissions Profile, Air Pollution Problems, Transport Actions). The survey was distributed to each of the target cities (see Appendix A, Survey Sheet 2, for specific contact information).

B. A report/literature search for relevant data (from the last 6 years) was performed, targeting:
   - Air quality assessments and air quality plans publicized or under preparation by the cities;
   - Scientific journals, conference proceedings and other scientific literature;
   - European and national research projects;
   - Reports from European, national and local expert groups

   See Section 9 at the end of this report for a complete set of the final literary sources with relevant information. The data collected from this literature search was compiled as an Excel based database.

The cities survey was to query the targeted cities for air quality and traffic information to meet the goals of the study, and the literature search was to complement the survey results by finding data and information not gathered by the survey responses. This procedure resulted in that the literature search provided extra information to surveys with weak responses, and also gave information for cities which did not respond to the survey. This two-tiered simultaneous data search proved necessary to increase the amount of relevant data for the data analysis.

Information and data from both exercises were compiled into a *city profile* for each city, and all of these profiles were compiled into one Excel workbook for analysis.

2.1 City Survey

The survey questionnaire was distributed to the 144 target cities during the last two weeks of March 2009. The participation in the survey was voluntary. In total only 22 cities provided

[1] The list of 144 city conglomerations was supplied by the EEA for this study. Note that some cities with less than the targeted 250 000 residents were included in the study: Clermont-Ferrand (140 000 residents), Darmstadt (140 000 residents), Erfurt (210 000 residents), Freiburg (220 000 residents), Geneva (188 000 residents), Grenoble (156 000 residents), Heilbronn (120 000 residents), Osnabrück (164 000 residents), and Ulm (121 000 residents). Also note that some cities with populations greater than 250 000 residents were not included (Athens and Paris for example).

(partial) data in response to the survey. Only four of these cities delivered data for the majority of questions of each of the three survey sections. Appendix B (“Survey” section) gives an overview over the completeness of responses to the survey for each of its data sections. Most respondents fully completed at least one section of the survey, and partly completed the other two.

2.2 City Literature and Report Search

The literature and report search task initially performed an internet search for references for air quality data for the target cities from the past 6 years. Once the data gaps from the survey results were identified, the compiled references were then searched for concrete data which could supplement the missing data points for the needed cities. Appendix B (“Database” section) lists the information compiled during this search task. Data was found for 45 cities, source apportionment data and data on mitigation measures was found for respectively 33 and 27 of these cities. Data was only deemed valuable for 36 of the 45 cities. The minimum requirement for the creation of a city profile from the literature data was the availability of a source apportionment (cp. Appendix B); the mere presence of mitigation measure information did not suffice. This data was migrated to the city profiles (see Section 2.3 below “City Profiles”). Of these 36 cities, 27 were new city data added during this task, and 9 were additional information added to the city survey data. It should be noted that the literature search data did not replace any survey data; it was only a supplement for the missing data areas.

2.3 City Profiles

A city profile template condenses the information from the city survey and the information gathered from the literature search. Appendix B lists the city profiles created from the survey and literature search tasks for each city. A city profile was created for each city which participated in the survey, independently of the amount of data submitted. On the other hand, for cities that did not respond to the survey and for which the literature review did not provide a satisfactory amount of data, a city profile was not created. This is the case for 9 cities (as seen in the “database” column in Appendix B). In total, 49 city profiles were generated and compiled (see Appendix C).

2.4 Further Information Sources

Since the information obtained from the above sources was insufficient to give a representative overview of the road traffic contribution to air pollution in Europe, additional information sources were investigated. Contact persons responsible for air quality and traffic emission assessment for some Scandinavian and other cities were directly contacted to provide information and reports.

Another source of information on the contribution of traffic sources to air pollution were notifications of postponements of attainment deadlines regarding the PM_{10} limit values, which EU member countries are obliged to submit to the European Commission in the case of exceedances in cities or zones. These notifications are supposed to include a detailed quantitative apportionment of the regional, urban and local sources of particulate matter, specifying the urban and the local traffic contributions. Analogous to selection criteria of the first part of this study, only cities with more than 250 000 inhabitants were considered.

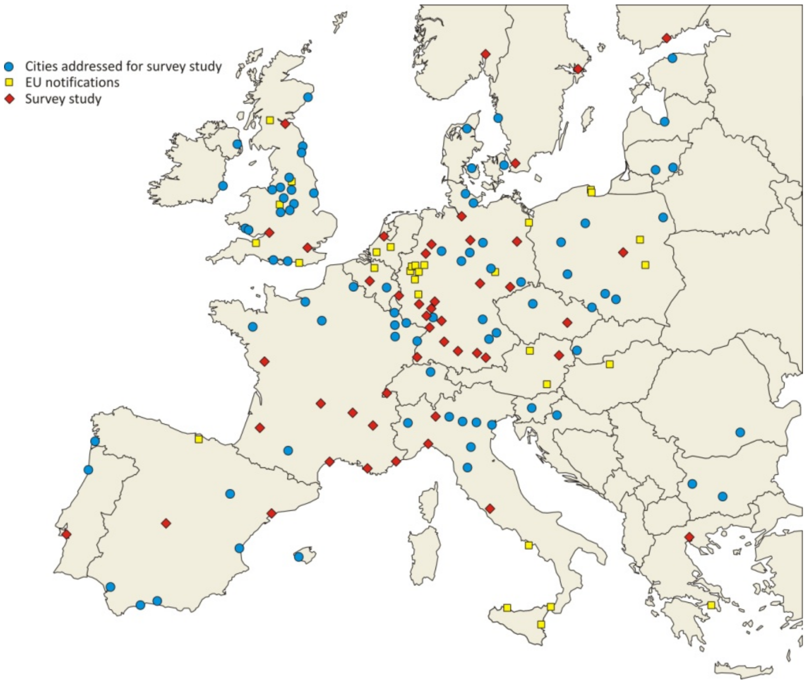


Figure 1: Map of Europe, showing the distribution of cities contacted in the survey studies but which did not respond (blue circles), cities that provided input in the survey study (red diamonds) and cities which provided notifications to the EC (yellow squares). Further data and information was given on the cities Berlin, Copenhagen, Helsinki, Oslo and Stockholm based upon direct contact with relevant colleagues.

A map is shown above, giving an overview of all cities contributing to the survey study, i.e. from both questionnaires and literature study, marked by red diamonds, all cities contacted in the survey study but which did not respond, marked by blue circles, and cities from which assessments for PM_{10} sources was available through the exemption notifications, marked by yellow squares.

Table 1: Number of cities with data on road traffic contribution to PM_{10} concentrations. 'Additional assessments' represents the 'total number' of cities minus the number of cities included in more than one part of the study.

	Total number	Additional assessments
Survey study	32	32
EC notifications	40	35
Separate cities	4	1
Total		**68**

The number of assessments obtained from the three parts of the study is summarized in Table 1. Since for a few cities, information was available in more than one part of the study, the 'additional' assessments are given in the second column of the overview.

3 Survey Results

Data analysis was performed based on the 49 city profiles generated from the joined information from questionnaire responses and literature review. Analysis was performed across all 49 profiles for each section within the profile, and is presented as total and average values. More detailed analysis was also performed comparing between multiple parameters across all 49 profiles.[2]

The total population represented by the 49 city profiles is 42.4 million people, with a total area of 13 700 km^2. The average population represented by the 49 city profiles is 865 000 people per city, with an average area of 280 km^2 per city.

The total annual transportation volume (in km per year) was available for 21 of the 49 cities. The data from one of the cities, however, was discarded from the analysis, since the values specified by Erfurt were not deemed reasonable for a city of that size (see Appendix C). 96% from the total transportation volume is from light duty vehicles (passenger cars, SUVs, taxis, light commercial vehicles, mopeds, and motorbikes) and 4% is from heavy duty vehicles (heavy goods vehicles, busses, and coaches). The average annual transportation volume per city is about 4.8×10^9 km per year.

Data responses are summarized in the following sections, for each of the items of interest.

3.1 Traffic emissions

The annual average emissions from road sources per 1000 inhabitants (tons per year) can be seen in Table 2. The figures represent the averaged annual road traffic emissions per capita from up to 35 cities, separately for light duty, heavy duty, and non-exhaust emissions, as well as an average from all road traffic sectors ('total'). The total average annual emissions per capita were calculated from the sum of annual light duty (LD), heavy duty (HD), non-exhaust (N-Ex) and total annual emissions (the latter only if no subdivided information was available) of each compound from the city profiles. Note that therefore, the sum of LD, HD and N-Ex emissions is not necessarily equal with the values given in the right hand column 'total'. The emission values obtained from city surveys and literature study originate from the time range between 2004 and 2009. The sample size (number of cities) for each component is listed in parenthesis; note the low sample size for the results for $PM_{2.5}$, benzene, and benzo(a)pyrene. Also note that the non-exhaust particle emissions only were specified by a few cities and for some other cities the non-exhaust part was included in the LD or HD parts, but not separately available. The values given here for total PM_{10} and $PM_{2.5}$ should thus be seen as lower limits of total city average traffic emissions.

[2] Note that the following outliers from the city profiles were not included in the following analysis: Stuttgart CO_2 values, Malmö absolute road traffic contribution values, and Erfurt annual emissions from road sources values.

Table 2: Average traffic emissions per 1000 inhabitants (tons per year) from road sources for light duty (LD), heavy duty (HD), and non-exhaust (N-Ex) sources averaged over responding European cities.

	LD	HD	N-Ex[a]	Total
NO_x	4.45 (n=24)	3.82 (n=22)		8.58 (n=35)
PM_{10}	0.59 (n=19)	0.13 (n=17)	0.48 (n=13)	0.77 (n=30)
$PM_{2.5}$	0.13 (n= 4)	0.06 (n= 4)	0.20 (n= 4)	0.29 (n= 4)
C_6H_6	0.15 (n= 4)	0.01 (n= 4)		0.15 (n= 6)
BaP	8.4E-6 (n= 1)	2.2E-7 (n= 1)		8.6E-6 (n= 1)
CO_2[b]	1580 (n=14)	486 (n=14)		2350 (n=17)

[a] *Non-exhaust applies only to particulate matter (PM) components.*
[b] *CO_2 data for Stuttgart was not included here or in Figure 2, and was treated as an outlier.*
** Numbers in parenthesis designate the sample size.*
***Data for Erfurt was not included here or in Figure 2, and was treated as an error.*

To set the city emissions into a European context, they may be compared with the figures presented in Table 3, showing the total emissions of NO_x, PM_{10} and $PM_{2.5}$ in the EU-27 (EEA, 2008) and the road traffic contribution.

Table 3: Total emissions per 1000 inhabitants (Gg/y) of NO_x, PM_{10} and $PM_{2.5}$ and contributions of road transport for the EU-27, survey year 2006 (basing on EEA, 2008).

	Total emission (t/y)	Transp. contr. (%)	Road emission (t/y)
NO_x	22.7	39.4	8.950
PM_{10}	3.5	15.9	0.557
$PM_{2.5}$	2.4	17.8	0.426

The city sample (35 cities) has about the same total road traffic NO_x emissions per 1000 inhabitants as comes out of the total EU-27 emission inventory (all areas including cities), while for PM_{10} the sample cities (30 cities) have on average 44% larger emissions than the European average. This is most probably a consequence of the low sample size of the survey study results and of the fact that source assessments are mainly performed for areas exceeding limit values and therefore are somewhat biased. For $PM_{2.5}$ the very few (4) sample cities preclude a relevant comparison.

The data from Table 2 is also presented in Figure 2 below, where the same considerations regarding sample size should be noted.

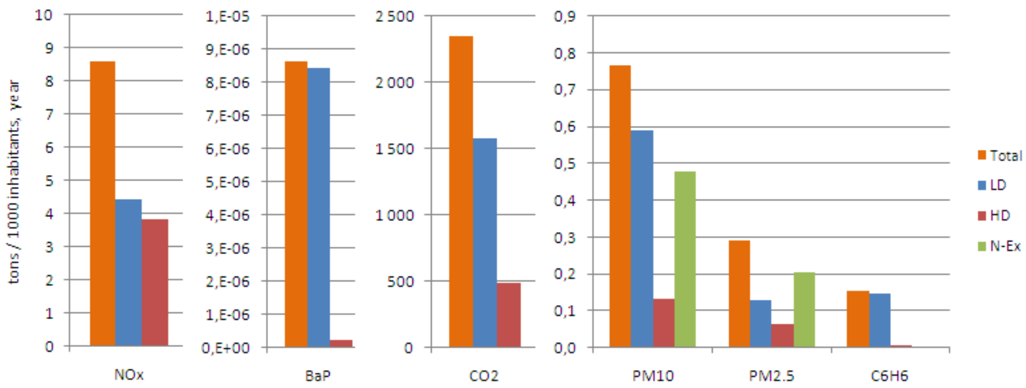


Figure 2: Annual total emissions per 1000 inhabitants (tons per year) from road sources for light duty (LD), heavy duty (HD), and non-exhaust (N-Ex) sources averaged over responding European cities.

3.2 Road traffic contribution to air pollutant concentrations

The contributions of road traffic to measured pollutant concentrations in the responding cities can be seen in Table 4 (average absolute contributions) and Table 5 (contribution in %). These values are presented as minimum and maximum absolute or percentage contributions to concentrations at both traffic and urban background sites and were mainly obtained from modeling (e.g. dispersion modeling). The sample size (number of cities) for each component is listed in parentheses. The presented road traffic contribution to particle concentrations should be seen as in the lower range of the actual contribution, since the non-exhaust fraction of particle emission often has not been taken into account in the data obtained by source apportionment modeling. The pollutants covered in the source apportionments by most cities are NO_2 and PM_{10}. These are the compounds cities are most concerned about, since annual or daily air quality limit values are frequently exceeded, especially at traffic stations.

Table 4: Average absolute contributions (µg/m^3) of road traffic to average annual pollutant concentrations in traffic and urban background situations, reference years between 2004 and 2009.

	Traffic Min	Traffic Max	Background Min	Background Max
NO_2	30.5 (n=20)	48.2 (n=20)	19.2 (n=11)	22.6 (n=10)
PM_{10}	11.9 (n=22)	17.9 (n=22)	9.5 (n=12)	12.1 (n=11)
$PM_{2.5}$	3.1 (n= 3)	4.7 (n= 3)	4.2 (n= 7)	5.0 (n= 6)
C_6H_6	0.4 (n= 2)	3.8 (n= 2)	0.3 (n= 2)	0.7 (n= 2)
BaP[a]	0.1 (n= 1)	0.1 (n= 1)	0.0 (n= 1)	0.0 (n= 1)

[a] BaP is measured in (ng/m^3)

** Numbers in parenthesis designate the sample size. Results for benzene and benzo(a)pyrene in this table should not be considered, based on the low sample size. $PM_{2.5}$ values for traffic stations should be taken with caution for the same reason.*

***Malmö values were not used in this analysis, or in Figure 3 below.*

Table 5: Average percentage contributions of road traffic to average annual pollutant concentrations

	Traffic Min	Traffic Max	Background Min	Background Max
NO_2	57 % (n=25)	69 % (n=25)	40 % (n=13)	49 % (n=12)
PM_{10}	30 % (n=27)	41 % (n=27)	21 % (n=14)	28 % (n=13)
$PM_{2.5}$	18 % (n= 5)	28 % (n= 5)	19 % (n= 9)	24 % (n= 8)
C_6H_6	26 % (n= 2)	80 % (n= 2)	26 % (n= 2)	34 % (n= 2)
BaP[a]	22 % (n= 1)	39 % (n= 1)	16 % (n= 1)	22 % (n= 1)

[a] BaP is measured in (ng/m^3)

** Numbers in parenthesis designate the sample size. Results for benzene and benzo(a)pyrene in this table should not be considered, based on the low sample size.*

The data from Table 4 and Table 5 is also represented in Figure 3 and Figure 4, respectively. The relevant annual limit and target values for the addressed pollutants are shown in Figure 3. At traffic sites, road traffic emissions alone can give rise to the exceedance of the annual NO_2 air quality standard. Average maximum benzene contributions from road traffic at traffic sites almost reach the annual C_6H_6 limit set for 2010. None of the cities, however, indicated an exceedance of the benzene limit value in the city survey.

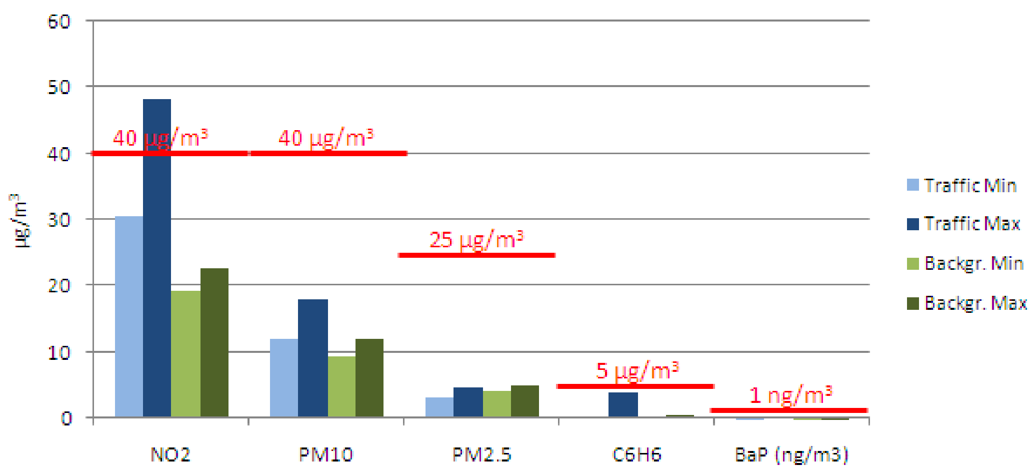


Figure 3: Average absolute (minimum and maximum) road traffic contributions (µg/m^3) to average annual concentrations of several pollutants at traffic and urban background sites.

The NO_2 road traffic contributions at traffic sites are 10-20 µg/m^3 higher than at urban background sites. For PM_{10}, the average local traffic contribution to the background concentrations in the studied cities amounts to only 2-5 µg/m^3. There was insufficient data on $PM_{2.5}$, C_6H_6 and BaP for any conclusions.

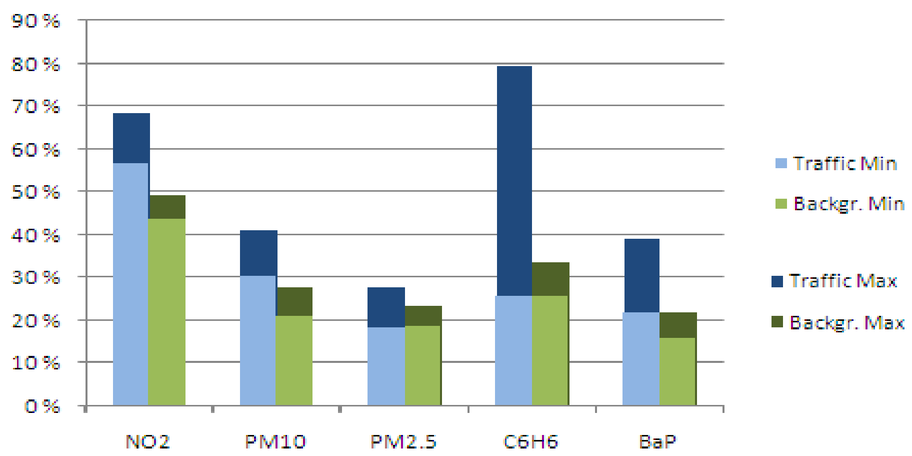


Figure 4: Average percentage (minimum and maximum) road traffic contributions to average annual concentrations of several pollutants at traffic and urban background sites.

There are a number of methods available for determining the road traffic contribution to air pollution in a city. These include:
1) Station pairing, where urban background concentrations are subtracted from traffic station measurements to determine the local traffic contribution (e.g. Larssen et al., 2007a).
2) Source apportionment based on statistical (receptor modeling) and/or chemical analysis from monitoring data. Typical methods include principle component analysis (PCA), Multiple Linear Regression (MLR), Chemical Mass Balance (CMB) and Positive Matrix Factorization (PMF), see Watson and Chow (2004) for an overview of these methods.
3) The use of dispersion models and emissions data to estimate source contributions at monitoring sites or in the city in general, e.g. Laupsa et al. (2009).

Each of these methods provides a different assessment of the source contributions. Station pairing provides the local traffic contribution (ignoring the traffic contributions to the urban background), source apportionment of PM through monitoring generally includes more than just the local source, while source apportionment through modeling only provides information based on the available emissions (e.g. if emissions are missing, then sources will be underestimated). In the data sources for review carried out, the methods used for the source apportionment were stated in less than half of the cases and in the survey no information was provided on the methods used. As a result, it is also often unclear if the provided information concerning traffic contribution refers to local contributions or total contributions from the city or all traffic, including regional contributions. Based on the available information, the majority of cases refer to the total traffic contribution from the city itself (including local) and this has been used as the common basis of all cities for the interpretation of the results.

In a previous analysis of air quality monitoring data in Europe (Larssen et al., 2007b) it was shown that, on average, there was only a small increment in PM_{10} concentrations when going from rural to urban and to traffic stations. On the other hand, NO_2 concentrations increased significantly within urban areas and close to roads, where the regional, urban and local road emissions all provided a similar contribution to the NO_2 concentrations at traffic stations. This previous study did not differentiate between the various source contributions, however, it is assumed that the average difference between traffic and the urban stations does represent the traffic contributions from the local road networks. For PM_{10} this is quite small, around 5–10%, but for NO_2 this is larger at approximately 33%.

3.3 Present-day compliance with limit and target values

From the cities that filled in the 'Air Pollution Exceedances' part of the city survey, information about today's exceedances of air quality standards and target values at traffic stations was obtained, based on the years 2007 and 2008.

All responding cities exceeded the annual NO_2 limit at traffic stations, while the hourly NO_2 limit was exceeded in 30% of the cities.
The annual PM_{10} limit value was exceeded in 39% of the cities. It is harder to comply with the daily PM_{10} limit of 50 $\mu g/m^3$, which was exceeded in 66% of the cities.
$PM_{2.5}$is not generally measured – only 50% of the responding cities replied regarding this point. In 18% of these cities the annual limit value of 25 $\mu g/m^3$ (to be met in 2015) was exceeded (the concerned cities are located close to each other in the southeast of France).
No exceedances of the annual C_6H_6 limit value were reported in the city surveys.
Only 36% of the cities have data available on benzo(a)pyrene. In one city, exceedance of the target value is announced.

The exceedance situation for air pollutants, including NO_2, PM_{10} and $PM_{2.5}$, has been assessed in another ETC/ACC report for Europe as a whole, based upon AirBase data (Mol et al., 2009). The maps below (Figure 5-Figure 7) show the extent and geographical distribution of exceedances at various types of monitoring stations.

A summary of the situation regarding exceedance of the EU air quality limit values (LV) for 2007 (latest year with available assessment) is as follows:

The annual average LV for PM_{10} was exceeded at 164 of 1890 monitoring stations, about 9% of the stations, increasing from rural to urban to traffic sites. The daily average LV is exceeded at 504 of the stations.

$PM_{2.5}$ is so far monitored at only 242 stations in Europe. Exceedance of the annual average LV was reported at 27 of the stations.

The annual average LV for NO_2 was exceeded at 477 of the 2563 monitoring stations, about 19% of the stations, predominantly at traffic sites (UT). The hourly LV is exceeded far less, at 63 of the stations.

Thus, the set of large cities selected for the survey study represents cities more polluted than the average city in Europe, which is also to be expected.

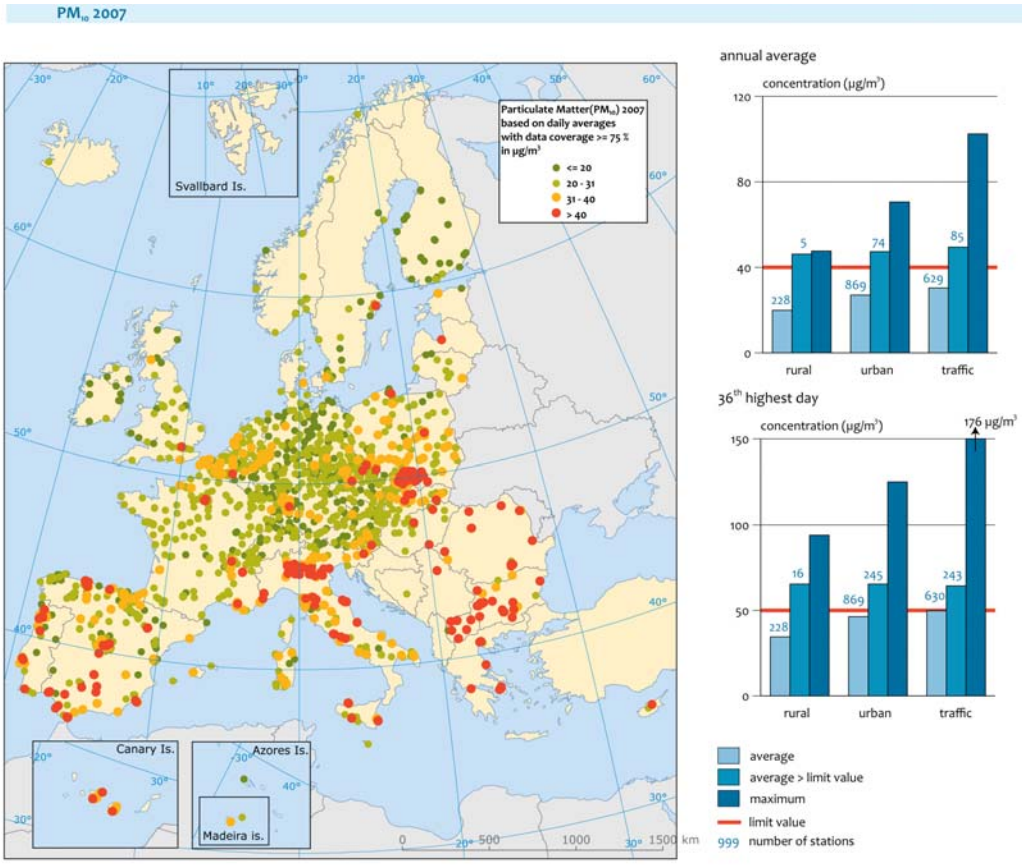


Figure 5: Overview of the monitored air pollution situation and exceedances of limit values for PM_{10} in the year 2007 in Europe (Mol et al., 2009).

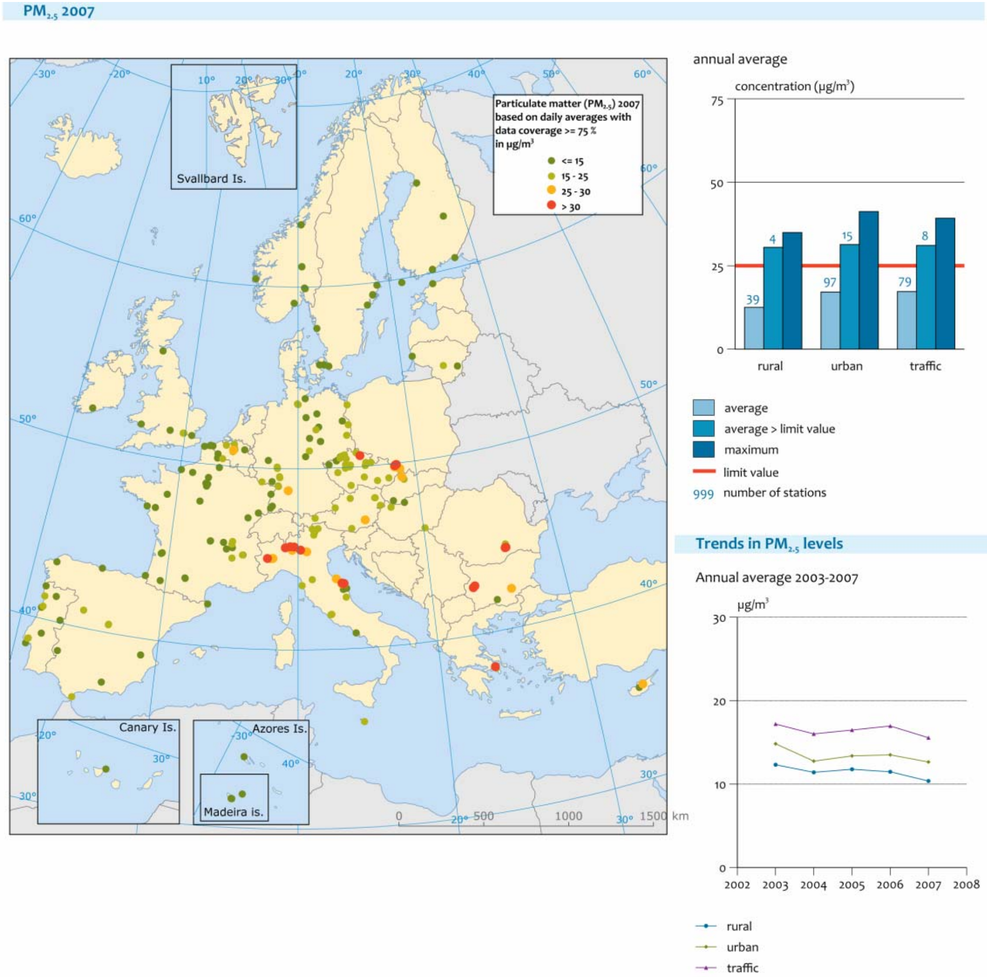


Figure 6: Overview of the monitored air pollution situation and exceedances of limit values for $PM_{2.5}$ in the year 2007 in Europe (Mol et al., 2009).

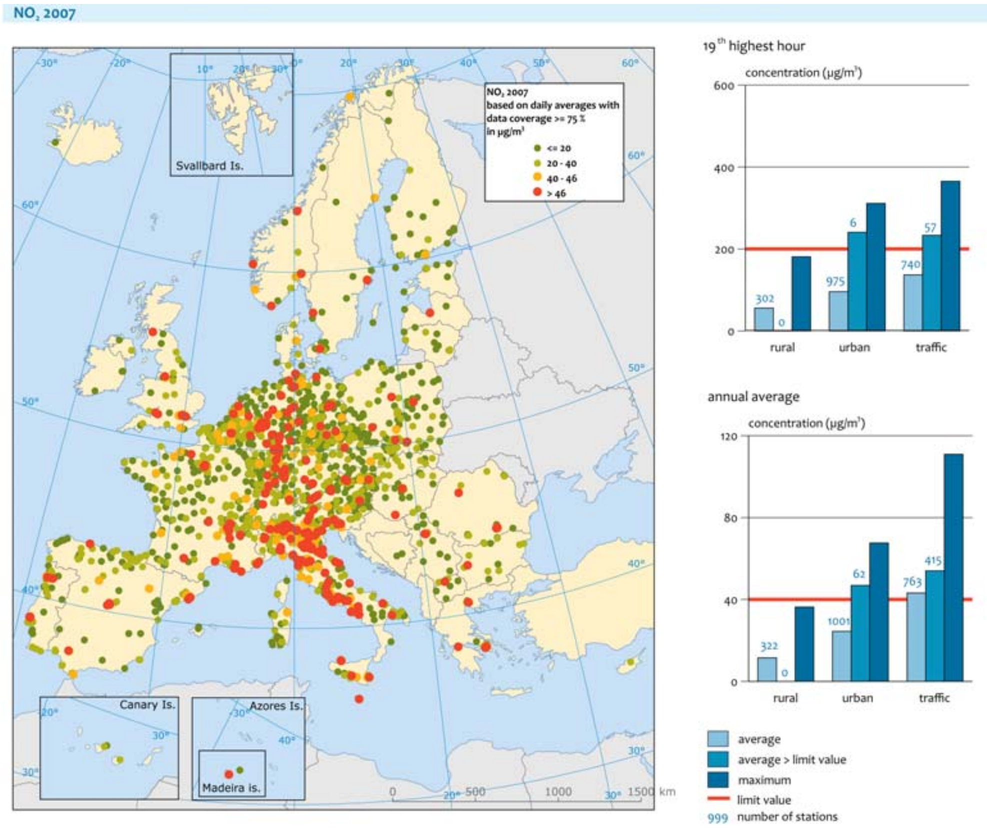


Figure 7: Overview of the monitored air pollution situation and exceedances of limit values for NO_2 in the year 2007 in Europe (Mol et al., 2009).

3.4 Mitigation measures

A large number of mitigation measures, cities may have taken or considered, was suggested in the survey questionnaires. An overview of all measures is given in Appendix A (Survey Sheet 6). They are grouped into 13 categories. The number and percentage of cities per transportation related action category can be seen in Table 6. For each of the 13 categories of mitigation measures, which were defined in the city survey, it was determined if the cities had implemented, planned, or envisioned for these measures. Data is recorded for 32 of the 49 cities, with many cities reporting that they have both implemented, planned, and/or envisioned for a single measure, which is the reason that the total and percentages can be greater than the number of participating cities. A more detailed presentation of the specific measures for each category and the corresponding city values can be found in Appendix D.

The most popular transport related actions and measures that have been **implemented** in the cities included promoting collective transport and promoting cycling (88% of cities), speed moderations and encouraging cleaner fuels/vehicles (84% of cities), and taking action on public fleets (75% of cities). These same measures were also popular **planned** activities (47%-66% of cities), except for taking action on public fleets (34% of cities). In addition, the measure of promoting walking (50% of cities) was also a popular planned activity. The more popular measures that the cities **envision** for the future include road access restrictions (34% of cities), encouraging cleaner fuels and vehicles (31% of cities), and taking action on urban

freight/logistics (28% of cities). The cities recorded a much lower total response rate to envisioned activities compared to implemented and planned.
More detailed and concrete information on mitigation measures in each city is found in the Appendix D ('Detailed mitigation strategies').

Table 6: Number and percentage of cities initiating transport related actions and mitigation measures.

Category of Mitigation Measures	Implemented		Planned		Envisioned		Total
C11. Promoting cycling	28	88 %	21	66 %	3	9 %	52
C5. Promoting collective transport	28	88 %	19	59 %	6	19 %	53
C7. Encouraging cleaner fuels and vehicles	27	84 %	15	47 %	10	31 %	52
C3. Speed moderation, traffic calming	27	84 %	15	47 %	5	16 %	47
C6. Taking action on public fleets	24	75 %	12	38 %	2	6 %	38
C9. Travel plans with a view to reducing private car use	20	63 %	7	22 %	1	3 %	28
C12. Promoting walking	18	56 %	16	50 %	1	3 %	35
C10. Flexible innovative and demand responsive transport systems	18	56 %	6	19 %	7	22 %	31
C1. Road access restrictions	17	53 %	14	44 %	11	34 %	42
C4. Parking related measures	17	53 %	9	28 %	5	16 %	31
C8. Landuse measures intending to limit car dependency	15	47 %	12	38 %	6	19 %	33
C13. Taking actions on urban freight and logistics	5	16 %	5	16 %	9	28 %	19
C2. Road charges or tolls	4	13 %	5	16 %	6	19 %	16

The air quality action plans of most cities include measures designed to lower the levels of NO_2 and PM_{10}, which have exceeded limit values. They tend more and more to also focus on $PM_{2.5}$ due to the associated health risks.

Some cities included in the study implemented measures which cannot be assigned to one of the categories defined in the city survey. These include waste disposal solutions (transport to the waste incineration plant by trains or on waterways by electric boats), coordination of waste disposal and street cleaning to be active outside of the peak traffic hours, construction of roundabouts to enhance traffic flow, introduction of high occupancy vehicle lanes, construction place logistics (organization of construction place related transport, measures to minimize dust resuspension, etc) and more.

A few measures named by cities may be controversial as to their effects, like redirecting traffic (bypasses, ring roads) or building tunnels. These measures will not solve the present air quality problems on the long term, since they aim to increase road capacity and hence are an incentive for more road traffic.

Measures related to the prevention of particle resuspension are not addressed by the city survey. However, this is a highly discussed point especially in Northern European countries.
The term 'adaptive speed control system' as a sub-point in the 'speed moderation, traffic calming' category may have led to misunderstandings. While it was marked as implemented, planned or envisioned in many survey responses, it is hardly found in action plans which were the basis for the literature review. Instead, traffic management systems, dynamical

traffic steering (direction signs), or dynamical car-park routing systems are named in many action plans and clean air plans. Being a specific subcategory of 'traffic management systems', the point 'adaptive speed control systems' was only in a few cases marked as implemented, as for the literature study. All these measures, however, aim at coordinating the traffic and improve the traffic flow in a way beneficial for air quality.

Measures like 'road charging' (e.g. German highway toll for heavy duty vehicles > 12 tons) or 'inspection of emissions' of vehicles are valid nationwide in certain countries and can thus not be included as measures taken by the individual cities.

3.5 Expected city compliance with air quality standards

Results were also collected regarding the expected compliance of each city with the listed EU air quality standards by the year 2010 and by the year 2015. Table 7 shows the anticipated compliance with these standards for all of the cities found with data for this information. Most of this information comes from the city surveys, however during the literature search it was found that several cities mentioned in their clean air action plans whether they expected exceedances of EU air quality standards by 2010 (2015) or not.

Table 7: Expected compliance totals with EU air quality standards.

	2010					2015					
	YES		NO		*n=*	YES		NO		*n=*	
Annual NO_2 limit	7	25 %	21	75 %	*28*	10	71 %	4	29 %	*14*	40 µg/m^3 by 2010
Hourly NO_2 limit	15	79 %	4	21 %	*19*	11	79 %	3	21 %	*14*	200 µg/m^3 by 2010
Annual PM_{10} limit	17	68 %	8	32 %	*25*	14	88 %	2	13 %	*16*	40 µg/m^3 by 2005
Daily PM_{10} limit	8	44 %	10	56 %	*18*	9	75 %	3	25 %	*12*	50 µg/m^3 by 2005
Annual $PM_{2.5}$ target	9	69 %	4	31 %	*13*	10	83 %	2	17 %	*12*	25 µg/m^3 target by 2010, limit by 2015
Annual C_6H_6 limit	12	92 %	1	8 %	*13*	11	85 %	2	15 %	*13*	5 µg/m^3 by 2010
Annual BaP target	8	80 %	2	20 %	*10*	8	80 %	2	20 %	*10*	1 ng/m^3 by 2012

Most cities have a very low expectation to comply with the annual NO_2 limit (25% expectation) and the daily PM_{10} limit (44% expectation) by 2010, although by 2015 they have good expectations to comply with these standards (71% and 75% respectively). There are good expectations for the cities to comply with the annual PM_{10} limit (68% expectation) and the annual $PM_{2.5}$ target (69% expectation) for 2010, and this is raised to excellent expectations by 2015 (88% and 83% respectively). There are excellent expectations for the cities to comply with the hourly NO_2 limit (79% expectation), annual benzene limit (92% expectation), and the annual benzo(a)pyrene target (80% expectation) by 2010, and these expectations are also excellent for 2015 (79%, 85%, and 80% respectively).

3.6 Expected intervals of emission reduction

Results were also collected regarding the expected emission reduction (between 2005-2010 and 2005-2015) for the target components, see Table 8. In the questionnaires, the cities were asked to choose between four intervals - 'less than 0%', 'between 0 and 5%', 'between 5 and 10%' and 'more than 10%'. Only a few cities responded. No data was obtained for

$PM_{2.5}$, CO_2, and PAH and results for NMVOCs are based on a particularly low sample size. The low response from the cities to this issue gives rise to the conclusion that cities are uncertain regarding the development of their emissions. The more long-ranging prognosis to 2015 did not show further reduction compared to the short-range prognosis to 2010, both are in the interval 5-10% for NO_x and PM_{10}.

Table 8: Expected intervals of urban emission reduction.

	2005-2010	2005-2015	n=
NO_x	5-10%	5-10%	*11*
PM_{10}	5-10%	5-10%	*9*
$PM_{2.5}$	-	-	*0*
CO_2	-	-	*0*
NMVOC	>10%	>10%	*4*
PAH	-	-	*0*

These expectations may be based on the expected results from EU measures on vehicles and fuels; mitigation measures on the national level, their own local mitigation measures, or a combination of several of these. The responding cities did not state which source formed the basis for their assumptions.

3.7 Emissions/contributions and EU compliance expectations

Only 26 and 28 cities dared to report their expectations whether it will be possible to comply with EU limit values for PM_{10} and NO_2, respectively, in 2010. There were even less cities to express estimations about compliance in 2015. Regarding $PM_{2.5}$, benzene and BaP, the number of cities was not sufficient for any statistical processing.

Cities with higher than average emissions per capita from road sources for NO_x have an optimistic view to comply with the annual NO_2 EU air quality standard of 40 $\mu g/m^3$ in 2010. Half of the cities expect to meet the standards, while the other half expects to fail. The majority of the cities (80%) with higher than average NO_x emissions is confident of meeting the hourly NO_2 standard of 200 $\mu g/m^3$. The response to this part of the study was very weak though. The long-term prognosis whether to meet the EU air quality standards in 2015 was not completed by most of the cities. The result that 50% of the cities expect to conform to both, the hourly and the annual standard in 2015, is thus rather weak. It is interesting to mention that one city which expected to meet both NO_2 standards in 2010, expected to fail at both standards in 2015. No information about the fleet composition regarding the fraction of, e.g., diesel vehicles is available from the questionnaires, but the increased NO_2 emission in areas with large diesel fraction must be included implicitly by the local assessments.

Cities with higher than average emissions per capita from traffic sources for PM_{10} are aware of having problems in complying with the air quality standards. 75% do not expect to comply with the annual or the daily PM_{10} limit in 2010. A similar picture is obtained for 2015, but the participation of respondents was lower. However, the majority of cities that answered the questions whether they expect to comply with standards or not belong to the group with lower emissions than average. In addition, the average PM_{10} emission per capita for the cities is quite high due to a few cities with very high emissions. The number of cities below the average is therefore larger than the number of cities above the average.

The majority of the cities (80%) with lower than average emissions per capita from traffic sources for NO_x expects not to comply with the annual air quality standard in 2010, but 71% expect to comply in 2015. The hourly NO_2 standard seems to pose a smaller problem to the cities. Already for 2010, 78% of the cities with comparatively low emissions expect to comply. The percentage grows to 85% for the compliance with the hourly standard in 2015.

Most cities with lower than average emissions per capita from traffic sources for PM_{10} expect to comply with the annual PM_{10} standard in 2010 (87%) and 2015 (100%). More than 50% doubt conforming to the daily air quality standard in 2010, but more than 85% are confident of meeting the standard in 2015.

Cities with higher than average maximum contributions of road traffic for NO_2 concentrations expect not to comply with the annual NO_2 standard in 2010, however, the same applies with the same high percentage of more than 83% for cities with lower than average minimum contributions of road traffic. Also, regarding the question whether to meet the hourly NO_2 limit in 2010, cities with high and low traffic contribution agree, with more than 62% expecting to comply with the standard. Regarding the conformance to the annual and hourly standards in 2015, the response was much lower. However the majority of cities with low and high traffic contributions expect to meet both standards.

Cities with higher than average maximum contribution of road traffic for PM_{10} concentrations mostly (71%) expect to comply with annual limits in 2010. For the cities with low traffic contribution, the percentage is even higher (83%). Regarding the daily PM_{10} limit, both high and low contributing cities are more skeptical towards compliance (43% and 57%, respectively). In the longer range prediction until 2015 all cities, irrespective of their traffic contribution, are confident of meeting the annual PM_{10} limit, while the expectations regarding the compliance with hourly limits increases to 75% (high contribution) and 67% (low contribution).

The used information on compliance expectation came predominantly from questionnaire responses, i.e. may be rather updated. Few estimations regarding this point were obtained from the literature survey. It should however be kept in mind that estimations for 2010 that have been published up to five years ago, may have changed in the meantime. Aachen, for example, assumed in the clean air plan from 2006 to comply with the daily and yearly limit in 2010, but submitted a notification to the EC in 2009, because they did not comply with the daily PM_{10} limit value. In the survey questionnaire in 2009, Brussels and Stuttgart reported not to comply with the daily and annual, respectively, PM_{10} limit value in 2010 and submitted similar notifications. Many countries have submitted notifications to the EC, reporting cities and zones that do not manage to comply with the PM_{10} limit value. Similar notifications for NO_2 and benzene will be due after 2010 but are not available for this study yet.

4 Results from Additional Research

4.1 PM_{10} assessments in Notifications to EC

Eighteen European member states submitted notifications on application for time extension of the deadline for compliance with the PM_{10} limit value to the European Commission[3]. The areas with PM_{10} levels exceeding the daily or annual limit value are divided into zones that may include an entire city, an agglomeration or several separate cities. This information source confirms that a majority of European member states still have not attained the PM_{10} limit values, which are defined in Directive 1999/30/EC, although they have been mandatory since 1 January 2005. According to Article 22 of Directive 2008/50/EC, member states may notify the European Commission if, according to their opinion, conditions are met in a given zone or agglomeration for being exempt from the limit values for PM_{10}. The conditions are that all appropriate measures to meet the deadline for the limit values have been taken at national, regional and local level, but due to certain site-specific circumstances the limit values could not be achieved. A quantitative source apportionment on the origin of pollution contributing to the exceedance is essential. The information to be provided in the notification by the member state is specified in COM(2008)403 and in the Staff Working Paper accompanying this Communication. The source apportionment must reflect regional, urban and local contributions within the member state. The urban and local contributions are further subdivided, so that, e.g., road traffic contributions are identified. Table 9 gives an overview on the amount of information obtained from the PM_{10} notifications. For countries printed bold, sufficiently detailed source apportionments for a number of cities larger than 250 000 inhabitants were found. For the remaining countries, however, forms have not been filled in with sufficient thoroughness, i.e. no or just very rough source apportionments were supplied. The information required in the form was actually specified in a rather detailed way, but still it was interpreted in different ways by the different authorities. Incompatibility of the information was the reason for some source apportionments not being usable for this assessment. The member states were advised to use a certain form, as defined in a Staff Working Paper by the European Commission, but not all of them met these demands.

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[3] The notifications are available online:
http://ec.europa.eu/environment/air/quality/legislation/time_extensions.htm

Table 9: Information yield from PM_{10} notifications, sorted by country.

Country	No. of zones reported	Thereof cities > 250 000 inh.	Source App.ments	Comments
Austria	30	3	2	Ok
Belgium	11	2	2	Ok
Bulgaria	23	3	0	
Cyprus	1	0	-	
Czech Republic	17	3	0	
Denmark	3	1	(1)	Not usable
France	13	--	--	Different form
Germany	42	12	12	Ok
Greece	4	2	2	One file was ok
Hungary	10	1	1	Ok
Italy	58	8	4	Ok
Latvia	--	--	--	File locked
Poland	44	9	5	Pdf files
Portugal	11	2	(2)	Not usable
Slovakia	19	2	0	SA not detailed
Spain	14	4	2	Ok
The Netherlands	9	4	4	(Ok)
United Kingdom	8	6	6	Ok

There was a substantial information gain regarding PM_{10} from traffic sources compared to the first part of this study (the 'survey study').

- Fifteen of the cities were not included in the initial list of cities for the study (see Appendix A, Survey Sheet 2). These were Athens, Brighton, Dortmund, Duisburg, Eindhoven, Essen, Gdynia, Graz, Krefeld, Leeds, Messina, Radom, Swansea, Szczecin and Wuppertal.
- Five cities (Amsterdam, Augsburg, Barcelona, Rotterdam and Thessaloniki) were also included in the survey study, but the information does not overlap, i.e. no PM_{10} information was available previously.
- Another fifteen cities were among the 144 contacted in the survey study, but no information was obtained from the questionnaire survey or the literature study. These cities were Antwerpen, Bilbao, Birmingham, Budapest, Catania, Düsseldorf, Gdansk, Glasgow, Köln, Leipzig, Linz, Napoli, Palermo, Utrecht and Warszawa.

The response to the questions on source apportionment was not expressed in a standardized way in the notifications provided by the various countries. The most often applied responses were to fill in concentrations and contributions from the individual sources to concentrations, percentage contributions of sources that sum up to 100% within each sub-sector (i.e. regional, urban and local part), or percentage contributions of the sources that sum up to a total of 100%. The latter, being the most frequently used method, was utilized here. Apportionments which consisted of concentration contributions were converted to percentage contributions. Some cities specified percentage contributions of the sources to the urban or the local increment, however, the contribution in terms of total concentration was not specified. Not all of the apportionment methods were compatible, so that a number of cities had to be omitted. A summary of the results obtained from the notifications for the individual cities is shown in Table 10.

The description of source apportionment methods used by the various responders was hardly available. Although the method used to calculate the source apportionment was requested in the form, only very few cities actually gave this information. Thus it was not possible to look into the quality of the responses.

In summary, **traffic within the urban area** was assessed to contribute with 4.5% to PM_{10} concentrations measured at urban non-traffic sites (urban or suburban background as well as a few industrial sites, here summarized as UB sites), as an average in 11 cities. The urban traffic contribution to urban traffic (UT) sites was 10.6% as an average in 32 cities (with only 3 cities overlapping with the 11 cities above). In terms of the urban (not including local) traffic contribution, there should not be a difference in the absolute concentration contribution to UT and UB sites located in the same area. The percentage contribution though would generally be lower at UT sites, since the UT concentrations would generally be larger than the UB concentrations.

Using the numbers as they are assessed by the various cities, the average contribution from the cities' own traffic to the concentrations at the UB and UT sites in these 40 cities is then about 9%, ranging from 1% to 39% (cp Table 10). Looking at the 32 UT sites only, and leaving out the suspiciously low contributions (5 cities with <3% from the urban traffic to concentrations at UT sites), the average for the 27 remaining UT sites becomes 12.3% with the range 3-39%. A previous study of concentrations at UT and UB sites, based upon data in AirBase (see the Street Emissions Ceiling (SEC) study: Moussiopoulos et al., 2004), reported an average ratio of 1.36 (std. dev.: 0.25) between PM_{10} concentrations at UT and UB sites in the same city. This ratio was based upon data from a large number of cities (number of station pairs: 86). If this ratio is used as a representative ratio for concentrations at UT vs UB sites also for the cities in Table 10, the 12.3% figure above translates into 16.7% as a derived average urban traffic contribution to UB sites and the range translates to 5-50%.

Local traffic in the immediate proximity of receptor or monitoring sites accounts for 24.3% of the PM_{10} concentrations at the UT sites, as an average in 33 cities. The range is 5-57% (Table 10). This represents an additional contribution from the very local traffic (in the street itself) on top of the traffic background contribution from the entire urban area. The large range reflects that the local traffic contribution obviously strongly depends upon the traffic volume in the street and the street type (e.g. canyon) as well as the distance between the curb and the monitoring site. The variations in source apportionment methods applied may also play a role.

For true UB sites, one would expect a local traffic contribution close to zero. The data in Table 10 contains seven cities that have given a figure significantly larger than zero for the contribution from local traffic to UB sites. Among them are four Polish cities and one Hungarian city which specified a contribution within 5.6-35.9%. If these assessments are correct, these sites should probably be classified as UT sites and not UB sites.

Combining the **urban and local** contribution to UT sites for the 21 cities[4] that report both with internally consistent data, the average urban plus local traffic contribution to PM_{10} concentrations at urban traffic (UT) sites in those 21 cities is about 36%, with a range of 13-75% (low: Duisburg, high: Barcelona). This value is in very good agreement with the average PM_{10} traffic contribution of 33.5% at UT sites, obtained from the analysis of city profiles in the survey study (cp Section 4.4).

Table 10: Urban and local traffic contribution to PM_{10} concentrations at urban traffic (UT) and urban background (UB) stations obtained from source apportionments in notifications to the EC.

City	No. of stations	Limit exceeded	Conc. (µg/m³), ref. year	Urban contr. to UT sites	Urban contr. to UB sites	Local contr. to UT sites	Local contr. to UB sites
Aachen (DE)	1 UT	Daily	32.0 (2007)	3.5% 1.1 µg/m³	-	22.9% 7.1 µg/m³	-
Amsterdam (NL)	Street#	Annual & daily	33.8 (2006)	9% 2.5 µg/m³	-	7.1% 2.4 µg/m³	-
Antwerpen (BE)	2 UT	Daily	36.0 (2005)	NI	-	8% 2.9 µg/m³	-
Augsburg (DE)	2 UT	Daily	36.5 (2005)	1% 0.2 µg/m³	-	30% 11 µg/m³	-
Athens+ Piraeus (GR)	NI#	Annual & daily	50.5 (2007)	8.7% 2.6 µg/m³		54.1% 27.3 µg/m³	-
Barcelona (ES)	Mostly UT	Annual & daily	50.0 (2005)	24% 12 µg/m³	-	51% 25.5 µg/m³	-
Bilbao (ES)	2 UT	Annual & daily	43.5 (2006)	20.6% 8.5 µg/m³	-	15.3% 6.3 µg/m³	-
Birmingham (UK)	1 UT	Daily	36.3 (2005)	9% 3.1 µg/m³	-	32.2% 11.1 µg/m³	-
Brighton (UK)	1 UT	Daily	25.2 (2005)	5.5% 1.3 µg/m³	-	19.6% 4.5 µg/m³	
Brussels (BE)	2 UT	Daily	34.0 (2005)	16% 10 µg/m³	-	13.1% 8.3 µg/m³	-
Budapest (HU)	1 UT, 2 UB	Annual & daily	47.5 (2005)	15%	15%	25%	21%
Catania (IT)	1 UT	Annual & daily	42 (2005)	32%	-	10%	-
Dortmund (DE)	1 UT	Daily	40 (2005)	3.5% 1.2 µg/m³	-	28.6% 9.8 µg/m³	-
Duisburg (DE)	1 UT, 5 UI, 1 SI	Daily	33 (2005)	4% 1.5 µg/m³	3.7%* 1.2 µg/m³	9% 3.3 µg/m³	n.s.
Düsseldorf (DE)	2 UT	Daily	36.5 (2005)	4% 1.5 µg/m³	-	39.6% 14.5 µg/m³	-
Eindhoven (NL)	Street#	Daily	33.8 (2005)	7% 2.1 µg/m³	-	11.5% 3.9 µg/m³	-

[4] Cities that report internally consistent data for UT sites: Aachen, Barcelona, Bilbao, Birmingham, Brighton, Brussels, Budapest, Catania, Dortmund, Duisburg, Düsseldorf, Eindhoven, Essen, Glasgow, Graz, Köln, Leipzig, Linz, London, Napoli, Stuttgart.

City	No. of stations	Limit exceeded	Conc. (µg/m³), ref. year	Urban contr. to UT sites	Urban contr. to UB sites	Local contr. to UT sites	Local contr. to UB sites
Essen (DE)	2 UT	Daily	35.0 (2005)	4.8% 1.6 µg/m³	-	22.4% 7.7 µg/m³	-
Gdansk (PL)	6 UB	Annual & daily	37.9 (2006)	-	0.8%	-	20.1%
Gdynia (PL)	6 UB	Daily	62.7 (2006)	-	1.7%	-	5.6%
Glasgow (UK)	1 UT	Daily	28.2 (2005)	8% 2.1 µg/m³	-	56.9% 15.1 µg/m³	-
Graz (AT)	UT, UB (mixed)	Annual & daily	43.0 (2005)	10%	10%	18%	18%
Köln (DE)	1 UT	Daily	36.0 (2007)	1.7% 0.6 µg/m³	-	37.5% 13.4 µg/m³	-
Krefeld (DE)	1 SI	-	41.0 (2005)	-	3.7%* 1.5 µg/m³	-	34.6%* 14 µg/m³
Leeds (UK)	1 UI	Daily	30.1 (2005)	-	2.2%* 0.6 µg/m³	-	0%* 0 µg/m³
Leipzig (DE)	1 UT	Daily	36.0 (2005)	6%	-	26%	-
Linz (AT)	ST, UI, SI (mixed)	Daily	31.0 (2006)	-	3%*	-	3%*
	UT	Daily	36.0 (2006)	3%	-	11%	-
London (UK)	1 UT	Annual & daily	41.1 (2005)	13.5% 5.4 µg/m³	-	35.2% 14.1 µg/m³	-
Messina (IT)	1 UT	Daily	-	37%	-	8%	-
München (DE)	3 UT	Annual & daily	38.0 (2005)	1% 0.2 µg/m³	-	32% 12.3 µg/m³	-
Napoli (IT)	2 UT	Daily	-	8%	-	16%	-
Palermo (IT)	1 UT	Annual & daily	43.0 (2005)	39%	-	10%	-
Radom (PL)	5 UB	Daily	52.3 (2004)	-	2.2%	-	35.9%§
Rotterdam (NL)	Street#	Annual & daily	34.2 (2006)	9% 2.6 µg/m³	-	5.3% 3.9 µg/m³	-
Stuttgart (DE)	2 UT	Annual & daily	42.0 (2006)	13%	-	38.5%	-
Swansea (UK)	1 UI	Daily	31.0 (2005)	-	2.9%* 0.8 µg/m³	-	0%* 0 µg/m³
Szczecin (PL)	4 UT	Daily	49.7 (2006)	2.5%	-	27.4%§	-
Thessaloniki (GR)	NI#	Annual & daily	49.0 (2007)	8.1% 2.6 µg/m³		40.4% 19.8 µg/m³	
Utrecht (NL)	Street#	Annual & daily	34.4 (2006)	11.2% 3.3 µg/m³	-	11% 3.8 µg/m³	-
Warszawa (PL)	3 UB	Annual & daily	42.9 (2004)	-	3.8%	-	28.8%§

City	No. of stations	Limit exceeded	Conc. (µg/m³), ref. year	Urban contr. to UT sites	Urban contr. to UB sites	Local contr. to UT sites	Local contr. to UB sites
Wuppertal (DE)	2 UT	Daily	35.0 (2005)	1.5% 0.5 µg/m³	-	28.3% 9.6 µg/m³	-
Average				**10.6%**	**4.5%**	**24.3%**	**16.7%**

[*] Industrial sites

[#] Treated as UT sites: The Dutch sites were referred to as ‚Street' sites, which are assumed to be equal with UT sites. The Greek sites were not classified, but based on the traffic contribution percentages they were assumed to be UT sites.

[§] Special remarks to selected cities: Radom gave a very high local traffic contribution for its UT sites. Szczecin gave 0% local traffic contribution at one of its UT sites. Warszawa has possibly reported traffic contribution to exceedances.

From five of the cities (Aachen, Brussels, London, München, Stuttgart), information from the survey study was available and can be compared to the new information (see Table 11). Overlapping information was only obtained for traffic sites, since the number of assessments for urban background sites was generally very low. It should be stressed that the traffic contributions specified by cities in the survey study may represent the total (urban and local) traffic in some cases and only the local traffic in other cases. This may explain the large differences between the figures given by some of the cities. The information requested in the city survey questionnaire was the minimum and maximum traffic contribution at all traffic sites within the city ('Traffic Min', 'Traffic Max'). In the notifications to the EC, the contribution of all urban traffic and the local traffic contribution to the PM_{10} concentrations at traffic sites ('UT urban', 'UT local') were requested. Pay attention to the discussion of uncertainties in the end of this section.

Details about the assessments in the five cities with data both from the survey questionnaire study and from the EC notifications, summarized in Table 11, are as follows:

The total traffic contribution at an urban traffic site in **Aachen** (Wilhelmstraße), assessed for the year 2007 and published in the notification to the EC, was 26.4% (or 8.2 µg/m³). For the year 2006, a total traffic contribution of 29% (23% local, 3% urban and 3% off-road contributions), corresponding to 9 µg/m³, was given in the clean air plan (see Section 9, Sources) for the same site and reported in the survey study. The assessments were most probably carried out using the same method in both cases, explaining the very good agreement.

Brussels specified a *total* traffic contribution to PM_{10} concentrations at traffic sites between 18% and 25% in the survey study response, valid for the year 2007. In the notification to the EC, two traffic sites with an average total traffic contribution of 29.1% are included, based on an assessment from 2005. According to the split-up into urban and local contributions to PM_{10}, indicated by the city, the urban traffic contribution in Brussels is reported to be larger than the local traffic contribution.

For a **London** traffic site (Marylebone Road), a *local* traffic contribution of 37%, assessed for the time period 2002-04 and published by Charron et al. (2007) was reported in the survey study. There is a very good agreement with the values (both the percentage and the absolute contribution) given in the notification to the EC for the same site, valid for 2005.

The total traffic contributions at four UT stations in **München** (Stachus, Luise-Kiesselbach-Platz, Landshuter Allee, Prinzregentenstraße) for the year 2005 was specified in the clean air plan (see Section 9, Sources) to range between 15% and 46% and reported in the survey study. In the notifications to the EC, the same contribution values were given for the same sites and the same year and the average is shown in Table 11, indicating that the basis for the information given in the two cases is probably the same.

Stuttgart specified a total traffic contribution to PM_{10} concentrations at UT sites between 39% and 58% in the survey questionnaire. The year of the assessment was not given. An average of four UT sites (Hohenheimer Straße, Am Neckartor, Siemensstraße, Waiblinger Straße) of 51.5% was given in the notification to the EC for the year 2006. This is in fair agreement with the survey study report.

Overall, the agreement of the traffic contribution information for these cities, obtained from mainly different sources was very good, supporting the consistency of the data presented in this study. However, it has to be considered that a few cities possibly only provided local traffic contributions in the survey part of the study.

Table 11: Results from survey questionnaires and EC notifications.

	Survey		EC notification		
City	**Traffic Min**	**Traffic Max**	**UT urban**	**UT local**	**UT total**
Aachen	29% 9 µg/m^3 (2006)	29% 9 µg/m^3 (2006)	3.5% 1.1 µg/m^3 (2007)	22.9% 7.1 µg/m^3 (2007)	26.4% 8.2 µg/m^3
Brussels	18% (2007)	25% (2007)	16% 10 µg/m^3 (2005)	13.1% 8.3 µg/m^3 (2005)	29.1% 18.3 µg/m^3
London	37% 14.3 µg/m^3 (2002/04)	37% 14.3 µg/m^3 (2002/04)	13.5% 5.4 µg/m^3 (2005)	35.2% 14.1 µg/m^3 (2005)	48.7% 19.5 µg/m^3
München	15% 4.4 µg/m^3 (2005)	46% 20.7 µg/m^3 (2005)	1% 0.2 µg/m^3 (2005)	32% 12.3 µg/m^3 (2005)	33% 12.5 µg/m^3
Stuttgart	39% 12.5 µg/m^3 (NI)	58% 25.7 µg/m^3 (NI)	13% (2006)	38.5% (2006)	51.5%

For Aachen and London, only one value was given, so that 'Min' and 'Max' are equal.

Uncertainties may arise as a consequence of imprecise phrasing in or misinterpretation of the EC notification form. An important uncertainty is that it is not specified clearly in the forms, whether only exhaust or also non-exhaust particle emissions from road traffic are requested. Some cities may have specified the total amount of particle emission from vehicle traffic, while others may have filled in only the exhaust fraction. No comments regarding this issue were given by the cities. It is furthermore not clear, whether all cities filled in contributions to average concentrations or contributions to *exceedances* of the PM_{10}

limit value. In the case of Warszawa, it seems that the traffic contribution to exceedances may have been specified.

4.2 Assessments in individual cities

To enhance the data basis for the project even further, the project team used their network to contact individual experts in a number of cities where it was anticipated that specific assessment work regarding the contribution from the road traffic sector had been carried out and reported. Response with useful information was provided from the following cities: Berlin, Copenhagen, Helsinki, Oslo, Stockholm. Information re Oslo was already available with the project team. Other contacts responded by referring to the PM_{10} compliance extension notifications delivered, as treated in the Section 4.1 above. Table 12 shows a summary of the information gained this way.

The methods used for the assessments in these cities are partly source apportionments based upon receptor modeling using chemical analysis of PM filter samples (Copenhagen) as well as emission inventories (Berlin) and partly based upon urban and local dispersion modeling methods (Helsinki, Oslo, Stockholm). The Oslo assessment (Sundvor et al., 2009) differs from the others, in that only the contribution from traffic to the exceedance days for PM_{10} has been assessed.

All these city assessments include and specify vehicle exhaust and non-exhaust PM. It should be noted that the use of studded tires is widespread in cities in Finland, Norway and Sweden, whereas their use is banned in German cities. The use of such tires increases the wear of the road surface significantly and thus increases the non-exhaust contribution to PM significantly.

Table 12: Contributions to the PM concentrations from road traffic to urban background and traffic sites in selected cities (years of assessment).

City	Urban background			Urban traffic sites		
	µg/m³	% road traffic contribution		µg/m³	% road traffic contribution	
Berlin						
PM_{10} (2002)	25.2	23%	from urban traffic to total UB conc.	34.3	26%	from local traffic to total concentration
		37%	from all urban and regional traffic to total conc.		43%	from all urban traffic to total conc.
					53%	from all regional and urban traffic to total concentration
$PM_{2.5}$ (2007)	19.6	17%	from urban traffic to total UB conc.	22.7	13%	from local traffic to total concentration
		27%	from all urban and regional traffic to total concentration		28%	from all urban traffic to total conc.
					37%	from regional and urban traffic to total conc.
Copenhagen						
PM_{10} (2005-2007)	26.6	9.5%	from regional and urban traffic to total concentration	42.5	43%	from regional, urban, local traffic to total concentration
$PM_{2.5}$ (2005-2007)		4.3%	-“-		19%	-“-
Helsinki						
$PM_{2.5}$ (2002)	8.6	12.5%	from urban traffic to total conc.	9.9	39%	from urban and local traffic to total conc.
Stockholm						
PM_{10} (2007)	18	28%	from urban traffic to total concentration	38	65%	from urban and local traffic
$PM_{2.5}$ (2007)	11.6	11%	-“-	15.8	35%	-“-
Oslo						
PM_{10} (2007)		63%	from urban traffic (contribution to exceedances)		72%	from urban traffic (contribution to exceedances)

Some details about the assessments in the cities summarized in Table 12 are as follows:

Berlin Source apportionment for PM_{10} (Lutz, 2004; John and Kuhlbusch, 2004) and $PM_{2.5}$ (Pesch et al., 2008) by chemical analysis, measurements at regional, near-city, urban background (Neukölln) and street station (Frankfurter Allee, 60 000 vehicles per day, curb side), combined with multi-element and component analysis.

Copenhagen Source apportionment based on multi-element analysis of filter samples by the COPREM statistical model, applied at measurements from an urban background (HC Ørsted

Institute) and a street site (HC Andersen Boulevard, 60 000 vehicles per day, curb side) (Wåhlin, 2008a; Wåhlin, 2008b; Wåhlin and Palmgren, 2008).

Helsinki Source apportionment by urban and local scale dispersion modeling. Assessment of road traffic contribution to $PM_{2.5}$ at the urban background site Kallio and the traffic site Vallila (13 000 vehicles per day, 14 m from curb) (Kauhaniemi et al., 2008). For the contribution to UB at Kallio, the results from Kauhaniemi et al. (2008) have been modified by including in the assessment that the urban space heating by wood combustion sources contributes about 25% of the concentrations in Helsinki dependent upon location (personal communication, J. Kukkonen).

Stockholm Assessment by urban dispersion modeling. Measurements at a UB site (roof station at Hornsgatan) and a street station (Hornsgatan, 35 000 vehicles per day, curb side) (Johansson and Eneroth, 2007; Nerhagen et al., 2008). The percentage for urban background represents the urban road traffic contribution to the total population weighted concentration averaged over the entire greater Stockholm area (35 x 35 km). In addition to the data given in the reference work, the regional concentration of 10 $\mu g/m^3$ is accounted for (based upon AirBase data).

In a study by Ketzel et al. (2007) it was shown that, while Stockholm (Hornsgatan) and Helsinki (Runebergkatu), where studded tire use was 75-84%, have a comparatively large non-exhaust contribution (80-88%), it is notedly smaller for Copenhagen (Jagtvei), 51%, where no studded tires were used. The three streets have comparable dimensions, average traffic volumes and traffic situations.

A summary from the road traffic contributions to annual average PM in these cities/traffic sites is as follows. Please note that the assessment methodologies differ between the cities, which may affect the quantity of road traffic contribution. Note also that the assessed contributions clearly include non-exhaust particles:

- PM_{10}, the cities' own traffic contribution to the total urban background (UB) sites:
  - 28% in Stockholm and 23% in Berlin.
  - Copenhagen has assessed the total (regional and urban) traffic contribution to its urban background station to be as low as 9.5%. This can be compared with the corresponding figure for Berlin, which is 37%.

- PM_{10}, the city and local traffic contribution to total concentration at the urban traffic (UT) sites:
  - 43% in Berlin (Frankfurter Allee), and higher, 65%, in Stockholm (Hornsgatan).
  - For Copenhagen, the assessment of the total traffic (regional, urban and local) contribution is 43%. The corresponding figure for Berlin is 53%.
  - The contribution depends of course on the traffic volume in the streets in question and the distance from the street/road, among other conditions. Hornsgatan is a narrow street canyon, and the non-exhaust/road dust contribution is very high there due to high fraction of cars using studded tires.

- The (urban plus local) traffic contribution to $PM_{2.5}$ for Berlin, Helsinki and Stockholm is quite a bit lower than for PM_{10}, 11-17% to the urban background and 28-35% at the street sites.
  For Copenhagen, the assessment of the total (incl. regional) traffic contribution to $PM_{2.5}$ is 4.3% for the UB site and 19% at the UT site.

- The non-exhaust PM contributes with 50-68% of the traffic PM_{10} contribution at urban background sites, except in Stockholm where it is much higher, about 90%. At traffic sites the contribution is naturally higher, 58-77% while dominating completely at the Stockholm site (Hornsgatan). Compared to the total PM_{10} concentration, the non-exhaust contribution is 6-11% at urban background (24% for Stockholm) and 23-30% at traffic sites (except again for Stockholm, where it is much higher, 59%). The high non-exhaust contribution in Stockholm is due to the extensive use of studded tires and to sanding practices during winter.

- The assessment in Oslo differs from the others, in that it deals with the road traffic contribution to the PM_{10} concentrations averaged over Oslo on days with exceedance of the EU daily limit value. The urban and local road traffic dominates the PM_{10} on those days, 63% as average for the urban background across the entire city, and 72% on average at street level. The road traffic contribution itself on these days is dominated by the non-exhaust (road dust) PM fraction.

The road traffic contributions to PM_{10} and/or $PM_{2.5}$ concentrations in Berlin, Helsinki, Oslo and Stockholm had been assessed in the survey study as well. The Berlin assessment was based on the year 2002, but with 50-52% traffic contribution at UT sites in good agreement with the data presented in Table 12. The non-exhaust part was given as 22%. The data for Helsinki, Oslo and Stockholm was obtained from the questionnaire responses, i.e. as recent as possible. At traffic stations in Helsinki, the traffic PM_{10} contribution was 36-63%. For $PM_{2.5}$ the range was 20-25%, which is lower than in Table 12. At UB stations, 19-29% of the PM_{10} and 14-15% of the $PM_{2.5}$ concentrations are assigned to traffic, which is in close agreement to the value shown in the table. The PM_{10} traffic contribution at UT stations in Stockholm was given with a range of 36-71%. For $PM_{2.5}$, the corresponding range was 29-50%. The numbers in Table 12 are within these ranges. At urban background sites, the traffic contribution was given with 36% for PM_{10} and 29% for $PM_{2.5}$. Both values are higher than those in Table 12. The numbers in Table 12 represent the population weighted average for the entire Stockholm region, while the numbers from the questionnaire probably represent one UB site in central Stockholm. For Oslo finally, the questionnaire reported 50-70% PM_{10} traffic contribution at UT sites and 15-35% at UB sites. The latter is considerably lower than the value given in Table 12, but it has to be kept in mind that the Oslo values in the table are contributions to exceedances. Regarding the collected information as a whole, the agreement between different information sources is good.

4.3 Road traffic contribution to regional background air pollution in Europe

The spatial distribution of the regional background PM concentration level in Europe has been assessed for 2005 by Horálek et al. (2008)[5]. The assessment is based upon a combination (interpolation methodologies) of measured concentrations and EMEP model results, in a representation using the EMEP grid cells. PM_{10} is shown in Figure 8 and $PM_{2.5}$ (de Leeuw and Horálek, 2009) in Figure 9.

In the central and parts of the northern areas of Europe, the regional background annual average PM_{10} concentration for 2005 was in the range 15-20 µg/m^3, increasing to above 20 µg/m^3 in Benelux and towards central-eastern Europe. Southern Spain and parts of Portugal also have a background above 20 µg/m^3, probably in part as a result of influx on Saharan dust. Parts of the Po Valley have the highest regional background PM_{10}, above 40 µg/m^3.
The regional background $PM_{2.5}$ concentration has a similar spatial distribution as PM_{10}, while the ratio between $PM_{2.5}$ and PM_{10} is typically 0.7, as derived from the concentration measurements.

The emissions from the road traffic sector contribute to the concentrations of air pollutants on the regional scale. To provide an assessment of its contribution, the EMEP Unified model (Simpson et al., 2003) was run with all emission sectors included, as well with the road traffic sector emissions excluded. The runs were done for the year 2005. The difference between the concentrations for these two model runs was calculated, and this difference can be interpreted as the contribution from the road traffic source to the regional concentration in the EMEP grid cells.

The road traffic sector emissions input to the EMEP model included exhaust particles as well as tire and brake wear (sector 1 A 3 b vi) and road abrasion (sector 1 A 3 b vii). Not all countries report these emissions. Tire and brake wear were, for 2005, reported from 10 countries: Belgium, Estonia, Finland, France, Germany, Latvia, Norway, Spain, Sweden and the UK. Road abrasion was also reported by 10 countries: Austria, Belgium, Estonia, France, Germany, Latvia, Norway, Slovakia, Spain and Sweden. For these countries, the officially reported non-exhaust PM_{10} particle emissions data represent about 47% of the exhaust particle emissions. The corresponding figure for $PM_{2.5}$ is 22%.

Figure 10 and Figure 11 show the calculated contribution from the road traffic sector to PM_{10} and $PM_{2.5}$, respectively. The calculated contribution includes primary as well as secondary inorganic particles. Secondary organic particles (SOA) are not included in the version of the EMEP model used here.

In order to show the relative contribution that the road traffic sector gives to regional PM concentrations, resulting from the above assessments, the ratio in each grid cell has been calculated between the road sector concentrations and the total regional PM concentrations from Horálek. Both these calculations obviously have uncertainties associated with them, and the uncertainties in a combined map will be even larger. Thus care should be used in the

[5] URL: http://air-climate.eionet.europa.eu/docs/ETCACC_TP_2007_7_SpatialAQmapping2005_annual_interpolations.pdf

interpretation of detailed features of the resulting relative contributions, shown in Figure 12 for PM_{10} and Figure 13 for $PM_{2.5}$.

Also, while the EMEP modeled concentrations in the Horálek approach are corrected using measurements (Figure 8 and Figure 9), the results of the EMEP differential calculations for the road sector (Figure 10 and Figure 11) are not, because specific measurements of the road sector contribution are not available. The corrections by the Horálek approach relates mostly to other sources than road traffic, such as correcting for the under-representation of the dust source in the EMEP model, although it does also correct for the missing organic aerosols in the EMEP modeling, this being a much smaller correction, though, in terms of mass. The road traffic contribution is established through a differential approach and is in any case unaffected by the dust underestimation. It is, however, subject to underestimation due to the missing organic aerosols in the EMEP modeling.

With these qualifications, it is considered that the method to assess the relative contribution from road traffic gives acceptable results in most areas where the EMEP emissions are reasonably complete and measurements are available. Differences in model structure may be important in other areas, such as high altitude Alpine areas, where the combination of the maps may produce skewed results.

PM_{10}

The modeled contribution from the road traffic source sector to the regional background concentrations (annual average) is around 1.5-3 µg/m^3 in most of continental EU Europe, with a maximum belt from Eastern France across South Germany and Hungary, as well as in the Po valley (Figure 10). The concentrations are gradually reduced towards Northern and Southern areas. The inclusion of non-exhaust PM in all countries would increase the road traffic contribution in those countries where this is not included so far (see above).

Larger cities and urban agglomerations show up as hot-spots. Examples are London, Paris, Madrid, Rome, Barcelona.

The modeled concentrations do not include secondary organic aerosol particles (SOA). SOA concentrations in Europe are uncertain. An assessment has been carried out by Simpson et al. (2007). Based upon measurements at a few sites across Europe as well as modeling, the anthropogenic SOA was estimated to be of size 1 µg/m^3 or less, as annual average for 2002-2003. Only a fraction of this again is associated with the road traffic source.

The main feature in Figure 12 is that the percentage contribution from road traffic to PM_{10} is in the range of 10-18% in an area including parts of eastern France and southwestern Germany, and it reduces to the north and south of Europe. As mentioned, the non-exhaust PM would increase the contribution in those areas where it is not included so far. The high percentage in areas of the Alps is difficult to explain. It could be an artifact resulting from different treatment of high altitude areas in the methods used to produce the different maps.

Adding a road traffic SOA contribution of less than 1 µg/m^3, the percentage contribution from road traffic increases somewhat. In the central parts of Europe, the increase is limited to about 5%, so that the road traffic contribution to regional PM_{10} grows to about 15-25%.

$PM_{2.5}$

For $PM_{2.5}$, the modeled contribution from the road traffic sector to the regional background (Figure 11) has a spatial distribution similar to PM_{10}, with somewhat lower concentration level, typically about 0.9 times PM_{10}. The full inclusion of non-exhaust PM sources in the emissions inventory (as mentioned above, only 10 countries have included non-exhaust PM) will bring this ratio towards a lower value.

The relative contribution from road traffic to the $PM_{2.5}$ concentrations (Figure 13) has a similar spatial distribution as for PM_{10}. It is somewhat higher than for PM_{10}, and approaches 20-25% in parts of the maximum area between France and Germany. When road traffic SOA is included, this contribution increases towards 30%. As for PM_{10}, the high percentage that comes out in the alpine areas is difficult to explain, but could be an artifact from the combination of the maps.

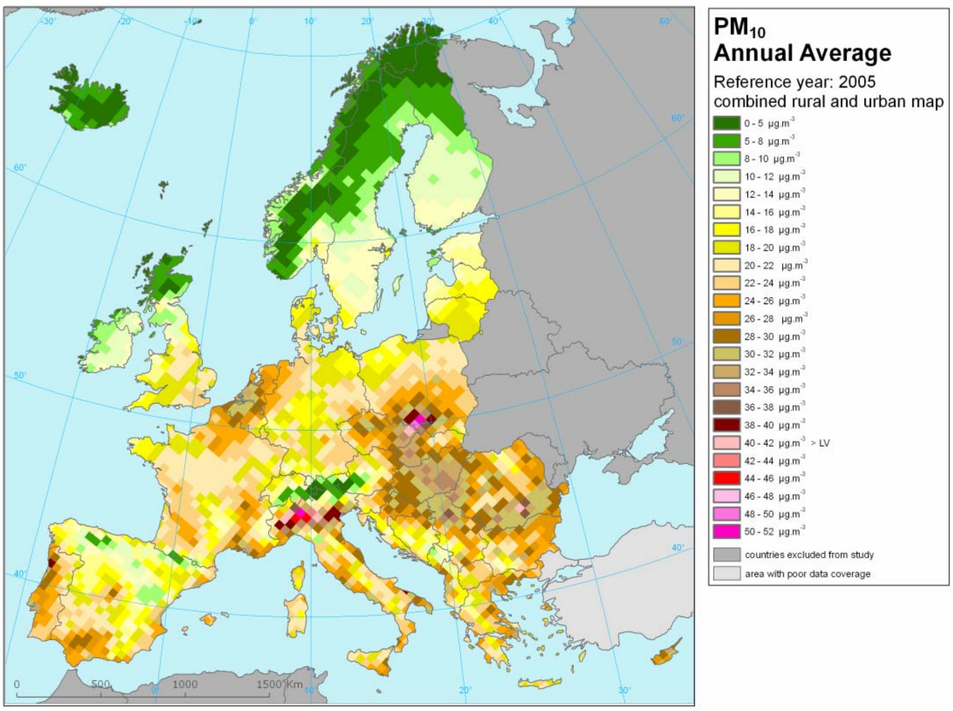

Figure 8: Interpolated PM_{10} map (µg/m^3) for Europe, annual average concentrations 2005, presented in the EMEP grid (Based upon Horálek et al., 2008).

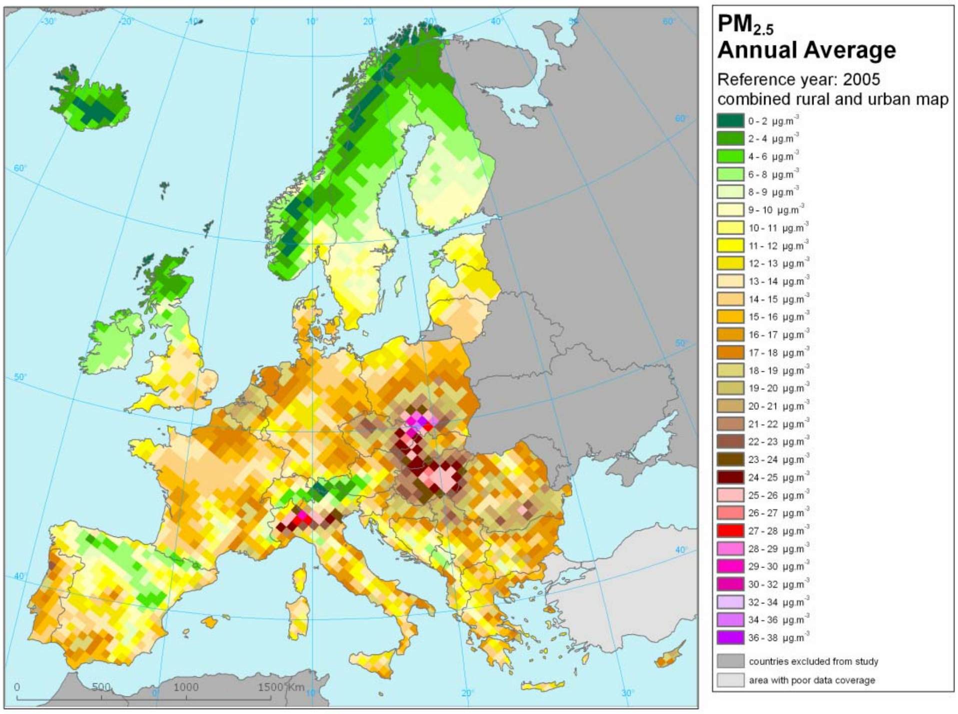

Figure 9: Interpolated $PM_{2.5}$ map ($\mu g/m^3$) for Europe, annual average concentrations 2005, presented in the EMEP grid (Based upon de Leeuw and Horálek, 2009).

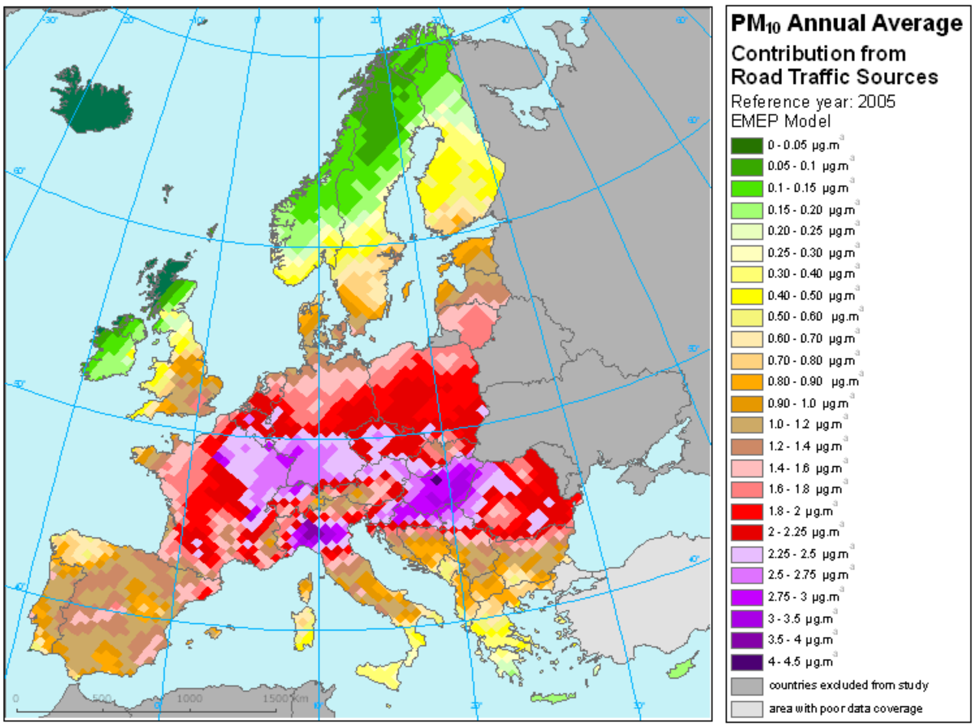

Figure 10: Modeled contribution ($\mu g/m^3$) from road traffic emissions to regional PM_{10} concentrations in Europe for the year 2005 (EMEP Unified model).

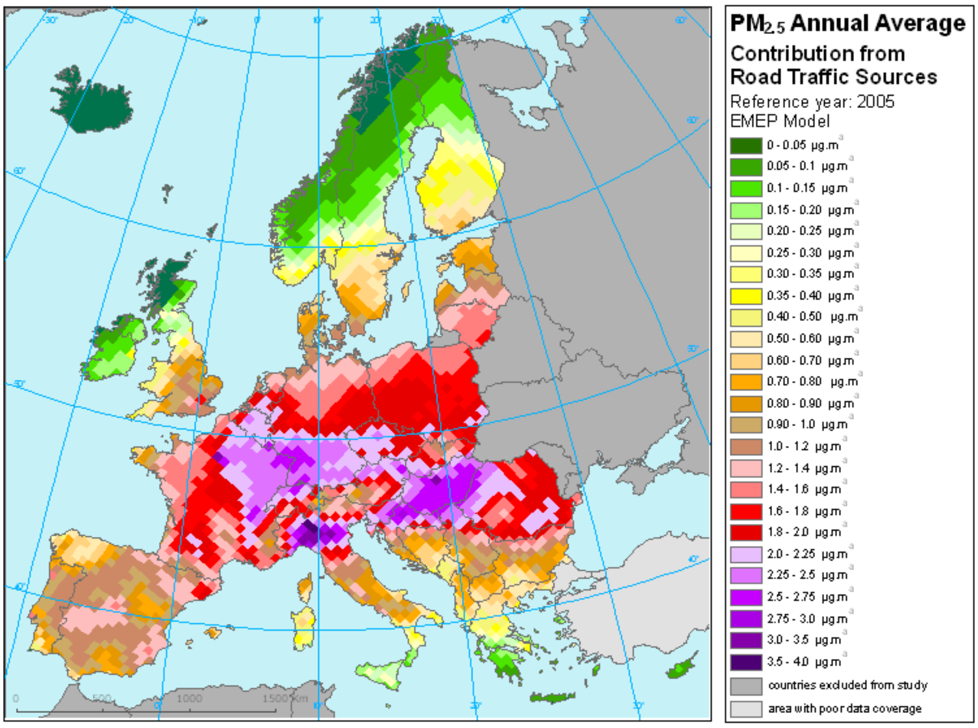

Figure 11: Modeled contribution (µg/m^3) from road traffic emissions to regional $PM_{2.5}$ concentrations in Europe for the year 2005 (EMEP Unified model).

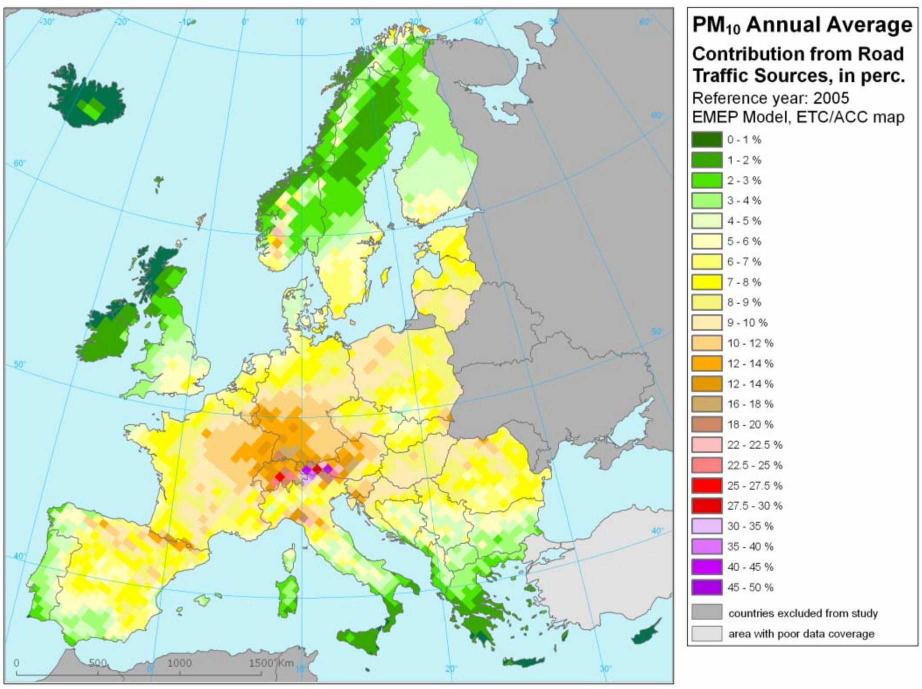

Figure 12: Modeled contribution (in %) from road traffic emissions to regional PM_{10} concentrations in Europe.

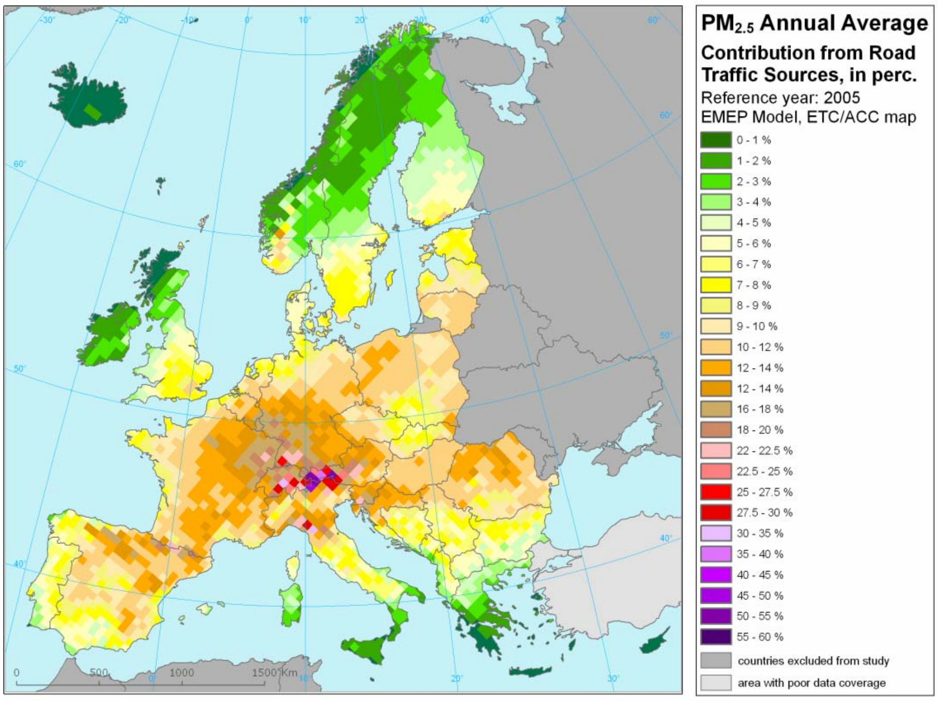

Figure 13: Modeled contribution (in %) from road traffic emissions to regional $PM_{2.5}$ concentrations in Europe.

4.4 Comparison of results from the three parts of the study

Information on the road traffic contribution to the concentrations of relevant pollutants in European cities has been gathered in this study from three resources – the questionnaire and literature survey, EC notifications and assessments of selected cities. The results from these three information bases of the project are merged in Table 13 in order to compare them. Also regional modeling results are given in this overview.

Table 13: Relative contributions from road traffic to the PM_{10} concentrations at urban background and traffic sites and at regional scale. Summary of results. Upper line: average percentage and number of cities (in parentheses); lower line: range. R: regional traffic; U: urban traffic; L: local traffic.

	Regional back-ground	Urban background		Urban traffic sites	
		U	R+U	U+L	R+U+L
Survey study		18.4%[1a] (14) 5-49%		33.5%[1b] (27) 7-71%	
EC notifications		17% (27)[2a] 5-50%		36% (21)[2b] 13-75%	
Separate city Assessments					
Berlin, Stockholm		23-28%	37% (<u>Berlin</u>)	43-65%	53% (<u>Berlin</u>)
Copenhagen			9.5%		43%
EMEP model run	15-25%[3]				

[1a] UB sites in Survey Study: Bonn, Brno, Brussels, Chemnitz, Edinburgh, Genova, Helsinki, Malmö, Milano, München, Münster, Oslo, Stockholm, Stuttgart. For some cities the response included the regional contribution, but for most cities it did not.
[1b] UT sites in Survey Study: Aachen, Berlin, Bonn, Braunschweig, Bremen, Brno, Brussels, Chemnitz, Darmstadt, Erfurt, Freiburg, Genova, Hamburg, Heilbronn, Helsinki, Karlsruhe, London, Malmö, Mannheim, München, Münster, Osnabrück, Oslo, Praha, Stockholm, Stuttgart, Ulm. For some cities the response included the regional contribution, but for most cities it did not.
[2a] Refer to Section 4.1 for the derivation of the shown figures.
[2b] Figure is based upon data from Aachen, Barcelona, Bilbao, Birmingham, Brighton, Brussels, Budapest, Catania, Dortmund, Duisburg, Düsseldorf, Eindhoven, Essen, Glasgow, Graz, Köln, Leipzig, Linz, London, Napoli, Stuttgart. See page 29
[3] Including an approximate SOA contribution from the road traffic source

On the *regional scale*, the road traffic contribution to PM_{10} and $PM_{2.5}$ varies across Europe, see Figure 8 and Figure 9. The contribution to PM_{10} is within the range 12-20% in an area extending around the border between France and Germany, and is gradually decreasing towards the North and South of Europe. The contribution to $PM_{2.5}$ is about 20% higher (relative) than the PM_{10} contributions. When road traffic SOA is included, the road traffic contribution increases somewhat - up to (and limited to) 15-25% for PM_{10}.

For *PM_{10} on the urban background scale*, the results from the various parts of the study agree quite well. The cities' own traffic contribution to PM_{10} was on average about 17% at UB sites, with a range of about 5-50%, as derived in the EC notification part (see Section 4.1). The results from the separate city assessments from Berlin and Stockholm are within this range. The results from the survey study (18.4% at UB sites, range 5-49%) agree very well with this, although for a few of those cities, the contributions may represent the *total* traffic contribution, including the contribution from the regional scale as well. This depends on how the city representatives interpreted this point in the questionnaire (compare with Appendix A, Survey Sheet 5, 'Air Pollution Problems' for the exact phrasing). The Copenhagen case also falls within the range, although the traffic contribution is very low there compared to the majority of the other cities.

If the regional contribution is brought into the picture, the contribution of the total traffic (regional and urban) to the urban background would increase. If the regional background contributes about 50% to urban PM_{10} concentrations (typical in central parts of Europe) and the road traffic contribution is up to 20% of this (cp Section 4.3), the total traffic contribution (regional + urban) to PM_{10} would increase from the 17-18% figure given above to up to about 25-30% (highest in maximum areas shown in Figure 12, and less increase in other parts of Europe).

Also for *traffic contributions to* PM_{10} *at urban traffic (UT) sites*, the first survey and the EC notifications give quite similar results. The average contribution from the urban and local traffic to PM_{10} at the 21 UT sites of the EC notification part is around 36%, and the range is 13-75%, while the survey study gave an average of 33.5%, range 7-71%, although according to the survey questionnaire the contribution includes the regional background for a few of these cities. The traffic PM contributions in Berlin and Copenhagen are also within this range. The use of studded tires in Stockholm brings the traffic contribution there up to a high level (65%), while the survey and the EC notification cities have traffic sites with even higher traffic contribution than this.

Including the regional background contribution, the total road traffic contribution to PM_{10} concentrations at the UT sites would increase by up to 5-10%, giving an average of up to 40-45% for this total road traffic contribution.

The contribution range at the UT sites depends of course upon the range of traffic volumes that is represented by the UT sites included, as well as their street geometry variation and distance to the curb. Traffic data for the streets by the UT sites is not given. However, the number of cities and UT sites involved is fairly large, and should represent the range of European streets to a certain degree.

For $PM_{2.5}$, the number of cities reporting the traffic contribution to average concentrations was much lower than for PM_{10}. Eight cities in the survey study contributed $PM_{2.5}$ assessments at UB sites, where the average range of the traffic contribution was 17-23%. The contribution from traffic at UT sites was assessed for five cities (Brussels, Genova, Helsinki, Malmö, Stockholm) with an average range of 18-28%. In the separate city assessments, the <u>traffic contribution to $PM_{2.5}$</u> is assessed for Berlin, Helsinki and Stockholm. The traffic contributions to urban $PM_{2.5}$ were quite a bit lower than to PM_{10}, 11-17% to the urban background and 28-43% at the street sites. For Copenhagen, the assessment of the total (incl. regional) traffic contribution to $PM_{2.5}$ was 4.3% for the UB site and 19% at the UT site. With this low number of cities with assessments for $PM_{2.5}$, it is not possible to conclude about the traffic contribution to urban and street level sites, and also not whether the relative contribution is larger or smaller than for PM_{10}, percentagewise.

It should be mentioned that except for the 'separate city assessment' group of cities, it is not always clear to what extent non-exhaust PM is included in the contribution assessments. This would depend to some extent upon the assessment method used. When non-exhaust PM is included for some cities and not for others, this would influence the reported range. For Berlin, Copenhagen, Helsinki and Stockholm the contribution to PM_{10} from the non-exhaust PM was included in their assessment. Compared to the total traffic (exhaust + non-exhaust) PM_{10} contribution, the non-exhaust PM contributes with about 50-68% of that at urban background sites, except in Stockholm where the assessment gives that the non-exhaust dominates completely (more than 90% of traffic PM) over the exhaust PM contribution, due to studded tires and winter sanding. At traffic sites the contribution is 58-77% and dominating completely at the Stockholm site (Hornsgatan). These values agree very well with the non-exhaust contributions Ketzel et al. (2007) found for traffic sites in Nordic cities. They reported 80-88% non-exhaust PM contribution in cities with studded tire use (Helsinki, Stockholm) and 51% in Copenhagen, where no studded tires are used.

Compared to the total PM_{10} concentration, the non-exhaust contribution is 6-11% at urban background (24% for Stockholm) and 23-30% at traffic sites (except again for Stockholm, where it is much higher, 59%).

In the EC notifications, the non-exhaust part is not specifically mentioned. For seven cities contributing to that part of the survey study, however, the non-exhaust part to PM_{10} concentrations was reported. It ranged between 11% in Hamburg and 43% in Rome, with an average contribution of 25%, at urban traffic (UT) sites.

The average for these cities compares well with the results from Berlin, Copenhagen and Helsinki.

The source apportionment methods used in the various assessments are predominantly dispersion modeling, positive matrix factorization (PMF) and principal component analysis (PCA). The quality of the assessments has not been evaluated in this work, except that it has been possible to study the reports from the assessments for Berlin, Copenhagen, Helsinki and Stockholm. It has not been studied whether there is a relationship between assessment methodology and the results regarding the level of the road traffic contribution.

Querol et al. (2004) have reported a study of source apportionment for PM based upon data from selected European cities: Berlin, curbside stations in Spain, Stockholm, London, Birmingham, Dutch cities, Vienna and Bern. A summary of their results is shown in Table 14. The traffic contribution to the regional background of PM_{10} in this reference is larger than that from the present study, 35-50% as opposed to 15-25%. The Berlin assessment referred to above, estimated a 22% road traffic contribution to regional PM_{10} concentrations. The urban + local contributions to curbside PM_{10} in Table 14 specified as 40-80% for 'Europe average' falls mostly within the range obtained in this study for UT sites, 13-75% (Table 13).

Table 14: Summary of contributions from regional scale, urban scale and local scale road traffic to curbside (UT) PM_{10} concentrations in selected European cities (Querol et al., 2004).

	Europe average	Netherlands	Sweden
PM_{10}			
Regional bg	35-50%	50-75%	30-65%
Urban bg	10-35%	15-35%	5-30%
Local	30-45%	01-20%	35-55%
$PM_{2.5}$			
Regional bg	35-50%	60-70%	40-65%
Urban bg	20-35%	5-25%	5-30%
Local	30-40%	15-25%	20-35%

In the study by Querol et al. (2004), The Netherlands and Sweden were selected to illustrate different scenarios of PM in the EU. In the Netherlands, very small differences between PM_{10} concentrations at urban background and curbside stations were observed, in contrast to most other of the case studies where levels at curbside sites were 30-50% higher than at urban background. However, the methodologies applied for the source apportionments summarized by Querol et al. (2004) are not given.

5 Conclusions

The main objective of this study was to assess the contribution from road traffic to the concentrations of PM in urban areas in Europe. The study concentrated on cities with population above 250 000 inhabitants. From the efforts of this study, such assessments were made available for more than 30 cities from the survey part of the study and for 40 cities from the EC notification part (with some overlap), as well as from separate assessments for Berlin, Copenhagen, Helsinki and Stockholm.

The representativity of these 68 cities for the more than 140 cities in Europe above 250 000 inhabitants has not been assessed. It would have been desirable to obtain data from cities which are more equally distributed over Europe (see map in Figure 1). In Germany, Italy, Austria and the Southern half of France data were obtained from a representative number of cities. With the exception of Poland, no assessments were available for Eastern European countries. As possible reasons for that, lack of expertise or language problems are assumed. When discussing the representativity of this study it has to be considered that most European countries only have one to three cities with population sizes greater than 250 000. Germany, United Kingdom, Spain, Italy, Poland, Romania and France were the countries with a larger number of big cities, and, with the exception of Romania, covered reasonably well by the study.

Starting with the regional PM concentrations and the road traffic contribution to these, the separate assessment carried out using assimilated maps of PM concentrations in Europe from previous ETC/ACC studies combined with modeling using the unified EMEP model provided the following estimate: road traffic emissions contributed with 15-25% to regional PM_{10} concentrations in the area with the highest contribution, an area around the border between France and Germany, and lower percentagewise contributions elsewhere. A separate assessment for Berlin, 22%, compared well with this. A paper by Querol et al. (2004) gave a larger contribution, 35-50% as a European average. For $PM_{2.5}$, the relative road traffic contribution to regional concentrations is assessed to be some 20% larger (relative) than to PM_{10}.

For the urban traffic contribution to urban background concentrations of PM_{10}, the assessments in the study gave an average value of 17-18%, with a large range between the various sites in the various cities, 5-50%. The results from the two main parts of the study agreed very well with each other. The number of urban background sites for which detailed quantitative assessments were available, however, is rather limited. In most cities, source assessments are only carried out for sites where limit values are exceeded. Limit value exceedances are not frequent for background sites.

When including the regional background contribution, the total road traffic contribution to PM_{10} increases to an average up to 25-30% for urban background locations.

For the urban traffic locations (traffic hot spots), the study gave an average of about 35% as the sum of the contributions from the cities' own traffic and the local (street) traffic by the street sites, with a large range between the sites, of 7-71%. Also here, the two main parts of the study gave very similar results. When including the regional contribution, the total road traffic contribution increases to an average up to 40-45%. The number of cities and street (UT) sites involved is fairly large, and should represent the range of European streets to a certain degree.

Regarding $PM_{2.5}$, the number of cities providing assessments was very low, about 10 cities. The results for $PM_{2.5}$ did not differ substantially from the PM_{10} results as regards percentage contributions from road traffic. However, it is not possible to conclude about the traffic contribution to $PM_{2.5}$ at urban and street level sites, and also not whether the relative contribution is larger or smaller than for PM_{10}, percentagewise.

Regarding non-exhaust PM, the assessments gave a certain basis for estimating its contribution compared to the exhaust PM. For 10 of the studied cities the non-exhaust contribution to PM_{10} concentrations was specifically reported. The average non-exhaust contribution at urban traffic sites (UT) was about 25% of the total PM_{10} concentration. For seven of the cities in the survey study, it ranged between 11% (Hamburg) and 43% (Rome). Additional assessments in Berlin, Copenhagen and Helsinki gave a range of 23-30% at UT sites, while in Stockholm it was much higher due to extensive use of studded tires and sanding during winter. At urban background sites in those three cities, the non-exhaust contribution was lower and ranged 6-11% (but 24% for Stockholm). For these cities, the non-exhaust PM contributed with 50-68% of the traffic PM_{10} contribution, except in Stockholm where the assessment gave that the non-exhaust dominates completely (about 90% of traffic PM) over the exhaust PM contribution.

This is consistent with the numbers above regarding the total road traffic contribution, and it can be indicated that a bit more than half of the road traffic contribution is associated with non-exhaust PM. The results found for the non-exhaust PM also agrees very well with results published in the literature.

Only 13 of the 30 cities analyzed could provide information on non-exhaust PM_{10} emissions. In these 13 cities, non-exhaust emissions are reported to represent between 40% and 50% of the total PM_{10} emissions. This may reflect the difficulty in estimating the non-exhaust contribution or perhaps a lack of awareness of the importance of non-exhaust emissions from traffic to PM_{10}. This is significant, because some of the mitigation methods applied, e.g. speed reduction, may be more effective for non-exhaust emissions than they are for other emissions.

The traffic contribution to NO_2 concentrations at traffic sites was found to be 10-20 $\mu g/m^3$ higher than at UB sites. The local traffic has a strong effect on its direct surroundings. For PM_{10}, however, the average local traffic increment to background concentrations in the studied cities amounts only to 2-5 $\mu g/m^3$.

Heavy duty total contributions to NO_x emissions are only 28% lower than light duty contributions, PM_{10} emissions are 79% lower, $PM_{2.5}$ emissions are 47% lower, and CO_2 emissions are 69% lower – even though heavy duty sources only make up 4% of the total traffic volume versus the light duty 96%.

As expected, road traffic is the main contributor to NO_2 concentrations in European cities. The cities are aware of that and mitigation measures to reduce the NO_x emission are already implemented or planned.

The most popular transport related actions and measures that have been **implemented** in the cities included promoting collective transport and promoting cycling (88% of cities), speed moderations and encouraging cleaner fuels/vehicles (84% of cities), and taking action on public fleets (75% of cities). However, the effectiveness of the measures implemented has not been assessed and is generally hard to assess, since the effect of measures and other outside influence overlap.

The cities expect an average of 5-10% **emissions reduction** for NO_x and PM_{10} between 2005 and 2010, as well as for the period 2005-2015. On the other hand, a reduction higher than 10% in average is expected for NMVOCs for the periods 2005-2010 and 2005-2015.The participation in this point of the study was very low, so that these figures should be regarded with caution.

The cities in general are rather **confident in complying** with EU air quality standards in 2015, while many are concerned about meeting the standards in 2010. Over the coming five years, they expect especially large improvements for the NO_2 concentrations to decrease. Also the prospects of the cities regarding the future PM_{10} and $PM_{2.5}$ situation are positive, with an increased percentage of expected compliance in 2015 compared to 2010.

Comparisons **between emissions and measures/standards** show that cities with high PM_{10} emissions or PM_{10} traffic contributions seem to be more aware of having problems meeting the EU air quality standards than cities with high NO_2 emissions/traffic contributions. Cities with lower than average NO_x emissions tend to have implemented a larger percentage of mitigation measures than cities with higher than average NO_x emissions. Also the selection of the most popular measures taken, differed between both groups (e.g. parking related measures, actions on public fleets).

As possible reasons for the low response rate to the survey, the elaborateness/extent of the survey should be named in the first instance. A lot of detailed information was asked to be collected, which probably involved contacting a larger amount of people within the cities' administrations (regarding transport, land use, air quality planning, etc.). In the most cases, one person per city was contacted by the study group.

Another potential reason is that the language of the survey (it was formulated in English for all 144 cities) may have been a barrier to get responses.

As an experience from this study some requirements for questionnaires became clear. When formulating questionnaires, the desired format of data to be filled in should be specified very explicitly, so that misunderstandings are avoided and all responses can be used. On the other hand, a questionnaire should not be too elaborate in order to not discourage the responsible persons to fill it in.

6 Uncertainties and Limitations

Many of the uncertainties in this study originate from the low sample size (see comments in Sections 3.2 and 5) for most parameters of the data-set, as well as many sub-items for each parameter not being comparable across all cities. These uncertainties are as follows:

- Several cities perform a very detailed source apportionment, differentiating between local or background traffic contributions, exhaust and non-exhaust contributions or between different vehicle types (e.g. LD, HD; passenger cars, lorries, motorbikes; etc) – other cities just publish one value called 'traffic', which may be local traffic or the sum of local and background or even regional contributions.
- The methods used by the cities in their source apportionment studies and their quality are to a large unknown for the data collected in this study. Where known, the used methods are included in the database. The questionnaire replies do not provide information regarding the assessment method applied, neither do the EC notifications. There is a need for a more standardized calculation of source apportionments in order to compare results Europe-wide.
- The source apportionment is often biased to polluted sites. As long as there are no exceedances in yearly averaged pollutant concentrations, no source apportionment is performed in most cases.
- For a few cities, information was collected from several different publications, basing on data from different years. This is noted in the database, but makes it hard to condense all this information into one consistent 'city profile'. The range of reference years considered covers years between 2004 and 2009.
- The meta data of the cities originates from different sources. It is often not made clear whether the population and area are valid only for the city or the greater urbanized (conglomerate) area. Especially for cities located at the coast, there are large differences between the official city area and the part of the area that is land.
- Measures extracted from action plans, clean air plans, or local transport plans may not be up-to-date, since some of these plans have been published several years ago. Moreover, it is often not clear from the plans whether measures are already implemented, planned or only envisioned. This has to be taken into account when evaluating the detailed mitigation measures table (Appendix D), in which it is marked whether the information comes from questionnaires or action plans. The discrimination of implemented and planned measures is most probably more reliable for those cities that have returned a filled-in questionnaire.
- There is a large number of different measures to be taken to improve air quality. Although the catalogue of measures in the questionnaire is very elaborate, many measures taken by individual cities do not fit in. Especially on the sector of parking related measures, cities tend to take different measures than suggested in the questionnaire.
- The measure 'adaptive speed control system' as a sub-point in 'speed moderation, traffic calming' has been marked as implemented, planned or envisioned in many questionnaires, but has hardly been found in action plans (or similar). Instead, traffic management systems, dynamical traffic steering (direction signs), dynamical car-park routing system are named in many action plans or clean air plans.

- Interesting regarding to which basis the cities expect to conform to the PM EU targets. Almost all of the cities that expect to have $PM_{2.5}$ below the target in 2010, do not even measure $PM_{2.5}$. They may expect it since they stay below the PM_{10} limit, but for some cities this does not apply. Many cities that measure $PM_{2.5}$ expect exceedance of the target value.
- The most complete questionnaire responses came from cities that are more active than average in their air quality management work. Possibly, cities less active in air quality management had less access to information and data and were therefore less inclined or not able to fulfill most of the city survey sections. These facts can have biased the data used as basis in this study.
- The assessment of road transport emissions has been carried out in different ways by the cities. While some did a rough estimate based on the vehicles' mileage and vehicle specific emission factors, others used emission modeling softwares. The years of assessment ranged between 2004 and 2008.

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OBS: The lack of bibliographic information for most of the clean air plans is due to the fact that the publishers of these reports obviously do not attach too great importance to stating, e.g. year of publication, report number, sometimes even author name, etc

Appendix A

Cities Survey

Survey Sheet 1 (Introduction):

Who are we?

The European Environment Agency (EEA) is a public body of the European Union.

Its core task is to provide sound, independent information on the environment.
It is a major information source for those involved in developing, adopting, implementing and evaluating environmental policy, and also the general public.

Currently, the EEA has 32 member countries.

To know more about the role and missions of the Agency, click on this cell.

To know more about the information that we provide on air quality, please click on this cell.

To know more about the information that we provide on transport & environment, please click on this cell.

The European Topic Centre on Air and Climate Change (ETC/ACC) assists the EEA in its support to EU policy in the field of air pollution and climate change.

The ETC/ACC is a consortium of European institutes contracting with the EEA.

To know more about the role and missions of the ETC/ACC, please click on this cell.

Our objectives

The objective of this short questionnaire is to collect data and information relevant to policy-making regarding:

** the contribution of transport activities to the air pollution in major European urban areas*

** the measures taken or planned to reduce transport contribution to urban air pollution in these areas.*

Intended use of the requested information

This survey is a good opportunity offered to European cities to share knowledge and experience on this issue through participation in this survey.

The sharing of information regarding the traffic contribution to urban air quality and measures taken will eventually give all cities in Europe valuable available information for planning activies to tackle their particular air quality issues.
The collected information will usefully complement information on air quality which is already available at EU level through the reporting obligations and available

databases (e.g. airbase).

It will help European policy makers have a better understanding of the impact of transport on urban air quality.
It will help the Agency play its role in making environmental information available to the public and in informing EU policy making processes.
It will in particular be helpful for the further development of EU policies on air quality, urban environment and urban mobility to name a few.
Assuming a sufficient quality and coverage of replies, the Agency intends to make the collected information publicly available through its reports and website.

Cities will be able to view which information have been reported by other cities in response to this survey.

Our approach

This questionnaire is addressed to the bodies in charge of assessing and/or managing air quality in the urban areas listed in the worksheet 'targeted urban areas'.

The targeted areas are amongst the 'larger urban zones' and the related 'cities' designated for the purpose of the Urban Audit.

Where relevant, the data are requested for both the 'city' and the whole 'larger urban zone' (=LUZ) including the city then.

To know more about the Urban Audit, please click on this cell.

Instructions to fulfil the questionnaire

For each City and LUZ, respondents are kindly requested to complete the following 4 worksheets inserted in this excel file :

** Worksheet 'Respondent' collecting details on the 'city' and contact persons in charge of replying to this questionnaire*

** worksheet 'Emissions profile' collecting information on transport emissions for some key pollutants*

** worksheet 'Air pollution problems' collecting information on the contribution of transport emissions to urban air pollution problems*
** worksheet 'Transport Actions' collecting information on the local measures implemented, planned or envisionned to reduce air pollution from transport*

Respondents are kindly requested to read the note written at the top of each worksheet which provides a summary of the requested information in the worksheet.

Only cells coloured in green have to be fulfilled.

If no information is available, respondents are requested to specify it by typing 'NI' in the corresponding cell.

If information is available but the value is zero, respondents are requested to specify it by typing the figure '0' in the corresponding cell. Where figures are requested, the format of the cell is set. Please do not change it. A dot '.' should separate the decimal part from the integer part of that figure.

In general, respondents are kindly requested to provide weblinks to public documents where more detailed information is available.

Adequate cells are devised to this aim.

Contact persons at EEA and ETC/ACC

Please send your replies and possible requests by e-mail to the below contact persons:

To: Scott RANDALL (sr@nilu.no), ETC/ACC project manager

Cc: David DELCAMPE (David.DELCAMPE@eea.europa.eu), EEA project manager

Deadline to respond

Please respond within 4 weeks from receipt of this questionnaire.

Survey Sheet 2 (Targeted Urban Areas):

Note
This worksheet displays for information the names of the urban zones targeted by this survey as well as the details of the persons who were sent this questionnaire. Therefore no particular information is requested here from the part of the respondents.

Country	Name of City/Larger Urban Zone	Contact
AT	Linz	alfred.luftensteiner@mag.linz.at
AT	Wien	tiz@m22.magwien.gv.at
BE	Antwerpen	jan.bel@stad.antwerpen.be
BE	Bruxelles / Brussel	msq@ibgebim.be
BE	Liège	lara.galetic@prov-liege.be
BG	Plovdiv	diana.vaneva@plovdiv.bg
BG	Sofia	b.borisov@sofia.bg
CH	Genève	francoise.dubas@etat.ge.ch
CH	Zürich	reto.lorenzi@vd.zh.ch
CZ	Brno	vanecek.martin@brno.cz
CZ	Ostrava	jdatinsky@mmo.cz
CZ	Praha	kazmukova@urm.mepnet.cz
DE	Aachen	elmar.wiezorek@mail.aachen.de
DE	Augsburg	alois.betz@augsburg.de
DE	Berlin	martin.lutz@senguv.verwalt-berlin.de
DE	Bielefeld	Martin.woermann@bielefeld.de
DE	Bonn	dieter.misterek@bonn.de
DE	Braunschweig	christiane.costabel@braunschweig.de
DE	Bremen	parfum@umwelt.bremen.de
DE	Chemnitz	Umweltamt@stadt-chemnitz.de
DE	Darmstadt	Birgitt.Kretzschmar@darmstadt.de
DE	Dresden	umweltamt@dresden.de
DE	Düsseldorf	werner.goertz@stadt.duesseldorf.de
DE	Erfurt	Umweltamt@erfurt.de
DE	Frankfurt am Main	klaus.wichert@stadt-frankfurt.de mathias.linder@stadt-frankfurt.de
DE	Freiburg im Breisgau	dieter.woerner@stadt.freiburg.de
DE	Göttingen	g.friedrich-braun@goettingen.de
DE	Halle an der Saale	uta.balleyer@halle.de
DE	Hamburg	gerald.boeckhoff@harburg.hamburg.de
DE	Hannover	umweltschutz@hannover-stadt.de
DE	Heidelberg	umweltschutz.heidelberg@heidelberg.de
DE	Heilbronn	Umweltamt@stadt-heilbronn.de
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DE	Köln	Ludwig.Arentz@stadt-koeln.de
DE	Leipzig	afritsch@leipzig.de
DE	Lübeck	Manfred.hellberg@luebeck.de
DE	Magdeburg	umweltamt@magdeburg.de
DE	Mannheim	Josef.krah@mannheim.de

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DE	Osnabrück	gerdts@osnabrueck.de
DE	Regensburg	schoernig.wolfgang@regensburg.de
DE	Saarbrücken	Elisabeth.streit@saarbruecken.de
DE	Stuttgart	u360000@stuttgart.de
DE	Ulm	k.schnaufer@ulm.de
DE	Wiesbaden	Joachim.Mengden@Wiesbaden.de
DK	Aalborg	msh-teknik@aalborg.dk
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DK	Odense	bt@odense.dk
EE	Tallinn	andres.harjo@tallinnlv.ee
ES	Barcelona	epla@bcn.cat
ES	Bilbao	fgv@ayto.bilbao.net
ES	Granada	jlcnvt@terra.es
ES	Madrid	dgsostenibilidadya21@munimadrid.es
ES	Málaga	jgordo@ayto-malaga.es
ES	Palma de Mallorca	transit@a-palma.es
ES	Sevilla	rgarcia.gobernacion@sevilla.org
ES	Valencia	atrafico@valencia.es
ES	Vigo	carmen.pintado@vigo.org
ES	Zaragoza	sertrafico@zaragoza.es
FI	Helsinki	jari.viinanen@hel.fi
FR	Bordeaux	airaq@airaq.asso.fr
FR	Clermont-Ferrand	contact@atmoauvergne.asso.fr
FR	Grenoble	contact@atmo-rhonealpes.org
FR	Lille	c.douget@atmo-npdc.fr
FR	Lyon	pcrepeaux@grandlyon.org FBouvier@atmo-rhonealpes.org
FR	Marseille	atmopaca@atmopaca.org
FR	Metz	aerfom@aerfom.org
FR	Montpellier	info@air-lr.org
FR	Nancy	airlor@airlor.org
FR	Nantes	geraldine.sorin@nantesmetropole.fr
FR	Nice	contact@airpl.org
FR	Paris	webmaster@airparif.asso.fr
FR	Rennes	air.breizh@wanadoo.fr
FR	Rouen	contact@airnormand.fr
FR	Strasbourg	aspa@atmo-alsace.net
FR	Toulouse	contact@oramip.org
GR	Thessaloniki	municipality@thessalonikicity.gr
HR	Zagreb	zvonimir.sostar@zagreb.hr
HU	Budapest	SzmereV@Budapest.hu
IE	Dublin	martin.fitzpatrick@dublincity.ie
IT	Bologna	fabio.cartolano@comune.bologna.it
IT	Brescia	ggangi@comune.brescia.it
IT	Catania	marcello.messina@provincia.ct.it
IT	Firenze	assllpp@comune.fi.it
IT	Genova	mmastretta@comune.genova.it

IT	Milano	aldo.pozzoli@comune.milano.it
IT	Napoli	gdeangelis@provincia.napoli.it
IT	Padova	marescottia@comune.padova.it
IT	Palermo	t.zingale@nis.comune.palermo.it
IT	Roma	fabio.nussio@atac.roma.it
IT	Torino	segreteria.sindaco@comune.torino.it
IT	Venezia	relazioni.internazionali@comune.venezia.it
IT	Verona	arnaldo_vecchietti@comune.verona.it
LT	Kaunas	rutaa@kaunas.sav.lt
LT	Vilnius	diana.paliukeniene@vilnius.lt
LU	Luxembourg	estreitz@vdl.lu
LV	Riga	dominika_hasinska@um.poznan.pl
NL	Amsterdam	n.frederiks@dmb.amsterdam.nl
NL	Rotterdam	b.verhoek@dsv.rotterdam.nl
NL	Utrecht	p.segaar@utrecht.nl
NO	Oslo	bente.gussias@sam.oslo.kommune.no jim.greatorex@fri.oslo.kommune.no
PL	Bialystok	jturowska@um.bialystok.pl
PL	Bydgoszcz	ewa.slowinska@um.bydgoszcz.pl
PL	Gdansk	rie2@gdansk.gda.pl
PL	Katowice-Zory	prezydent@um.katowice.pl
PL	Kraków	zwolinto@um.krakow.pl
PL	Lódz	a.mioduszewska@uml.lodz.pl
PL	Poznan	dominika_hasinska@um.poznan.pl
PL	Warszawa	sszweycer@warszawa.um.gov.pl
PL	Wroclaw	jaroslaw.obremski@um.wroc.pl
PT	Lisboa	dca@cm-lisboa.pt
PT	Porto	dmri@cm-porto.pt
RO	Bucuresti	adrian.dorogan@bucuresti-primaria.ro
SE	Göteborg	lisa.sundell@trafikkontoret.goteborg.se
SE	Malmö	stina.nilsson@malmo.se
SE	Stockholm	tage.jonson@miljo.stockholm.se larsb@slb.nu christer@slb.nu
SI	Ljubljana	zdenka.simonovic@ljubljana.si
SK	Bratislava	odp@bratislava.sk
UK	Aberdeen	mbochel@aberdeencity.gov.uk
UK	Belfast	jamiesona@belfastcity.gov.uk
UK	Birmingham	Sandy.Taylor@birmingham.gov.uk
UK	Bournemouth	richard.barnes@bournemouth.gov.uk
UK	Bradford-Leeds	brian.anderson@bradford.gov.uk
UK	Bristol	david.muir@bristol.gov.uk
UK	Cardiff	cojones@cardiff.gov.uk
UK	Coventry	jaz.somal@coventry.gov.uk
UK	Edinburgh	marshall.poulton@edinburgh.gov.uk
UK	Glasgow	Laura.Lambert@glasgow.gov.uk
UK	Kingston-upon-Hull	graham.hall@hullcc.gov.uk
UK	Leicester	jolanta.obszynska@leicester.gov.uk
UK	Liverpool	williamgood@liverpool.gov.uk
UK	London	Lucy.Parkin@london.gov.uk
UK	Manchester	r.lewis@manchester.gov.uk
UK	Newcastle upon Tyne	edwin.t.foster@newcastle.gov.uk

UK	Nottingham	richard.taylor@nottinghamcity.gov.uk
UK	Portsmouth	amanda.morris@portsmouthcc.gov.uk
UK	Sheffield	ogo.osammor@sheffield.gov.fr
UK	Stockton-on-Tees	rob.farnham@stockton.gov.uk
UK	Stoke-on-Trent	john.nichol@stoke.gov.uk

Survey Sheet 3 (Respondents):

Note
This worksheet provides basic contact information on the individual(s) who replied to this questionnaire.

Name of Large Urban Zone (see worksheet 'targeted urban areas')	

contact person 1	
Name of responding organization	
Website of responding organization	
Name of contact person	
Title of contact person	
telephone of contact person	
e-mail of contact person	

contact person 2	
Name of responding organization	
Website of responding organization	
Name of contact person	
Title of contact person	
telephone of contact person	
e-mail of contact person	

contact person 3	
Name of responding organization	
Website of responding organization	
Name of contact person	
Title of contact person	
telephone of contact person	
e-mail of contact person	

contact person 4	
Name of responding organization	
Website of responding organization	
Name of contact person	
Title of contact person	
telephone of contact person	
e-mail of contact person	

Survey Sheet 4 (Transport and Emissions Profile):

Note
In this worksheet, we request information on transport activities and emissions from roads and railways with a view to assessir emissions. This information is usually derived from transport emissions local inventories. Information on air transport emissions available.

Annual transport volumes

road vehicles x km per year	City	LUZ
Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles		
Buses and coaches		
Heavy Goods Vehicles		
Bicycles and tricycles		
Moppeds and motorbikes		

passengers x km per year	City	LUZ
Passenger Cars (inc. SUVs and taxis)		
Buses and coaches		
Railways		
Boats and ships		
Bicycles and tricycles		
Moppeds and motorbikes		

tons x km per year	City	LUZ
Light Commercial Vehicles		
Heavy Goods Vehicles		
Boats and ships		
Bicycles and tricycles		
Moppeds and motorbikes		

Annual emissions from overall ROAD sources ↓

tons (left column) of pollutant per year and % (right column) of total emissions (= mobile + stationary sources)

	City		LUZ	
NO_x				
PM_{10}				
$PM_{2.5}$				
CO_2				
NMVOC				
PAH				
Benzene				
Benzo-a-Pyrene				

NOx emissions per category of motor vehicle in tons per year

	City	LUZ
Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles		
Buses and coaches		
Heavy Goods Vehicles		
Moppeds and motorbikes		

PM_{10} emissions per category of vehicle in tons per year

exhaust emissions	City	LUZ	*non-exhaust emissions*	City	LUZ
Passenger Cars (inc. SUVs and taxis)			Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles			Light Commercial Vehicles		
Buses and coaches			Buses and coaches		
Heavy Goods Vehicles			Heavy Goods Vehicles		
Moppeds and motorbikes			Moppeds and motorbikes		

$PM_{2.5}$ emissions per category of vehicle in tons per year

exhaust emissions	City	LUZ	*non-exhaust emissions*	City	LUZ
Passenger Cars (inc. SUVs and taxis)			Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles			Light Commercial Vehicles		
Buses and coaches			Buses and coaches		
Heavy Goods Vehicles			Heavy Goods Vehicles		
Moppeds and motorbikes			Moppeds and motorbikes		

NMVOC emissions per category of vehicle in tons per year

	City	LUZ
Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles		
Buses and coaches		
Heavy Goods Vehicles		
Moppeds and motorbikes		

PAH emissions per category of vehicle in tons per year

	City	LUZ
Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles		
Buses and coaches		
Heavy Goods Vehicles		
Moppeds and motorbikes		

Benzene emissions per category of vehicle in tons per year

	City	LUZ
Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles		
Buses and coaches		
Heavy Goods Vehicles		
Moppeds and motorbikes		

Benzo-a-Pyrene emissions per category of vehicle in tons per year		
	City	LUZ
Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles		
Buses and coaches		
Heavy Goods Vehicles		
Moppeds and motorbikes		

CO_2 emissions per category of vehicle in tons per year		
	City	LUZ
Passenger Cars (inc. SUVs and taxis)		
Light Commercial Vehicles		
Buses and coaches		
Heavy Goods Vehicles		
Mopped and motorbikes		

Annual exhaust emissions from overall RAIL sources

tons (left column) of pollutant per year and % (right column) of total emissions including mobile and fixed sources

	City		LUZ	
NOx				
PM_{10}				
$PM_{2.5}$				
CO_2				
NMVOC				
PAH				
Benzene				
Benzo-a-Pyrene				

Methodology used for calculation of emissions	

Year of calculation of emissions	

Weblinks providing further details	

Further comments may be provided below

Survey Sheet 5 (Air Pollution Problems):

Note

The below questions intend to catch key information with regard to exceedances of EU air quality standards at traffic sites for sor
on the relative weight of traffic contribution in the concentrations assessed both at traffic sites and at urban background sites. Th

Air Pollution Exceedances ↓

NO_2 exceedances at traffic sites

% of traffic stations (left column) and % of total road network length (right column) where EU **annual limit value of 40µg/m^3 (by 2010)** is exceeded

year	City		LUZ	
2007				
2008				

% of traffic stations (left column) and % of total road network length (right column) where EU **hourly limit value of 200µg/m^3 (by 2010)** is exceeded

year	City		LUZ	
2007				
2008				

PM_{10} exceedances at traffic sites

% of traffic stations (left column) and % of total road network length (right column) where EU **annual limit value of 40µg/m^3 (by 2005)** is exceeded

year	City		LUZ	
2007				
2008				

% of traffic stations (left column) and % of total road network length (right column) where EU **daily (24 hours) limit value of 50µg/m^3 (by 2005)** is exceeded

year	City		LUZ	
2007				
2008				

$PM_{2.5}$ exceedances at traffic sites

% of traffic stations (left column) and % of total road network length (right column) where EU **annual standard of 25µg/m^3 (target by 2010, limit by 2015)** is exceeded

year	City		LUZ	
2007				
2008				

Benzene exceedances at traffic sites

% of traffic stations (left column) and % of total road network length (right column) where EU **annual limit value of 5µg/m³ (by 2010)** is exceeded

year	City		LUZ	
2007				
2008				

Benzo-a-Pyrene exceedances at traffic sites

% of traffic stations (left column) and % of total road network length (right column) where EU **annual target value of 1ng/m³ (by 2012)** is exceeded

year	City		LUZ	
2007				
2008				

Contributions of road traffic emissions to urban air quality

Min and Max contributions (in % of total annual concentration, and amount of total annual concentration) of OVERALL road traffic emissions at traffic and urban background sites

▼ ▼

NO_2	City		LUZ		City		LUZ	
	%min	%max	%min	%max	min	max	min	max
traffic sites								
urban background sites								

PM_{10}	City		LUZ		City		LUZ	
	%min	%max	%min	%max	min	max	min	max
traffic sites								
urban background sites								

$PM_{2.5}$	City		LUZ		City		LUZ	
	%min	%max	%min	%max	min	max	min	max
traffic sites								
urban background sites								

Benzene	City		LUZ		City		LUZ	
	%min	%max	%min	%max	min	max	min	max
traffic sites								
urban background sites								

Benzo-a-Pyrene	City		LUZ		City		LUZ	
	%min	%max	%min	%max	min	max	min	max
traffic sites								
urban background sites								

Weblinks providing further details ⍰	

Further comments may be provided below ⍰

Survey Sheet 6 (Transport Actions):

Note

In this worksheet, you are kindly asked to provide us with information on the transport related measures aiming to reduce the contribution of urban mobility to air pollution in your city and larger urban zone. We are looking for information on implemented and planned actions/measures, i.e. those publicized in air quality or urban mobility/transport plans, programmes or strategies. And we are also interested by the envisioned actions, i.e. those which have not formally been adopted yet but which are being considered or analyzed. Information on impacts of the measures regarding emissions and air quality are also most welcome. We are very grateful in anticipation for any weblinks that can provide further details on the planned or envisioned actions. The right side text box 'Short description of the measures' enables you to provide us with further clarifications wherever you believe it useful in order to avoid misinterpretations of your information on actions.

	YES or NO
Have targets on reduction of emissions from transport been set?	
for emissions in the City?	
for emissions in the LUZ?	
for CO_2?	
for NO_x?	
for PM_{10}?	
for $PM_{2.5}$?	
for NMVOC?	
for PAH?	
for benzene?	
for benzo-a-pyrene?	

Transport related actions and measures

*Please type **X** in appropriate green cell if the measure is implemented, planned or envisioned*

	Implemented	Planned	Envisioned	Short description of the measures
Road access restrictions?				
applying to passenger cars				
applying to light commercial vehicles				
applying to heavy goods vehicles				
applying to buses coaches				
applying to motorbikes or moppeds				
based upon emissions of vehicles				
other (please explain in the text box 'short description of the measures')				

	Implemented	Planned	Envisioned	Short description of the measures
Road charges or tolls?				
applying to passenger cars				
applying to light commercial vehicles				
applying to heavy goods vehicles				
applying to buses coaches				
applying to motorbikes or moppeds				

differentiated according to emissions of vehicles				
other (please explain in the text box 'short description of the measures')				

Speed moderation, traffic calming?				Short description of the measures ⍰
zones 10, 20, 30 km/h				
traffic light coordination				
adaptative speed control systems				
automatic detection and sanction of speeding				
other (please explain in the text box 'short description of the measures')				

Parking related measures?				Short description of the measures ⍰
parking restrictions for most polluting vehicles				
parking restrictions for commuters				
parking fees differentiated according to emissions				
standards limiting parking supply in new buildings				
other (please explain in the text box 'short description of the measures')				

Promoting collective transport?				Short description of the measures ⍰
setting targets on increasing public transport modal share				
densification and extension of network				
increasing frequency				
increasing speed (right of way, dedicated lanes)				
improving comfort (stops, stations, vehicles)				
improving security				
improving passengers information				
improving ticketing systems				
developing demand responsive collective transport				
other (please explain in the text box 'short description of the measures')				

Taking action on public fleets?				Short description of the measures ⍰
setting emission standards for purchase of new vehicles				
setting emission standards for rental of vehicles				
setting standards for transport fuels used in public fleets				
inspection of emissions and maintainance programme				
other (please explain in the text box 'short description of the measures')				

Encouraging cleaner fuels and vehicles?				Short description of the measures ⍰
Economic incentives for cleaner vehicles and fuels				
Developing facilities for electric vehicles				
Developing facilities for hydrogen vehicles				
Developing facilities for biofuels				
Developing facilities for CNG vehicles				
Inspecting emissions of vehicles				

Retrofitting scheme for most polluting vehicles				
Raising public awareness on cleaner fuels and vehicles				
Setting up demonstration projects				
promoting use of cleaner taxis				
promoting use of cleaner buses and coaches				
promoting use of cleaner vehicles for deliveries				
other (please explain in the text box 'short description of the measures')				

Landuse measures intending to limit car dependency?				Short description of the measures
controlling land prices with a view to limiting suburban sprawl				
setting urban density standards to avoid low density extensions				
orienting new housing and offices along railway corridors and cycling network				
making urban extensions conditional to access to public transport and cycling network				
favouring compact and dense urban forms				
planning car free housing areas				
other (please explain in the text box 'short description of the measures')				

Travel plans with a view to reducing private car use?				Short description of the measures
promoting travel plans for schools				
promoting travel plans for work places				
other (please explain in the text box 'short description of the measures')				

Flexible innovative and demand responsive transport systems?				Short description of the measures
car sharing				
van pooling				
collective taxis, taxi-buses				
vélo-taxis				
other (please explain in the text box 'short description of the measures')				

Promoting cycling?				Short description of the measures
setting targets on increasing cycling modal share				
densifying and extending the cycling network and improving continuity				
making road crossings safer for cyclists				
providing parking areas and facilities for bikes				
setting up bike sharing scheme				
reallocation of road space to cycling lanes and tracks				
promoting cycling at schools				
promoting cycling at work places				
other (please explain in the text box 'short description of the measures')				

Promoting walking?				Short description of the measures
setting quantitative targets aiming to increase walking modal share				

densifying and extending walking network and improving continuity			
making road crossings safer for walkers			
reallocation of road space to walking paths and strolling zones			
promoting walking at schools			
promoting walking at work places			
other (please explain in the text box 'short description of the measures')			

Taking actions on urban freight and logistics?				Short description of the measures ⍰
promoting round deliveries instead of parallel deliveries to reduce last miles				
setting up 'nearby deliveries areas'				
solutions and standards aiming to maximize loading of vehicles and avoid empty journeys				
setting up green logistics centres aiming to coordinate deliveries and limit miles				
other (please explain in the text box 'short description of the measures')				

Providing advice to the public on sustainable urban mobility solutions?				Short description of the measures ⍰

Other type of implemented/planned/envisioned measures? Please list them below ⍰				Short description of the measures ⍰

Weblinks providing further details on actions and measures ⍰	

Impact assessment and prognosis

	YES or NO
	⍰
Have impacts of transport measures been assessed (ex ante)?	

Please specify below the expected intervals of emissions reduction : < 0%; [0 - 5%];]5 - 10%]; > 10%	
	⍰
Between 2005 and 2010	
CO_2	
NOx	
PM_{10}	
$PM_{2.5}$	
NMVOC	
PAH	
Between 2005 and 2015	
CO_2	
NOx	
PM_{10}	
$PM_{2.5}$	
NMVOC	
PAH	

	YES or NO
Are following EU standards expected to be met in **2010**?	⍰
NO2 annual limit value (40µg/m3 by 2010)	
NO2 hourly limit value (200µg/m3 by 2010)	
PM10 daily limit value (50µg/m3 by 2005)	
PM10 annual limit value (40µg/m3 by 2005)	
PM2.5 annual target value (25µg/m3 by 2010)	
Benzene annual limit value (5µg/m3 by 2010)	
Benzo-a-Pyrene annual target value (1ng/m3 by 2012)	

	YES or NO
Are following EU standards expected to be met in **2015**?	⍰
NO2 annual limit value (40µg/m3 by 2010)	
NO2 hourly limit value (200µg/m3 by 2010)	
PM10 daily limit value (50µg/m3 by 2005)	
PM10 annual limit value (40µg/m3 by 2005)	

PM2.5 annual limit value (25µg/m3 by 2015)	
Benzene annual limit value (5µg/m3 by 2010)	
Benzo-a-Pyrene annual target value (1ng/m3 by 2012)	

Weblinks providing more information on expected impacts	

Appendix B

City Profile Data Overview

Country	City	Survey*			Database (Literature Search)		Profile
		Transp&Emiss (4)**	Air Poll Probl (5)**	Transp Actions (6)**	Source apportionment	Mitigation measures	Created
AT	Linz						
AT	Wien	Partly	Partly	Partly			yes
BE	Antwerpen						
BE	Bruxelles / Brussels	Yes	Yes	Yes			yes
BE	Liège						
BG	Plovdiv						
BG	Sofia						
CH	Genève	Partly	Partly	Yes			yes
CH	Zürich						
CZ	Brno	Partly	Partly	Yes			yes
CZ	Ostrava						
CZ	Praha		Partly	Yes			yes
DE	Aachen				PM10, NO2, 1 site	3 measures (NO2, PM10)	yes
DE	Augsburg				PM10, NO2, 2 sites	3 measures (PM10, NO2)	yes
DE	Berlin				PM10, NO2, 1 site	3 measures (PM10, NO2)	yes
DE	Bielefeld						
DE	Bonn				PM10, NO2	Yes	yes
DE	Braunschweig				PM10, NO2	Yes	yes
DE	Bremen		Little/Partly	Partly		2 measures (PM10)	yes
DE	Chemnitz				PM2.5, PM10, NOx, 3 sites	1 measure (effect not quantified)	yes
DE	Darmstadt					Yes	yes
DE	Dresden						
DE	Düsseldorf					1 measure (PM10)	
DE	Erfurt				PM2.5, 2 sites		yes
DE	Frankfurt am Main	Partly	Partly	Yes			yes
DE	Freiburg im Breisgau				PM10, NO2, 2 sites		yes
DE	Göttingen						
DE	Halle an der Saale						
DE	Hamburg				NO2		yes
DE	Hannover					1 measure (PM10)	
DE	Heidelberg						
DE	Heilbronn				PM10, NO2, 2 sites	1 measure (NO2, PM10)	yes
DE	Ingolstadt						
DE	Karlsruhe				PM10, NO2, 2 sites	3 measures (PM10, NO2)	yes
DE	Kassel						
DE	Kiel						
DE	Köln						
DE	Leipzig						
DE	Lübeck						
DE	Magdeburg						
DE	Mannheim				PM10, NO2, 1 site		yes

		Survey*			Database (Literature Search)		Profile
Country	City	Transp&Emiss (4)**	Air Poll Probl (5)**	Transp Actions (6)**	Source apportionment	Mitigation measures	Created
DE	München				PM10, NO2, 5 sites	3 measures (NO2, PM10, C6H6)	yes
DE	Münster				PM10, NO2, 5 sites	1 measure (NO2)	yes
DE	Nürnberg					1 measure (NO2, CO, HC)	
DE	Osnabrück				PM10, NO2, 1 site		yes
DE	Regensburg						
DE	Saarbrücken						
DE	Stuttgart	Yes	Yes	Yes	PM10, NO2, 3 sites	4 measures (PM10, NO2)	yes
DE	Ulm				PM10, NO2, 1 site		yes
DE	Wiesbaden						
DK	Aalborg						
DK	København					1 measure (PM2.5, PM10, NO2)	
DK	Odense						
EE	Tallinn						
ES	Barcelona	Partly		Partly	PM2.5, PM10, 2 sites		yes
ES	Bilbao						
ES	Granada						
ES	Madrid	Yes	Little	Yes	PM10, 1 site		yes
ES	Málaga						
ES	Palma de Mallorca						
ES	Sevilla						
ES	Valencia						
ES	Vigo						
ES	Zaragoza						
FI	Helsinki	Yes	Yes	Yes	PM2.5, 2 sites	2 measures (NO2, PM10)	yes
FR	Bordeaux	Little/partly	Little				yes
FR	Clermont-Ferrand		Partly				yes
FR	Grenoble	Yes	Partly	Yes			yes
FR	Lille						
FR	Lyon	Yes	Partly	Yes			yes
FR	Marseille	Yes	Partly				yes
FR	Metz						
FR	Montpellier						
FR	Nancy						
FR	Nantes	Partly	Little	Yes			yes
FR	Nice	Yes	Partly				yes
FR	Paris						
FR	Rennes						
FR	Rouen						
FR	Strasbourg					2 measures (O3)	
FR	Toulouse						
GR	Thessaloniki				PM3, PM10, 4 sites		yes
HR	Zagreb						

Country	City	Survey*			Database (Literature Search)		Profile
		Transp&Emiss (4)**	Air Poll Probl (5)**	Transp Actions (6)**	Source apportionment	Mitigation measures	Created
HU	Budapest						
IE	Dublin						
IT	Bologna						
IT	Brescia						
IT	Catania						
IT	Firenze				PM1, 1 site		
IT	Genova				PM1, PM2.5, PM10, 3 sites		yes
IT	Milano				PM2.5, PM10, 3 sites	2 measures	yes
IT	Napoli						
IT	Padova						
IT	Palermo						
IT	Roma				PM2.5, PM10, 2 sites		yes
IT	Torino						
IT	Venezia				PM10, 1 site		
IT	Verona						
LT	Kaunas						
LT	Vilnius						
LU	Luxembourg						
LV	Riga						
NL	Amsterdam				PM2.5, 1 site		yes
NL	Rotterdam	Partly	Little	Yes		1 measure (NO2, PM10)	yes
NL	Utrecht						
NO	Oslo	Yes	Little	Yes		4 measures (PM10, NO2)	yes
PL	Bialystok						
PL	Bydgoszcz						
PL	Gdansk						
PL	Katowice-Zory						
PL	Kraków						
PL	Lódz				PM10, NO2		yes
PL	Poznan						
PL	Warszawa						
PL	Wroclaw						
PT	Lisboa				PM2.5, 2 sites		yes
PT	Porto						
RO	Bucuresti						
SE	Göteborg					4 measures (PM10, NOx, HC, CO)	
SE	Malmö		Yes	Yes		1 measure (effect not quantified)	yes
SE	Stockholm	Yes	Yes	Yes	PM10, 2 sites	1 measure (NO2, PM0.2)	yes
SI	Ljubljana						
SK	Bratislava						
UK	Aberdeen						

Country	City	Survey*			Database (Literature Search)		Profile
		Transp&Emiss (4)**	Air Poll Probl (5)**	Transp Actions (6)**	Source apportionment	Mitigation measures	Created
UK	Belfast						
UK	Birmingham				PM10, 3 sites		
UK	Bournemouth						
UK	Bradford-Leeds						
UK	Bristol					1 measure (effect not quantified)	yes
UK	Cardiff						
UK	Coventry						
UK	Edinburgh				PM2.5, PM10, 1 site		yes
UK	Glasgow						
UK	Kingston-upon-Hull						
UK	Leicester						
UK	Liverpool						
UK	London				PM10, 1 site	3 measures (PM10, NO2)	yes
UK	Manchester						
UK	Newcastle upon Tyne						
UK	Nottingham						
UK	Portsmouth						
UK	Sheffield						
UK	Stockton-on-Tees						
UK	Stoke-on-Trent						
	Sub-total	**18**	**21**	**18**	**33**	**27**	**49**
		Total 22			**Total 45**		**Total 49**

**Blank cells signify that no information was received for this section from the survey*
***Number in parenthesis signifies the sheet number from the city survey.*

Appendix C

City Profiles

General Information (to obtain from database)

City	Aachen
Country	Germany
Latitude (°N)	50,776
Longitude (°E)	6,084
Population	251000
Area (km2)	161
Site character	Located in almost closed basin; Low wind speeds, inversions

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	1,29E+09	92 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,12E+08	8 %	(heavy goods vehicles, incl. buses, coaches)
Total	1,40E+09		

(Information valid for *City* 2006)

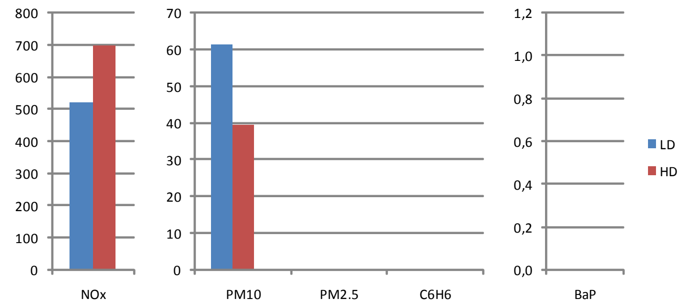
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	522	699		
PM10	62	40		
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air p* 2006)

Assessment year

Pollutants available NOx PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

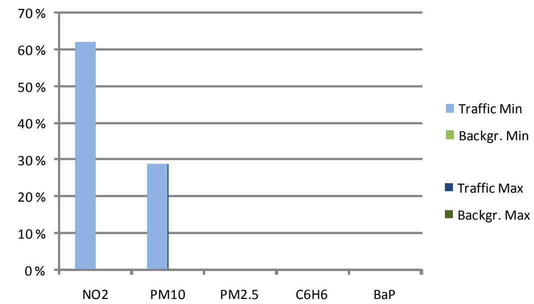
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	62 %	62 %		
PM10	29 %	29 %		
PM2.5				
C6H6				
BaP				

(Information from *database*)

Assessment year

Pollutants available NO2 PM10

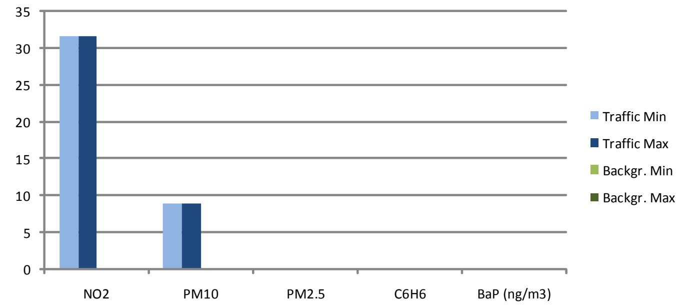
Traffic stations	1
Background stations	0



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	31,6	31,6		
PM10	9,0	9,0		
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			x
Road charges or tolls			
Speed moderation, traffic calming		x	
Parking related measures		x	
Promoting collective transport	x	x	
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency		x	
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x	x	
Promoting walking		x	
Taking actions on urban freight and logistics	x		

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	> 10%	
PM10	> 10%	
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit	Y		40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Amsterdam
Country	Netherlands
Latitude (°N)	52,373
Longitude (°E)	4,892
Population	727000
Area (km2)	220
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

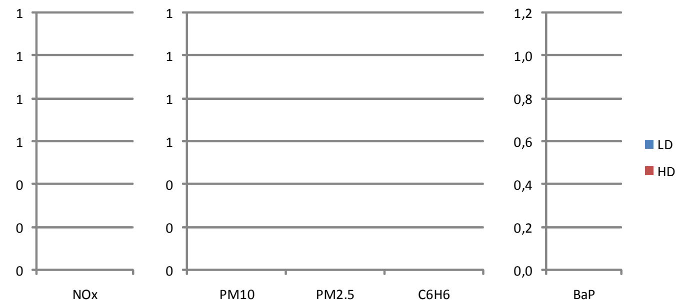
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

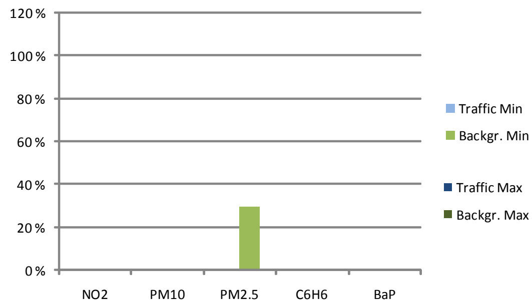
Contributions of road traffic to pollutant concentrations in city

	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2					
PM10					
PM2.5			30 %		
C6H6					
BaP					

(Information from *database*)

Assessment year Nov 1998 - Jun 1999

Pollutants available PM2.5

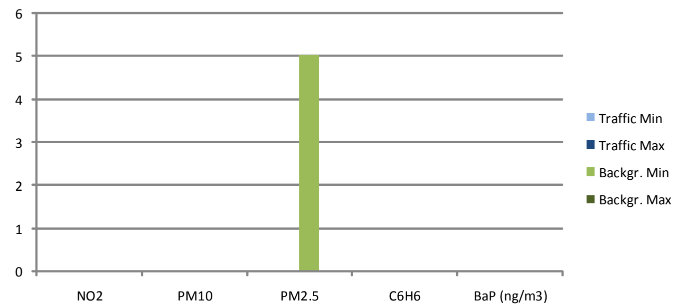


Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

Traffic stations	0
Background stations	1

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5			5,0	
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions		x	
Road charges or tolls			
Speed moderation, traffic calming		x	
Parking related measures	x		
Promoting collective transport			
Taking action on public fleets		x	
Encouraging cleaner fuels and vehicles	x	x	
Landuse measures intending to limit car dependency		x	
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling	x	x	
Promoting walking	x		
Taking actions on urban freight and logistics	x		

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	15 %	
PM10	15 %	
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Augsburg
Country	Germany
Latitude (°N)	48,369
Longitude (°E)	10,898
Population	275000
Area (km2)	150
Site character	Unfavourable mixing conditions under low wind speed NE-erly directions (occ. frequ. ca 13%)

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

Annual emissions from road sources (tons per year)

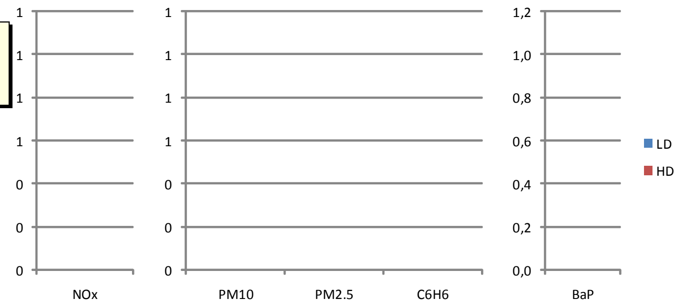
	LD	HD	N-Ex	Total
NOx				816
PM10				30
PM2.5				
C6H6				44
BaP				
CO2				

only NO2 fraction

(Information from *clean air plan*)

Assessment year 2000

Pollutants available		
	SO2	NO2
	CO	NMVOC
	PM	PM10
	Soot	C6H6
	N2O	NH3



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

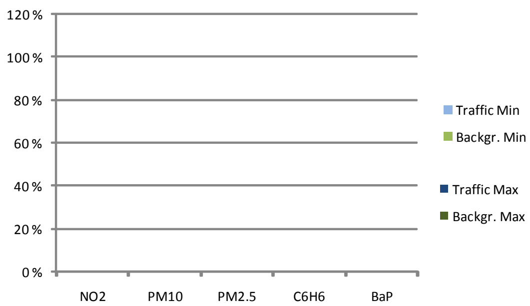
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. M	Traff N-E
NO2					
PM10					
PM2.5					
C6H6					
BaP					

(Information from)

Assessment year

Pollutants available

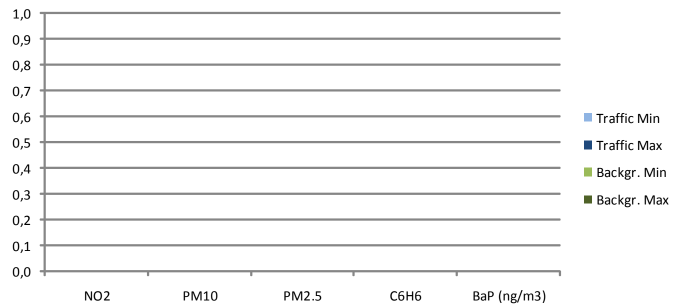
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Barcelona
Country	Spain
Latitude (°N)	41,382
Longitude (°E)	2,168
Population	1600000
Area (km2)	100
Site character	located in flat coastal area between Collserola range (500 m) and Mediterranean Sea

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	2,48E+10	90 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	2,85E+09	10 %	(heavy goods vehicles, incl. buses, coaches)
Total	2,76E+10		

(Information valid for *LUZ* 2006)

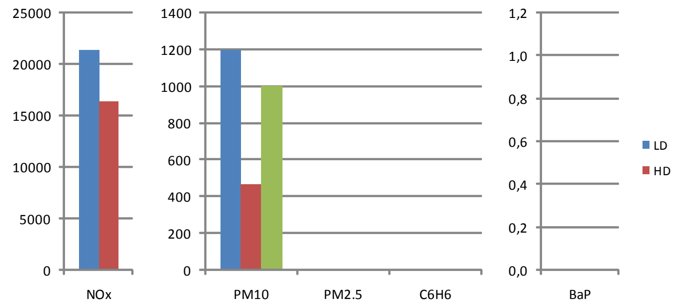
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total	
NOx	21376	16451			
PM10	1200	469	1007		
PM2.5					
C6H6					
BaP					
CO2	5040192	1662881			6703073

(Information from *questionnaire*)

Assessment year 2006

Pollutants available NOx
PM10
CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

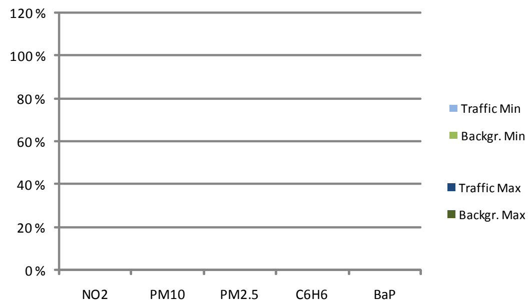
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

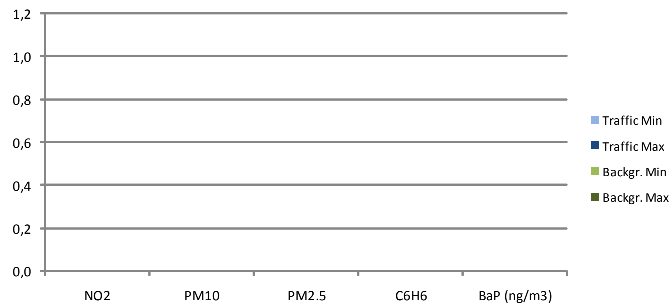
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls		x	
Speed moderation, traffic calming	x	x	
Parking related measures			x
Promoting collective transport	x	x	
Taking action on public fleets		x	
Encouraging cleaner fuels and vehicles	x	x	x
Landuse measures intending to limit car dependency	x	x	x
Travel plans with a view to reducing private car use	x	x	
Flexible innovative and demand responsive transport systems	x		x
Promoting cycling	x	x	
Promoting walking	x	x	
Taking actions on urban freight and logistics			x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Berlin
Country	Germany
Latitude (°N)	52,518
Longitude (°E)	13,376
Population	3400000
Area (km2)	892
Site character	No special topographic features; Frequent temperature inversions in winter

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	1,15E+10	94 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	5,80E+08	5 %	(heavy goods vehicles, incl. buses, coaches)
Total	1,22E+10		

(Information valid for *City* 1993)

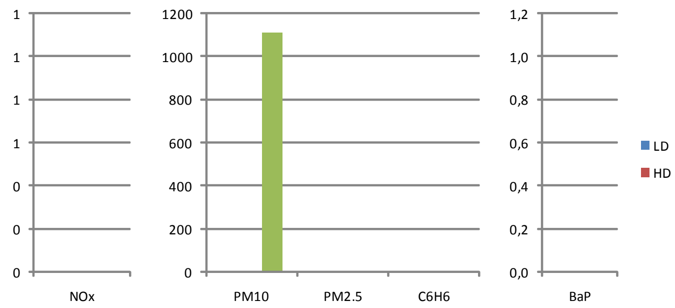
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				8876
PM10			1113	311
PM2.5				
C6H6				
BaP				
CO2				

(Information from *database*)

Assessment year

Pollutants available NOx
PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

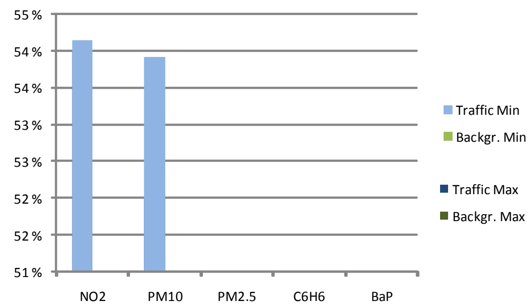
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	54 %	54 %			
PM10	50 %	52 %			22 %
PM2.5					
C6H6					
BaP					

(Information from *database* 2002)
1998

Assessment year

Pollutants available NO2
PM10

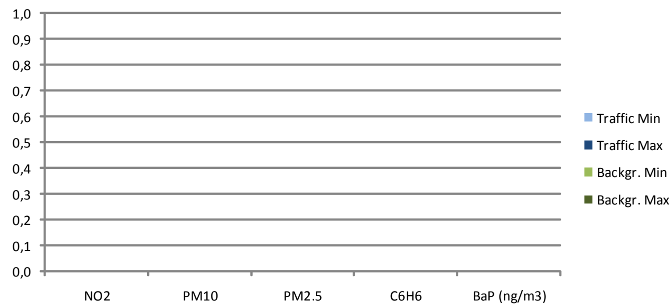
Traffic stations	1
Background stations	0



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	> 10%	
PM10	5-10%	
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit	Y		40 µg/m3 by 2005
Daily PM10 limit	N		50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Bonn
Country	Germany
Latitude (°N)	50,733
Longitude (°E)	7,085
Population	315000
Area (km2)	141
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	1,48E+09	95 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	7,30E+07	5 %	(heavy goods vehicles, incl. buses, coaches)
Total	1,56E+09		

(Information valid for *City* 2006)

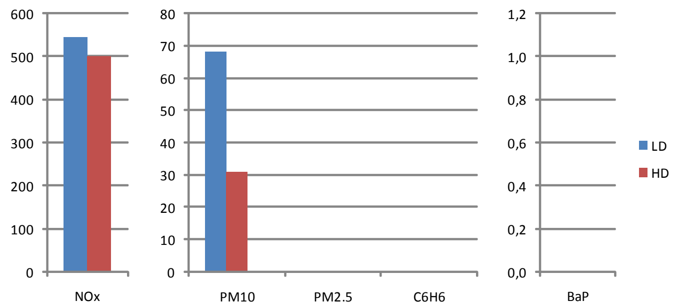
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	545	500		
PM10	68	31		
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air plan*)

Assessment year 2006

Pollutants available NOx, PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

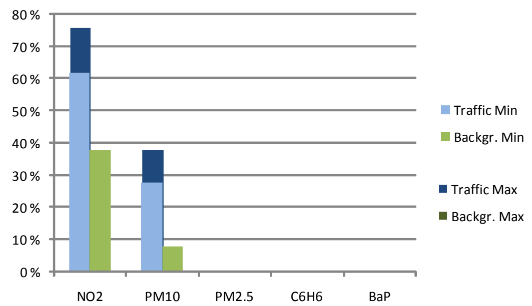
	percental				
	Traffic Mir	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	62 %	76 %	38 %		
PM10	28 %	38 %	8 %		
PM2.5					
C6H6					
BaP					

(Information from *clean air plan*)

Assessment year 2006

Pollutants available PM10, NO2

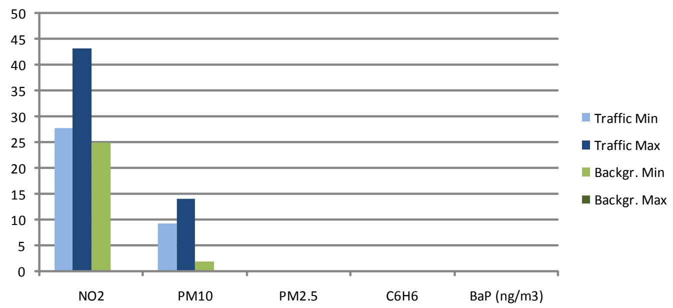
Traffic stations	2
Background stations	1



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mir	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	27,9	43,3	25,0	
PM10	9,2	14,1	2,0	
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *clean air plan*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions		x	x
Road charges or tolls			
Speed moderation, traffic calming	x	x	
Parking related measures	x		
Promoting collective transport		x	
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles		x	
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x		
Promoting walking			x
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10	5-10%	
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit	Y		40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Bordeaux
Country	France
Latitude (°N)	44,838
Longitude (°E)	0,579
Population	250000
Area (km2)	50
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for *City*)

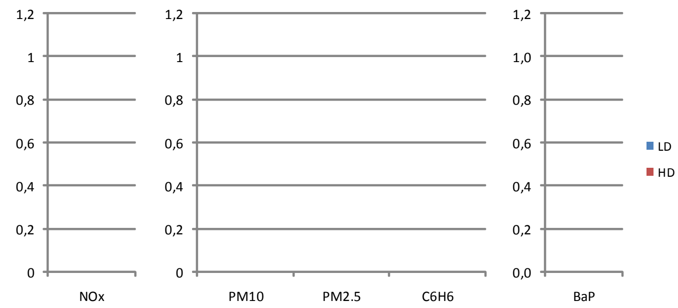
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total	
NOx				6996	
PM10				446	
PM2.5					
C6H6					
BaP					
CO2				1801092	1801092

(Information from *database*)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

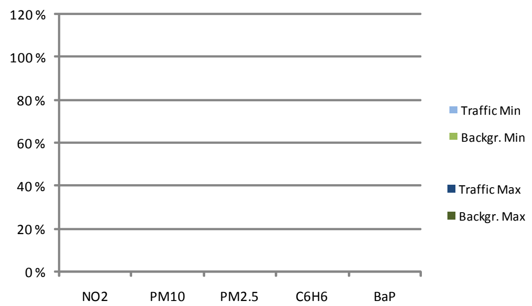
	percental			
	Traffic Min	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

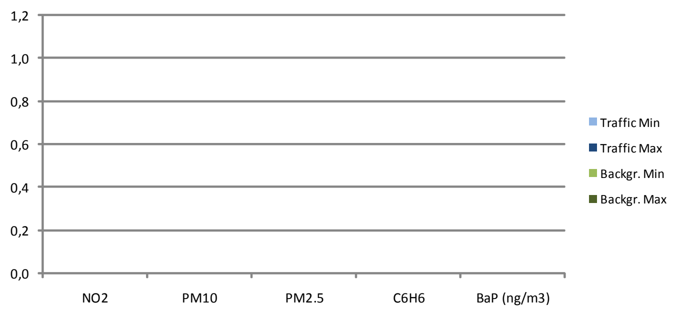
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Min	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Braunschweig
Country	Germany
Latitude (°N)	52,265
Longitude (°E)	10,524
Population	250000
Area (km2)	192
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

Annual emissions from road sources (tons per year)

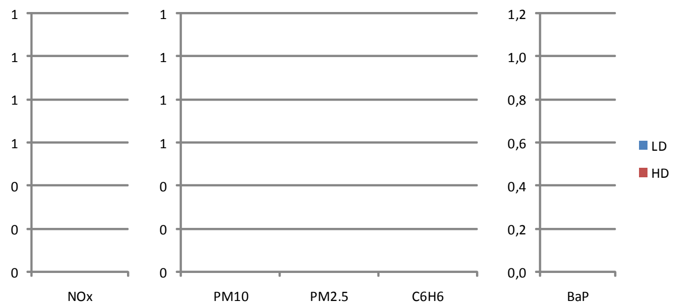
	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

PM10: 20% exh, 80% N-Ex

(Information from)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

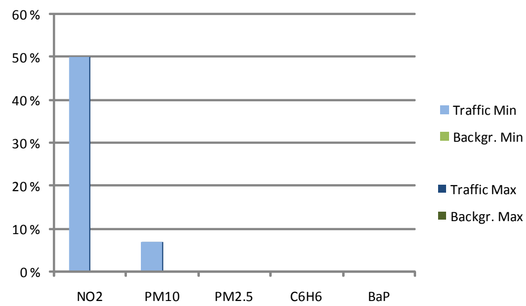
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	50 %	50 %			
PM10	7 %	7 %			28 %
PM2.5					
C6H6					
BaP					

(Information from *clean air plan*)

Assessment year 2001-2005

Pollutants available PM10
NO2

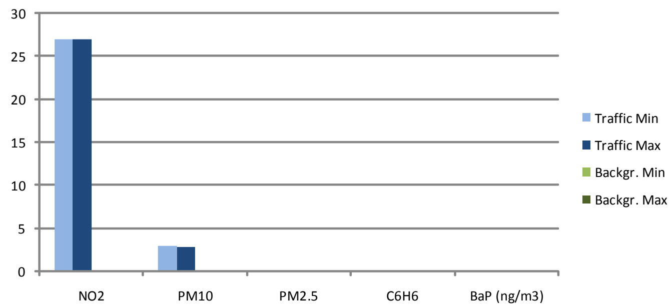
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	N-Ex
NO2	27,0	27,0			
PM10	2,9	2,9			11,8
PM2.5					
C6H6					
BaP (ng/m3)					

(Information from *clean air plan*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions		x	
Road charges or tolls			
Speed moderation, traffic calming	x	x	
Parking related measures			
Promoting collective transport	x	x	
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency	x		
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems			
Promoting cycling	x	x	
Promoting walking		x	
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit	Y		200 µg/m3 by 2010
Annual PM10 limit	Y		40 µg/m3 by 2005
Daily PM10 limit	?		50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Bremen
Country	Germany
Latitude (°N)	53,075
Longitude (°E)	8,783
Population	550000
Area (km2)	330
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for *City*)

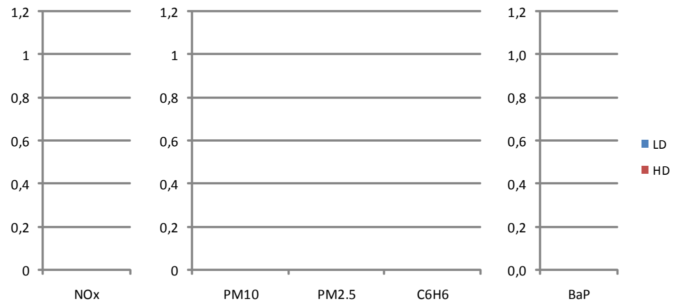
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from *database*)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

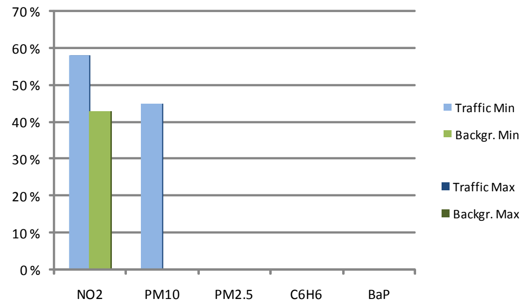
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	58 %	58 %	43 %	43 %
PM10	45 %	45 %		
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

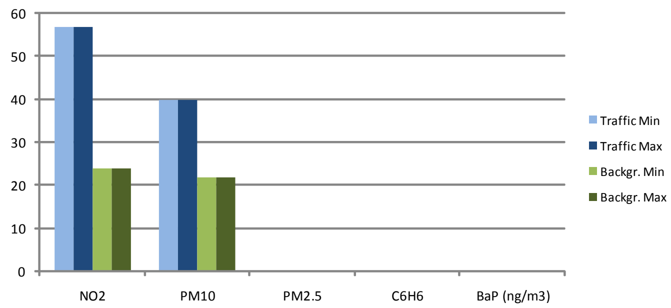
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	57,0	57,0	24,0	24,0
PM10	40,0	40,0	22,0	22,0
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures			
Promoting collective transport	x		
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x		x
Landuse measures intending to limit car dependency	x		
Travel plans with a view to reducing private car use	x	x	
Flexible innovative and demand responsive transport systems		x	
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit	N		40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Bristol
Country	United Kingdom
Latitude (°N)	51,455
Longitude (°E)	-2,592
Population	416000
Area (km2)	110
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

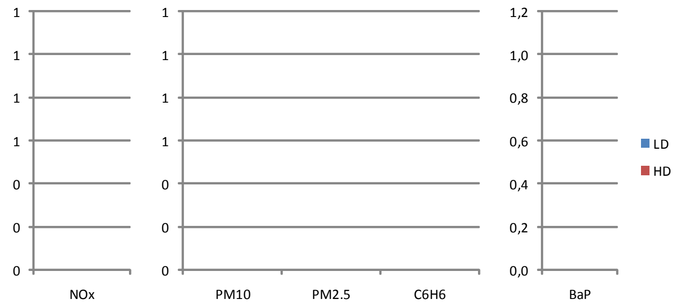
LD: 45%, HD: 25%

LD: 18%, HD: 7%

(Information from *local transport plan*)

Assessment year 2000

Pollutants available NOx, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

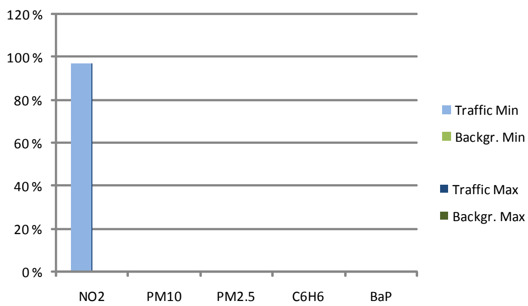
Contributions of road traffic to pollutant concentrations in city

	percental				
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max	Traff N-Ex
NO2	97 %	97 %			(city avg)
PM10					
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2003

Pollutants available NO2



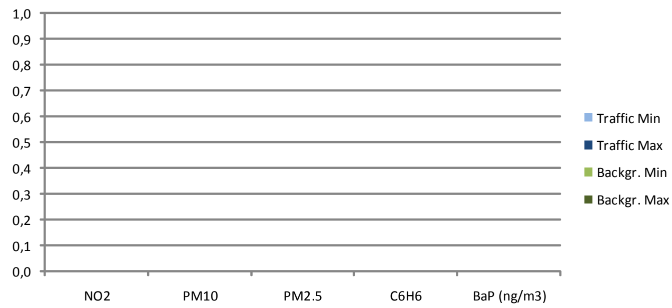
Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

Traffic stations

Background stations

	absolute (µg/m3)			
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions		x	
Road charges or tolls		x	
Speed moderation, traffic calming		x	
Parking related measures		x	
Promoting collective transport	x	x	
Taking action on public fleets		x	
Encouraging cleaner fuels and vehicles		x	
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x	x	
Promoting cycling	x	x	
Promoting walking	x	x	
Taking actions on urban freight and logistics		x	

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		11 %
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Brno
Country	Czech Republic
Latitude (°N)	49,195
Longitude (°E)	16,601
Population	400000
Area (km2)	230
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	1,29E+09	93 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	9,12E+07	7 %	(heavy goods vehicles, incl. buses, coaches)
Total	1,38E+09		

(Information valid for *City* 2007)

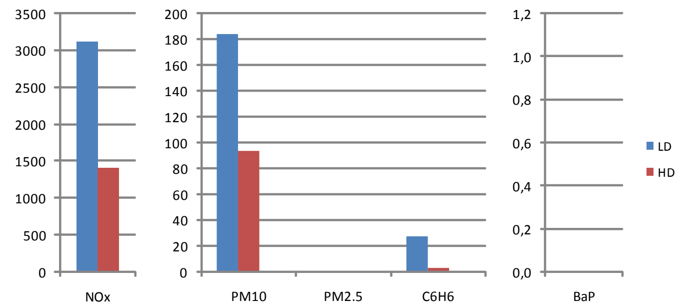
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	3116	1421		
PM10	184	94		
PM2.5				
C6H6	28	4		
BaP				
CO2	989600	235000		

(Information from *questionnaire*)

Assessment year 2007

Pollutants available NOx, PM10, NMVOC, C6H6, PAH, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

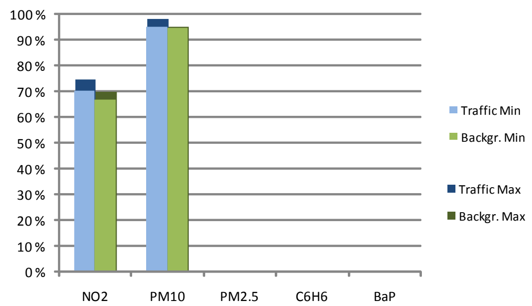
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	70 %	75 %	67 %	70 %
PM10	95 %	98 %	95 %	95 %
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

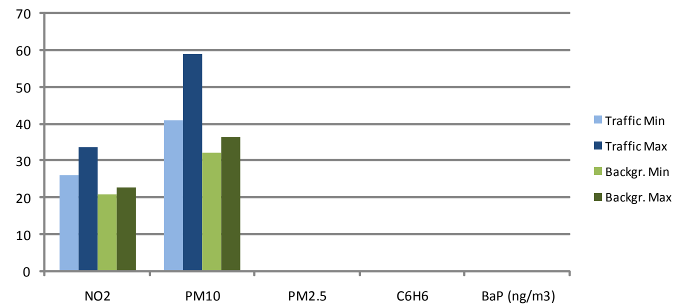
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	26,1	33,8	20,9	22,9
PM10	41,1	59,1	32,4	36,4
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls			
Speed moderation, traffic calming	x	x	
Parking related measures			
Promoting collective transport	x	x	x
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency	x	x	
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			x
Promoting cycling		x	
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	Y	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit	Y	Y	50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target	Y	Y	1 ng/m3 by 2012

General Information (to obtain from database)

City	Brussels
Country	Belgium
Latitude (°N)	50,846
Longitude (°E)	4,352
Population	1031000
Area (km2)	161
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	3,08E+09	95 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,67E+08	5 %	(heavy goods vehicles, incl. buses, coaches)
Total	3,25E+09		

(Information valid for *City*)

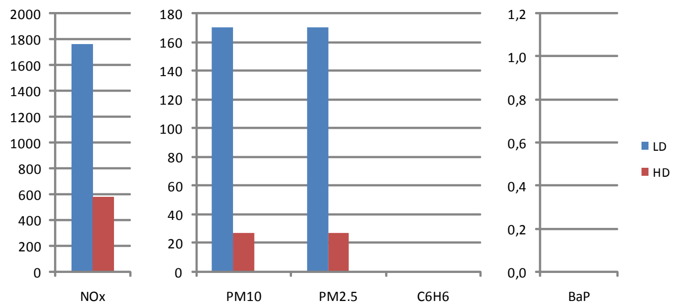
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	1761	586		
PM10	171	27		
PM2.5	171	27		
C6H6				
BaP				
CO2	641181	125047		

(Information from *questionnaire*)

Assessment year 2007

Pollutants available NOx, PM10, PM2.5, NMVOC, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	36 %	52 %	30 %	38 %
PM10	18 %	25 %	7 %	9 %
PM2.5	9 %	20 %	4 %	20 %
C6H6				
BaP	22 %	39 %	16 %	22 %

(Information from *questionnaire*)

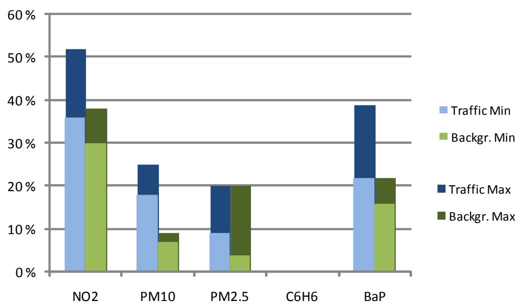
Assessment year

Pollutants available

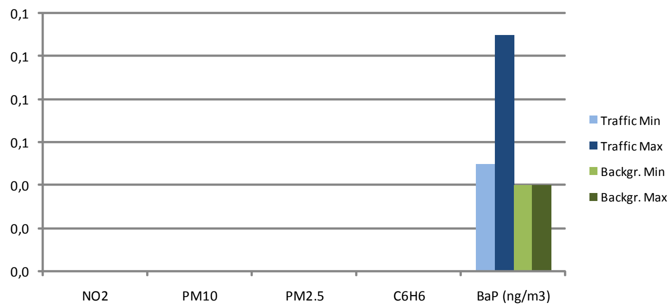
Traffic stations
Background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)	0,1	0,1	0,0	0,0

(Information from *questionnaire*)



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			x
Road charges or tolls		x	
Speed moderation, traffic calming	x		
Parking related measures	x		x
Promoting collective transport	x		
Taking action on public fleets	x	x	
Encouraging cleaner fuels and vehicles	x		x
Landuse measures intending to limit car dependency			x
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x	x	
Promoting walking		x	
Taking actions on urban freight and logistics		x	

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	5-10%	5-10%
PM10	> 10%	> 10%
PM2.5	> 10%	> 10%
CO2	< 0%	< 0%
NMVOC	> 10%	> 10%
PAH	0-5%	0-5%

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	N?	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit	N	N?	50 µg/m3 by 2005
Annual PM2.5 target	N	N?	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target	Y	Y	1 ng/m3 by 2012

General Information (to obtain from database)

City	Chemnitz
Country	Germany
Latitude (°N)	50,068
Longitude (°E)	12,920
Population	243000
Area (km2)	221
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

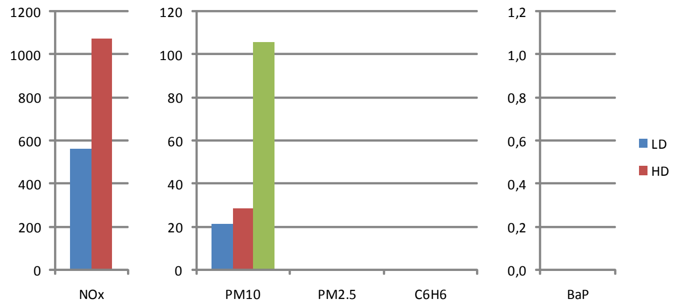
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	566	1074		
PM10	22	29	106	
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air report*)

Assessment year 2005

Pollutants available NOx, PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

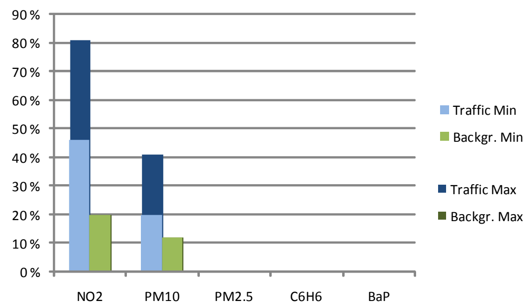
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	46 %	81 %	20 %	20 %	
PM10	20 %	41 %	12 %	12 %	
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2007

Pollutants available NOx, PM10

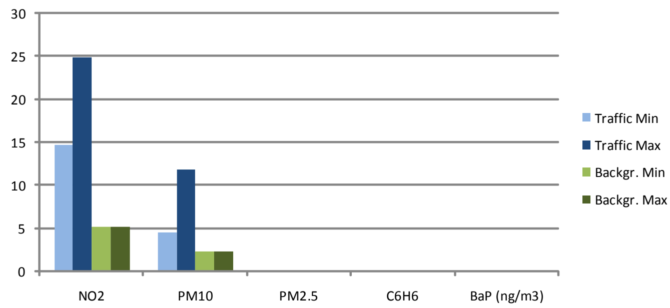
Traffic stations	2
Background stations	1



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	14,7	24,9	5,2	5,2
PM10	4,6	11,9	2,4	2,4
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			x
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures			
Promoting collective transport	x	x	
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency		x	
Travel plans with a view to reducing private car use			x
Flexible innovative and demand responsive transport systems			
Promoting cycling	x	x	
Promoting walking	x	x	
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	5 %	10 %
PM10	5 %	10 %
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	N	40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Clermont-Ferrand
Country	France
Latitude (°N)	45,779
Longitude (°E)	3,085
Population	140000
Area (km2)	43
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for *City*)

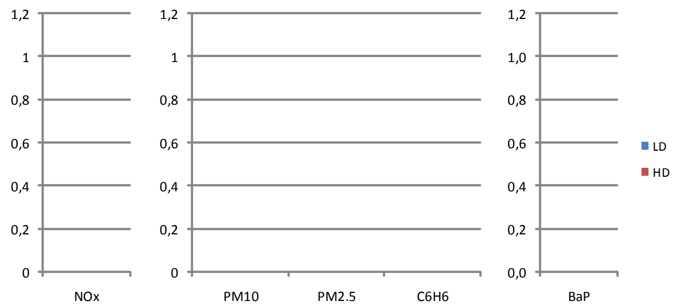
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from *database*)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

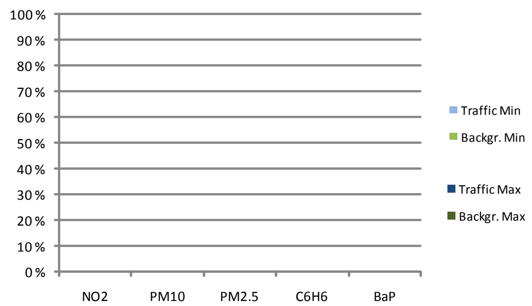
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

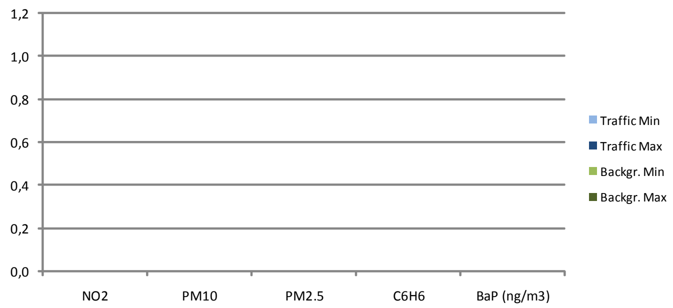
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Darmstadt
Country	Germany
Latitude (°N)	49,873
Longitude (°E)	8,667
Population	140000
Area (km2)	122
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	9,24E+08	94 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	6,10E+07	6 %	(heavy goods vehicles, incl. buses, coaches)
Total	9,85E+08		

(Information valid for *City*)

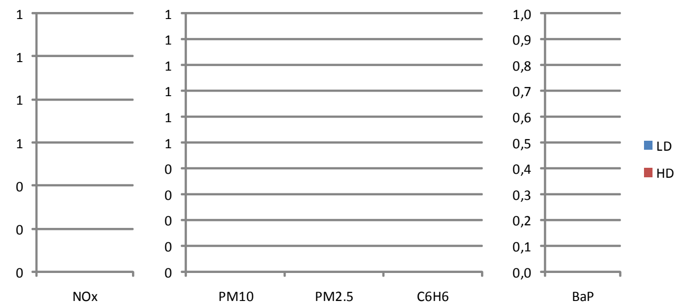
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				1079
PM10				42
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air p* 2000)

Assessment year 2000

Pollutants available NOx, PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

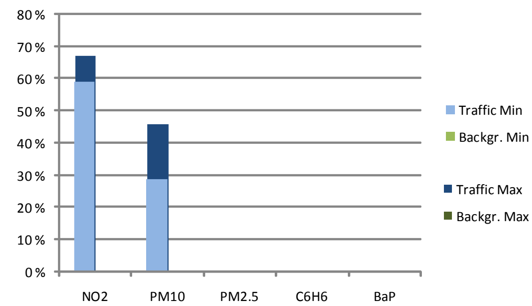
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. M	Traff N-Ex
NO2	59 %	67 %			
PM10	29 %	46 %			
PM2.5					
C6H6					
BaP					

(Information from *clean air plan*)

Assessment year 2002

Pollutants available NO2, PM10

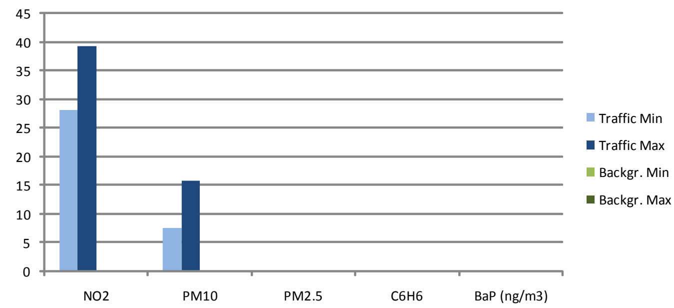
Traffic stations	3
Background stations	0



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	28,1	39,3		
PM10	7,6	15,8		
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *clean air plan*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		x
Road charges or tolls			
Speed moderation, traffic calming		x	
Parking related measures			
Promoting collective transport	x		
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency	x		
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			x
Promoting cycling	x		
Promoting walking			
Taking actions on urban freight and logistics			x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Edinburgh
Country	United Kingdom
Latitude (°N)	55,950
Longitude (°E)	-3,188
Population	450000
Area (km2)	260
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

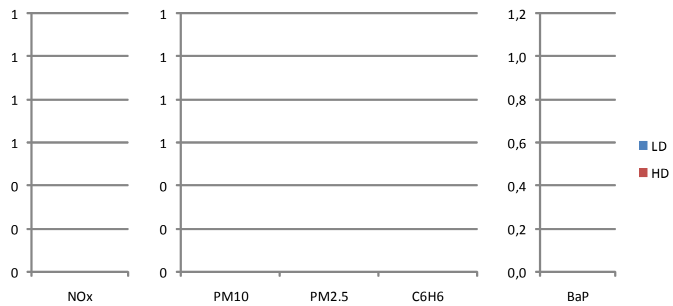
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

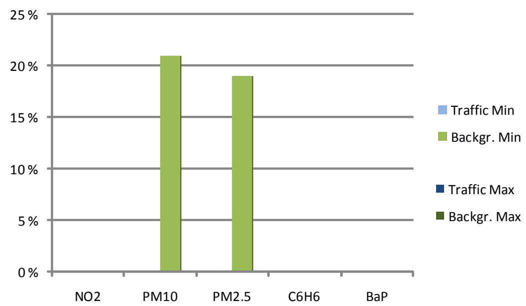
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2					
PM10			21 %	21 %	
PM2.5			19 %	19 %	
C6H6					
BaP					

(Information from *database*)

Assessment year 1999/2000

Pollutants available PM10
PM2.5

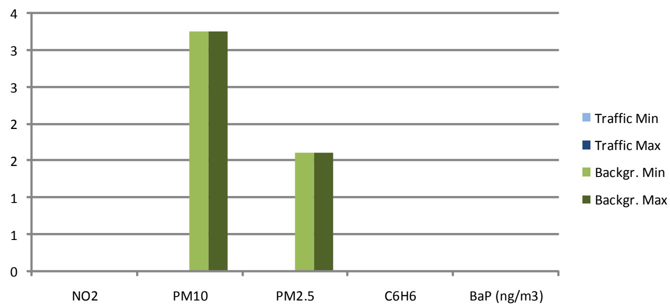
Traffic stations 0
Background stations 1



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10			3,3	3,3
PM2.5			1,6	1,6
C6H6				
BaP (ng/m3)				

(Information from)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Erfurt
Country	Germany
Latitude (°N)	50,094
Longitude (°E)	11,029
Population	210000
Area (km2)	270
Site character	On 3 sides surrounded by ridges, open only to N; Short-term inversions in summer, long-term inversions in winter

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	2,90E+11	97 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	9,42E+09	3 %	(heavy goods vehicles, incl. buses, coaches)
Total	3,00E+11	rather high, I wonder whether this is valid for the entire federal state Thüringen instead of just the city of Erfurt	

(Information valid for *??* 2003)

Annual emissions from road sources (tons per year)

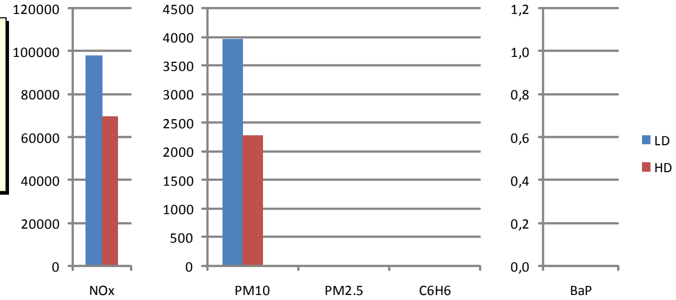
	LD	HD	N-Ex	Total
NOx	98042	69774		
PM10	3973	2287		
PM2.5				
C6H6				
BaP				
CO2				

NOx and PM10 emissions very high ?maybe strange use of decimal separator in the clean air plan?

(Information from *clean air plan*)

Assessment year 2003

Pollutants available PM10
NOx



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

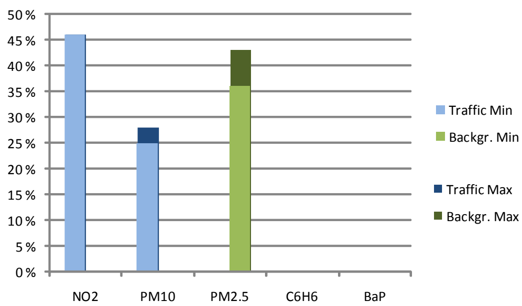
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	46 %	46 %			
PM10	25 %	28 %			
PM2.5			36 %	43 %	
C6H6					
BaP					

(Information from *database*)

Assessment year 1997-2001 2003

Pollutants available PM2.5 NO2
PM10

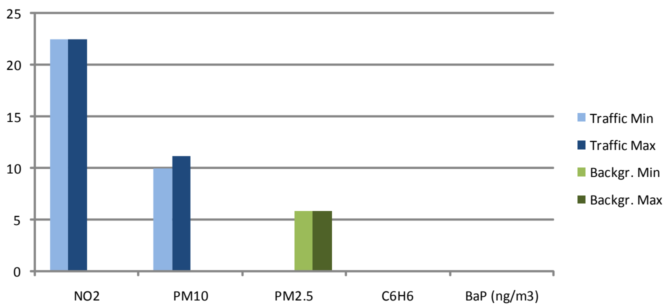
Traffic stations	1
Background stations	2



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	22,5	22,5		
PM10	10,0	11,2		
PM2.5			5,9	5,9
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions		x	x
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures	x		
Promoting collective transport	x		
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling	x	x	
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Frankfurt am Main
Country	Germany
Latitude (°N)	50,110
Longitude (°E)	8,682
Population	670000
Area (km2)	248
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for *City*)

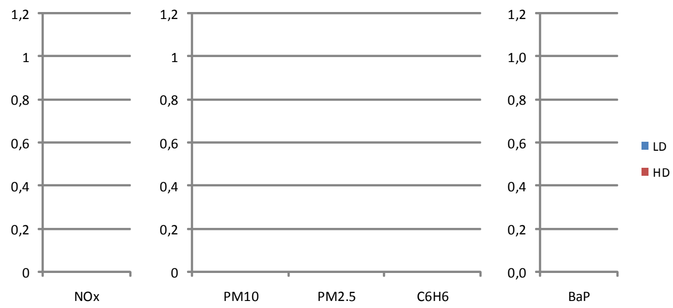
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from *database*)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

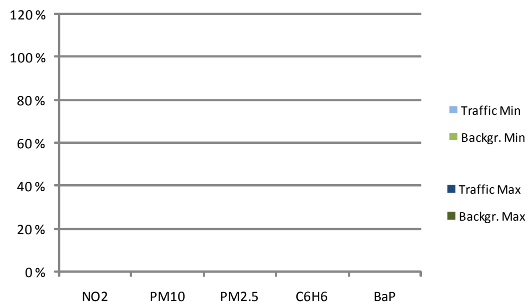
Assessment year

Pollutants available

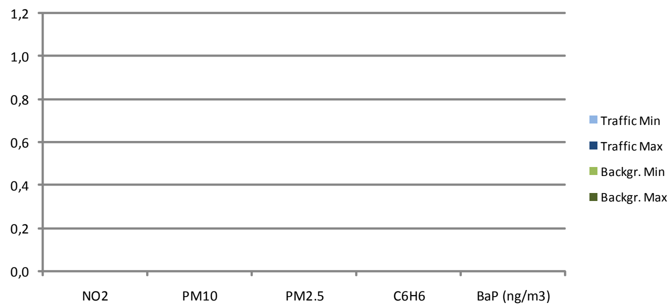
Traffic stations
Background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls	x	x	x
Speed moderation, traffic calming	x	x	x
Parking related measures	x	x	x
Promoting collective transport	x		
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x		x
Landuse measures intending to limit car dependency	x		
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x		
Promoting walking	x		
Taking actions on urban freight and logistics	x		x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit	Y	Y	50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Freiburg
Country	Germany
Latitude (°N)	47,994
Longitude (°E)	7,846
Population	220000
Area (km2)	153
Site character	Rhine rift influences the flow, local wind systems dominate; Frequent stable high pressure conditions in summer, autumn and winter

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic		94 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		6 %	(heavy goods vehicles, incl. buses, coaches)
Total			

(Information valid for)

Annual emissions from road sources (tons per year)

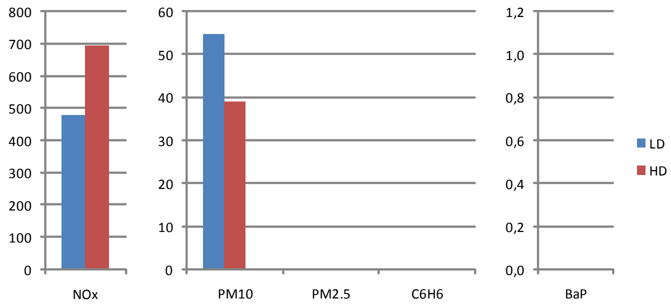
	LD	HD	N-Ex	Total
NOx	481	696		
PM10	55	39		
PM2.5				
C6H6				
BaP				
CO2				

only NO2 fraction

(Information from *clean air plan*)

Assessment year 2004

Pollutants available: CO, NO2, NMVOC, TPM, PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

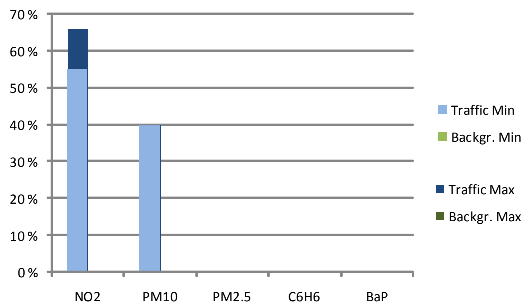
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	55 %	66 %			
PM10	40 %	40 %			24 %
PM2.5					
C6H6					
BaP					

(Information from *clean air plan*)

Assessment year 2006

Pollutants available: NO2, PM10

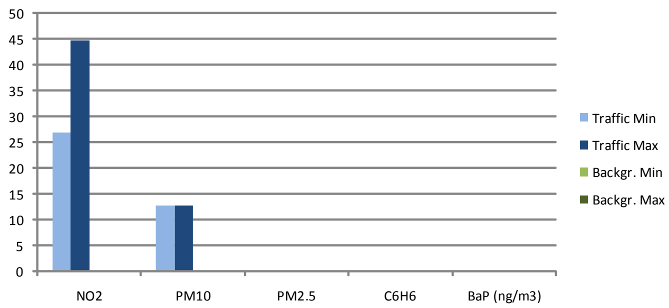
Traffic stations	2
Background stations	0



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	27,0	44,9			
PM10	12,8	12,8			7,7
PM2.5					
C6H6					
BaP (ng/m3)					

(Information from *clean air plan*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.	
Road access restrictions		x		
Road charges or tolls				N
Speed moderation, traffic calming	x	x		
Parking related measures				
Promoting collective transport	x	x		
Taking action on public fleets	x			
Encouraging cleaner fuels and vehicles	x			
Landuse measures intending to limit car dependency		x		
Travel plans with a view to reducing private car use				
Flexible innovative and demand responsive transport systems	x			
Promoting cycling		x		
Promoting walking	x	x		
Taking actions on urban freight and logistics				

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Genève
Country	Switzerland
Latitude (°N)	46,201
Longitude (°E)	6,001
Population	188000
Area (km2)	16
Site character	

Annual transport volume (km per year)

	km/(veh yr)
Light traffic	
Heavy traffic	
Total	

(Information valid for *City*)

(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
(heavy goods vehicles, incl. buses, coaches)

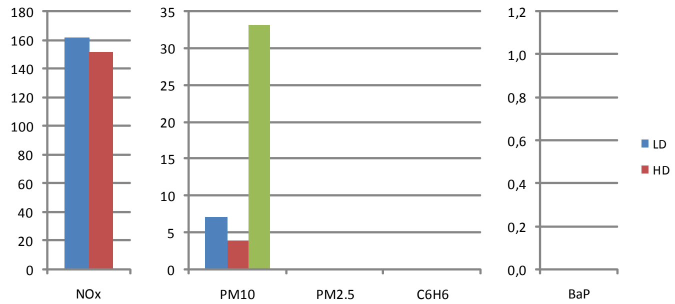
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	162	152		
PM10	7	4	33	
PM2.5				
C6H6				
BaP				
CO2	111162	15821		

(Information from *questionn City*)

Assessment year 2008

Pollutants available: NOx, PM10, NMVOC, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

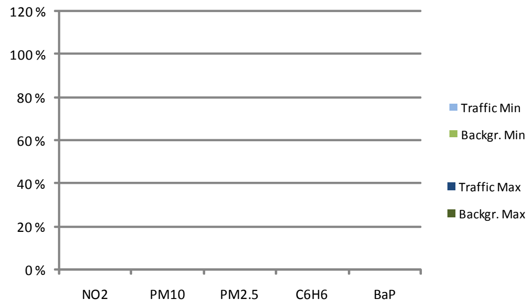
	percental			
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

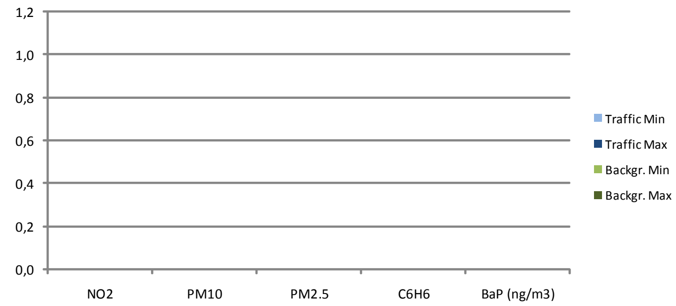
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions		x	
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures	x	x	
Promoting collective transport	x		
Taking action on public fleets		x	
Encouraging cleaner fuels and vehicles	x	x	
Landuse measures intending to limit car dependency		x	
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x		
Promoting walking	x		
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit	Y		200 µg/m3 by 2010
Annual PM10 limit	Y		40 µg/m3 by 2005
Daily PM10 limit	N		50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Genova
Country	Italy
Latitude (°N)	44,417
Longitude (°E)	8,923
Population	700000
Area (km2)	244
Site character	City bordered by sea and mountains, complex terrain and meteorology; Small scale meteorological variability; stable atmospheric conditions in summe

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic	-	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	-	(heavy goods vehicles, incl. buses, coaches)
Total	2,18E+09	

(Information valid for 2008)

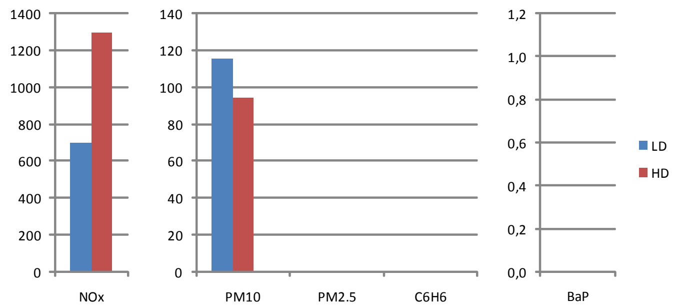
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	700	1299		
PM10	116	95		
PM2.5				
C6H6				
BaP				
CO2				

(Information from *scientific article*)

Assessment year 2008

Pollutants available: NOx, NO2, PM, CO, HC



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2					
PM10	23 %	34 %	21 %	21 %	
PM2.5	23 %	23 %			
C6H6					
BaP					

(Information from *database*)

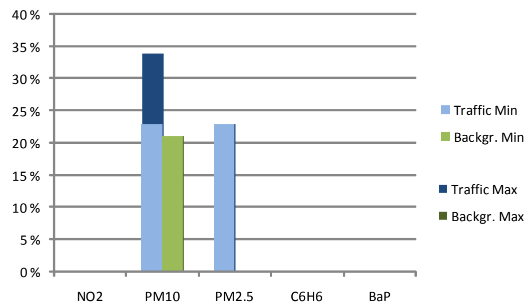
Assessment year 2004 2005

Pollutants available: PM10 PM2.5 PM1

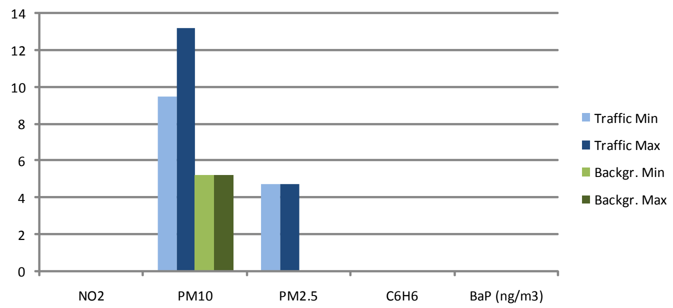
Traffic stations	2
Background stations	1

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10	9,5	13,2	5,3	5,3
PM2.5	4,7	4,7		
C6H6				
BaP (ng/m3)				

(Information from *database*)



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Grenoble
Country	France
Latitude (°N)	45,191
Longitude (°E)	5,724
Population	156000
Area (km2)	18
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	2,30E+09	94 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,45E+08	6 %	(heavy goods vehicles, incl. buses, coaches)
Total	2,45E+09		

(Information valid for *City*)

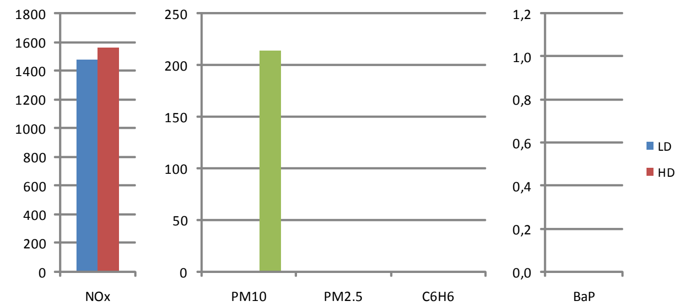
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	1482	1564		
PM10			214	
PM2.5				
C6H6				
BaP				
CO2	479937	156119		

(Information from *questionn City*)

Assessment year 2006

Pollutants available: NOx, PM10 N-Ex, NMVOC, PAH, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

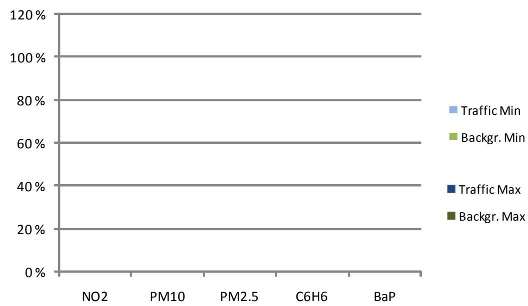
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

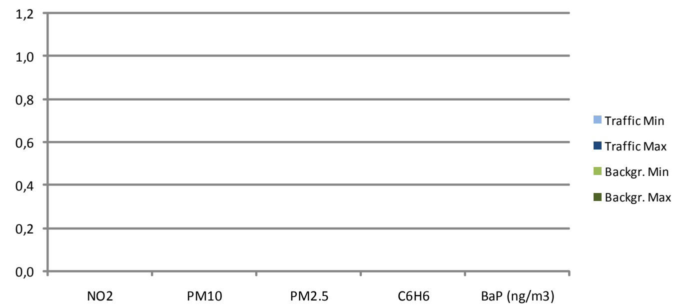
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures	x	x	
Promoting collective transport	x		
Taking action on public fleets		x	
Encouraging cleaner fuels and vehicles	x		x
Landuse measures intending to limit car dependency	x	x	x
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x	x	
Promoting cycling	x		
Promoting walking	x		
Taking actions on urban freight and logistics			x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	>10%	>10%
PM10	>10%	>10%
PM2.5		
CO2		
NMVOC	>10%	>10%
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	Y	N	40 µg/m3 by 2010
Hourly NO2 limit	Y	N	200 µg/m3 by 2010
Annual PM10 limit	N	N	40 µg/m3 by 2005
Daily PM10 limit	N	N	50 µg/m3 by 2005
Annual PM2.5 target	N	N	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	N	5 µg/m3 by 2010
Annual BaP target	Y	N	1 ng/m3 by 2012

General Information (to obtain from database)

City	Hamburg
Country	Germany
Latitude (°N)	53,550
Longitude (°E)	9,992
Population	1700000
Area (km2)	755
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

Annual emissions from road sources (tons per year)

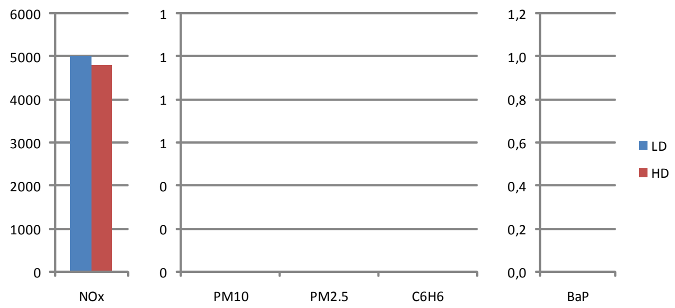
	LD	HD	N-Ex	Total
NOx	5000	4800		
PM10				
PM2.5				
C6H6				
BaP				
CO2				

numbers estimated from a figure

(Information from *clean air plan*)

Assessment year 2000

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

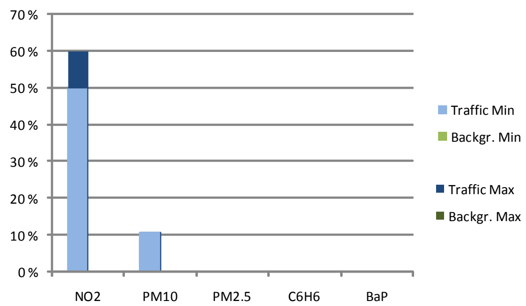
	percental				
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max	Traff N-Ex
NO2	50 %	60 %			
PM10	11 %	11 %			11 %
PM2.5					
C6H6					
BaP					

(Information from)

Assessment year

Pollutants available

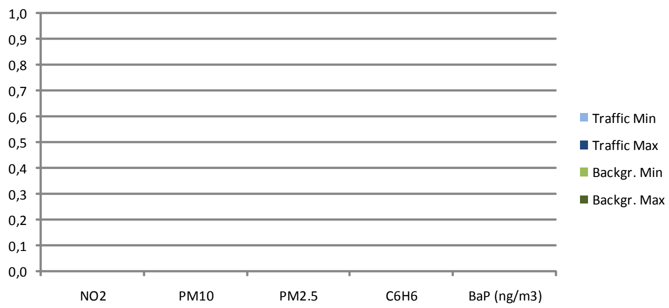
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	Y	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	?		40 µg/m3 by 2005
Daily PM10 limit	?		50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Heilbronn
Country	Germany
Latitude (°N)	49,150
Longitude (°E)	9,217
Population	120000
Area (km2)	100
Site character	City located in Neckar-valley; Inversions in winter

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

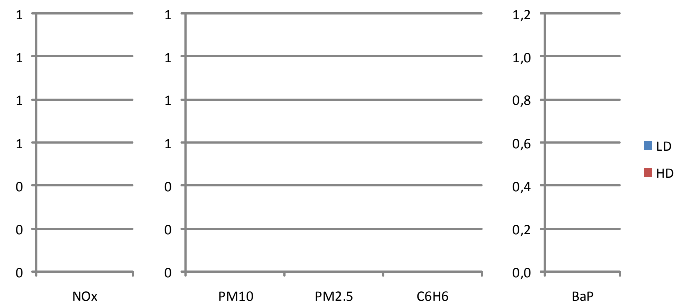
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				1039
PM10				43
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air plan*)

Assessment year 2002

Pollutants available NOx as NO2
Total PM
PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

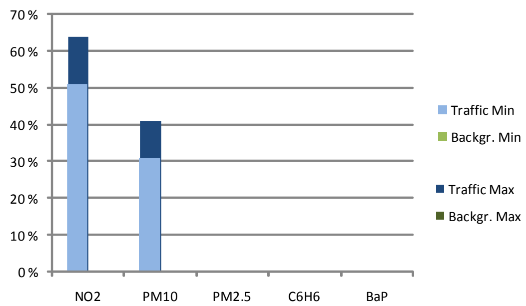
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	51 %	64 %			
PM10	31 %	41 %			
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2007

Pollutants available PM10
NO2

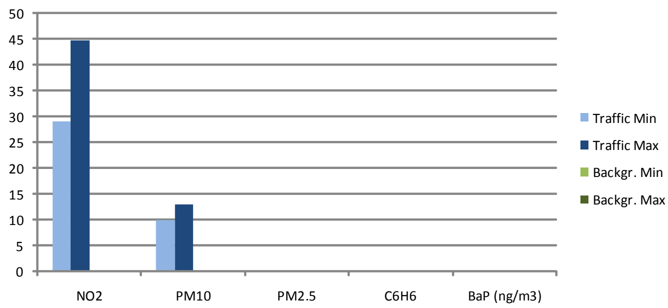
Traffic stations 3
Background stations 0



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	29,1	44,8		
PM10	9,9	13,1		
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x	x	
Road charges or tolls			
Speed moderation, traffic calming		x	
Parking related measures			
Promoting collective transport		x	
Taking action on public fleets	x	x	
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use		x	
Flexible innovative and demand responsive transport systems			x
Promoting cycling	x	x	x
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit	N		50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Helsinki
Country	Finland
Latitude (°N)	60,176
Longitude (°E)	24,933
Population	580000
Area (km2)	213
Site character	Flat terrain; downtown on peninsula

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	2,21E+09	93 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,54E+08	7 %	(heavy goods vehicles, incl. buses, coaches)
Total	2,37E+09		

(Information valid for *City*)

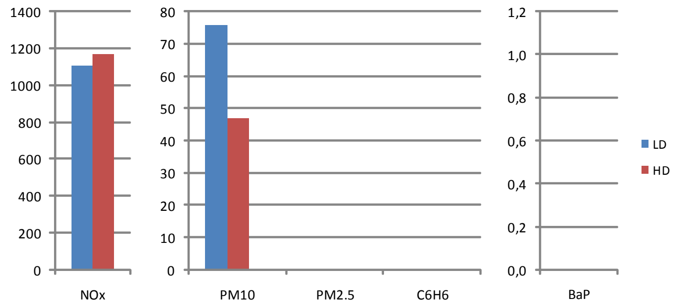
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	1110	1167		
PM10	76	47		
PM2.5				
C6H6				
BaP				
CO2	394481	161897		

(Information from *questionn City*)

Assessment year 2007

Pollutants available: NOx, PM10, NMVOC, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

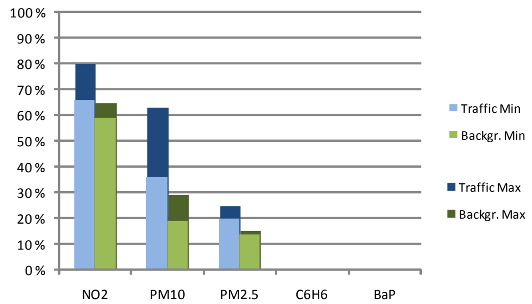
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	66 %	80 %	59 %	65 %
PM10	36 %	63 %	19 %	29 %
PM2.5	20 %	25 %	14 %	15 %
C6H6				
BaP				

(Information from *questionn City*)

Assessment year

Pollutants available

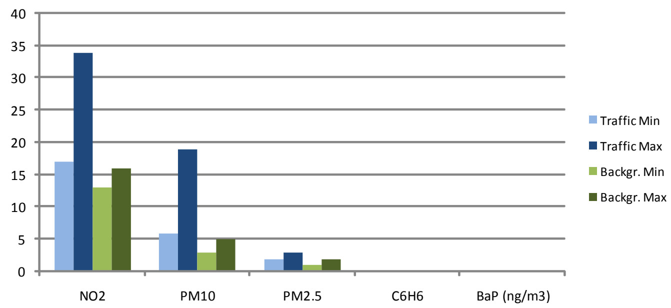
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	17,0	34,0	13,0	16,0
PM10	6,0	19,0	3,0	5,0
PM2.5	2,0	3,0	1,0	2,0
C6H6				
BaP (ng/m3)				

(Information from *questionn City*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x	x	
Road charges or tolls			x
Speed moderation, traffic calming	x		
Parking related measures	x	x	
Promoting collective transport	x		
Taking action on public fleets	x	x	
Encouraging cleaner fuels and vehicles	x	x	
Landuse measures intending to limit car dependency	x	x	
Travel plans with a view to reducing private car use		x	
Flexible innovative and demand responsive transport systems		x	
Promoting cycling	x	x	
Promoting walking	x	x	
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		50 %
PM10		50 %
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit	N	Y	50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target	N	Y	1 ng/m3 by 2012

General Information (to obtain from database)

City	Karlsruhe
Country	Germany
Latitude (°N)	49,013
Longitude (°E)	8,404
Population	290000
Area (km2)	174
Site character	Location in the Upper Rhine Rift, canalising the flow

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

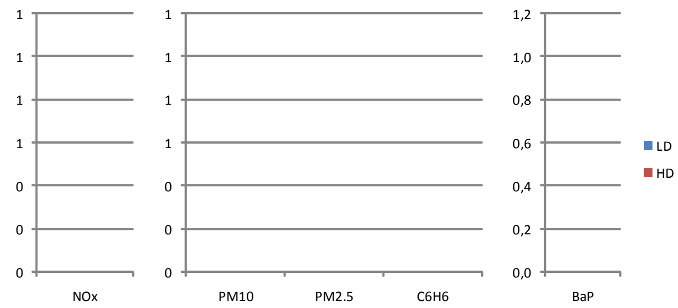
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				2569
PM10				105
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air plan*)

Assessment year 2002

Pollutants available: CO, NOx, NMVOC, Total PM, PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

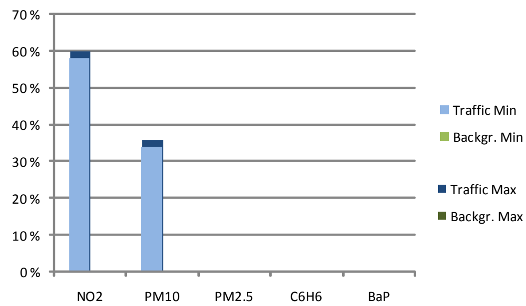
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	58 %	60 %			
PM10	34 %	36 %			
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2006, 2007

Pollutants available: PM10, NO2

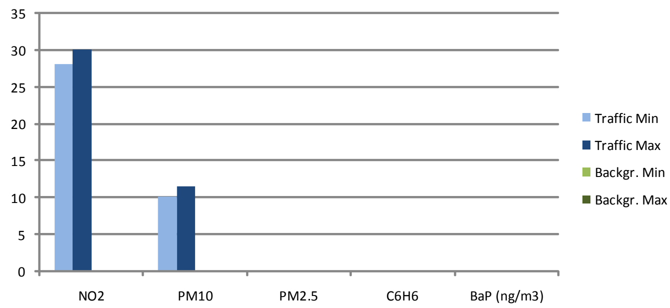
Traffic stations	2
Background stations	0



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	28,2	30,2		
PM10	10,2	11,5		
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions		x	
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures			
Promoting collective transport	x	x	
Taking action on public fleets		x	
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems			
Promoting cycling	x	x	
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	5-8%	
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Lisboa
Country	Portugal
Latitude (°N)	38,725
Longitude (°E)	-9,150
Population	560000
Area (km2)	90
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

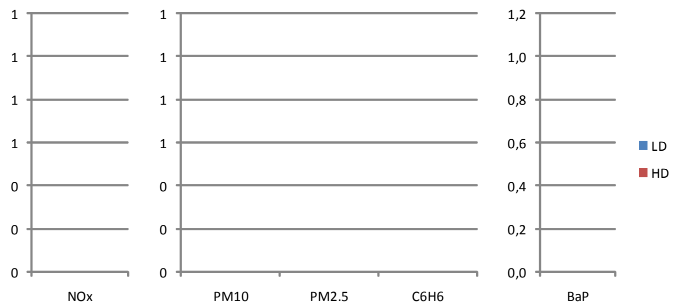
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

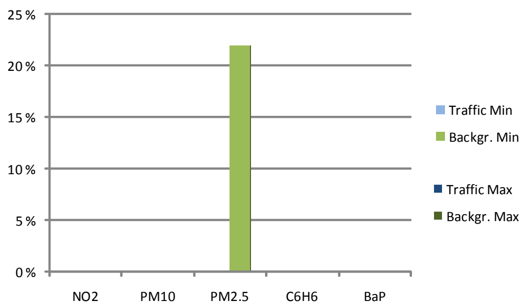
Contributions of road traffic to pollutant concentrations in city

	percental				
	Traffic Mir	Traffic Ma	Backgr. Mi	Backgr. M:	Traff Nex
NO2					
PM10					
PM2.5			22 %	22 %	
C6H6					
BaP					

(Information from *database*)

Assessment year 2001

Pollutants available PM2.5



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

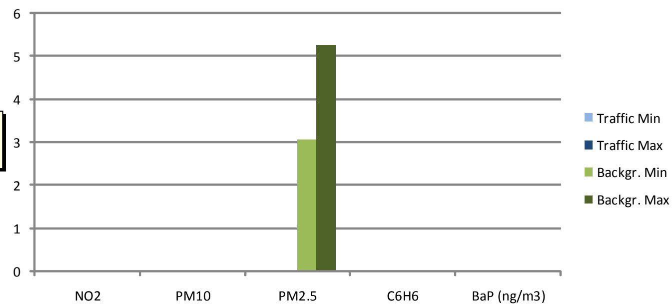
Traffic stations

Background stations 2 (suburban)

	absolute (µg/m3)			
	Traffic Mir	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5			3,1	5,3
C6H6				
BaP (ng/m3)				

only exhaust fraction

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Lodz
Country	Poland
Latitude (°N)	51,777
Longitude (°E)	19,455
Population	763000
Area (km2)	293
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

Annual emissions from road sources (tons per year)

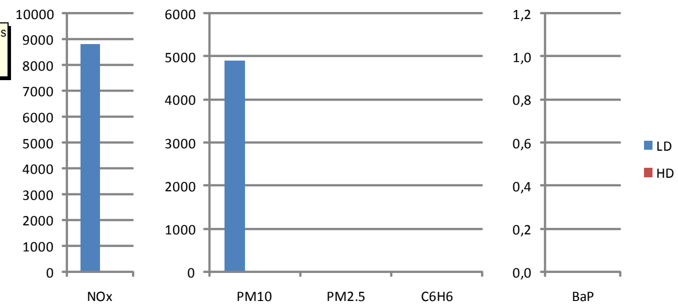
	LD	HD	N-Ex	Total
NOx	8844			
PM10	4911			
PM2.5				
C6H6				
BaP				
CO2				

all emissions from line sources

(Information from *report*)

Assessment year 2008

Pollutants available: CO, NOx, PM10, SO2, WWA?



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

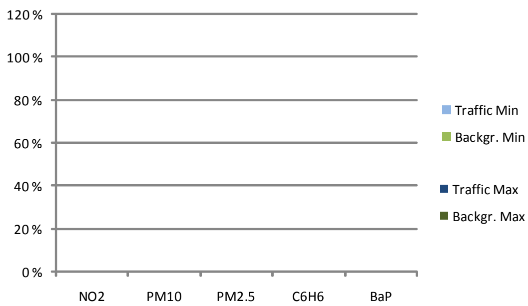
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2					
PM10					
PM2.5					
C6H6					
BaP					

(Information from)

Assessment year

Pollutants available

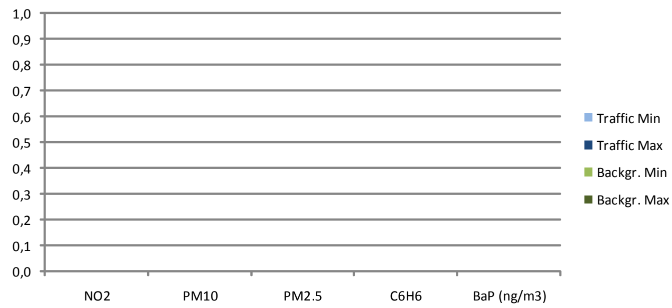
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	London
Country	United Kingdom
Latitude (°N)	51,505
Longitude (°E)	-0,078
Population	7557000
Area (km2)	1700
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

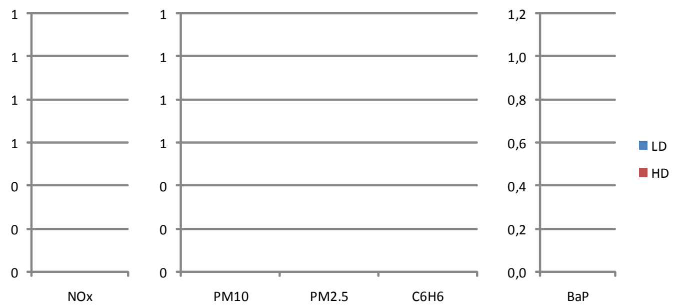
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

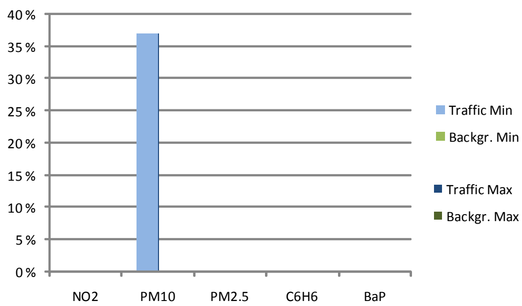
Contributions of road traffic to pollutant concentrations in city

	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2					
PM10	37 %	37 %			
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2002-2004

Pollutants available PM10

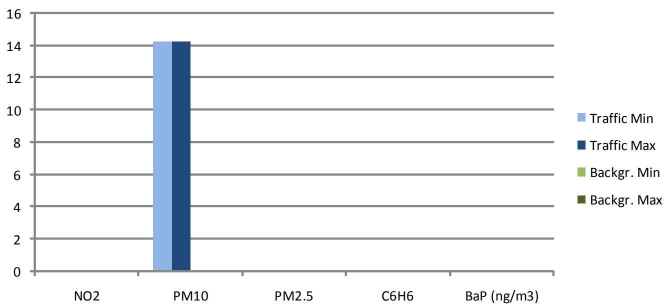


Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

Traffic stations	1
Background stations	0

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10	14,3	14,3		
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Lyon
Country	France
Latitude (°N)	45,767
Longitude (°E)	4,834
Population	472000
Area (km2)	48
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	7,17E+09	93 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	5,70E+08	7 %	(heavy goods vehicles, incl. buses, coaches)
Total	7,74E+09		

(Information valid for *City*)

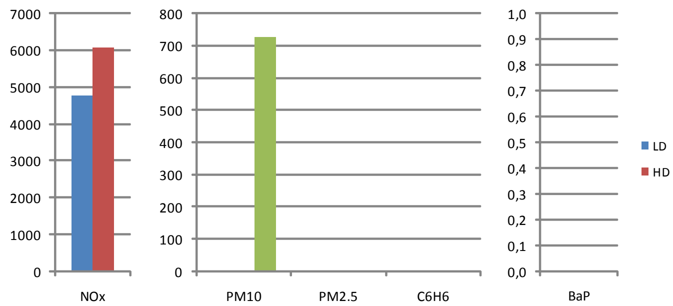
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total	
NOx	4786	6102			
PM10			725		
PM2.5					
C6H6					
BaP	0	0			
CO2	1557386	613065			2170451

(Information from *questionn City*)

Assessment year 2006

Pollutants available: NOx, PM10 N-Ex, NMVOC, PAH, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

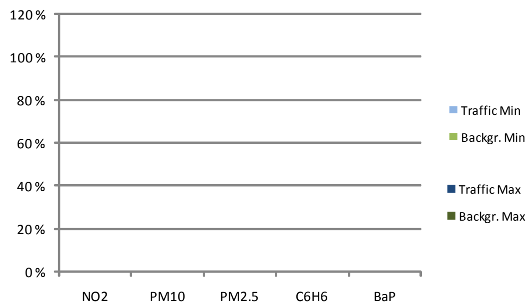
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

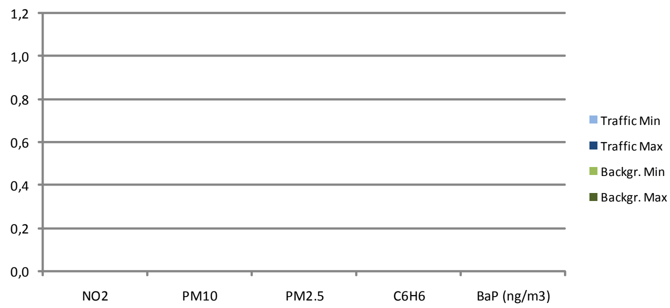
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls			x
Speed moderation, traffic calming	x		
Parking related measures			
Promoting collective transport	x		
Taking action on public fleets			
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency	x		
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x		
Promoting walking	x		
Taking actions on urban freight and logistics			x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	>10%	>10%
PM10	>10%	>10%
PM2.5		
CO2		
NMVOC	>10%	>10%
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	N	40 µg/m3 by 2010
Hourly NO2 limit	N	N	200 µg/m3 by 2010
Annual PM10 limit	N	N	40 µg/m3 by 2005
Daily PM10 limit	N	N	50 µg/m3 by 2005
Annual PM2.5 target	N	N	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	N	5 µg/m3 by 2010
Annual BaP target	Y	N	1 ng/m3 by 2012

General Information (to obtain from database)

City	Madrid
Country	Spain
Latitude (°N)	40,419
Longitude (°E)	-3,692
Population	3250000
Area (km2)	607
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	1,40E+10	92 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,19E+09	8 %	(heavy goods vehicles, incl. buses, coaches)
Total	1,52E+10		

(Information valid for *City* 2007)

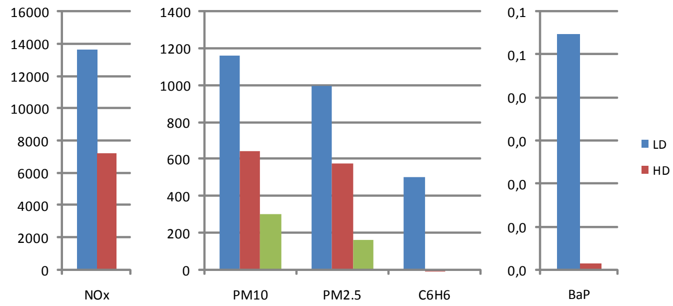
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total	
NOx	13667	7207			
PM10	1164	646	304		
PM2.5	1000	582	167		
C6H6	503	1			
BaP	0	0			
CO2	3342000	1156920			4498920

(Information from *questionn City*)

Assessment year 2005

Pollutants available: NOx; PM10, PM2.5; NMVOC, C6H6; PAH, BaP; CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

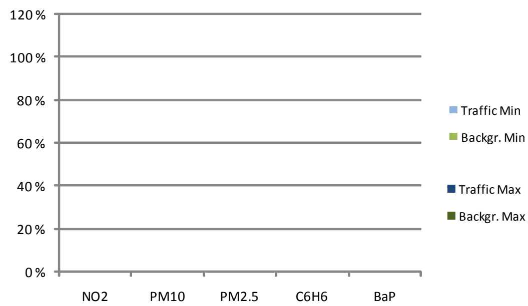
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

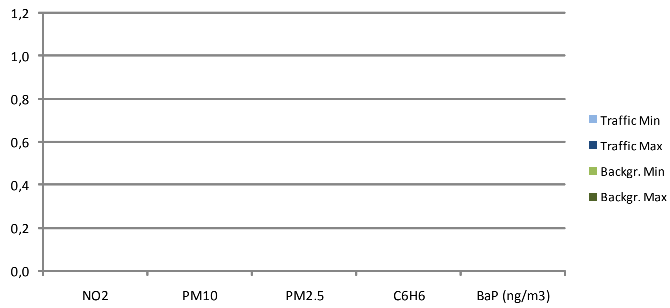
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		x
Road charges or tolls	x		x
Speed moderation, traffic calming	x		x
Parking related measures	x	x	
Promoting collective transport	x	x	
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x	x	x
Landuse measures intending to limit car dependency			x
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x	x	
Promoting cycling	x	x	
Promoting walking	x	x	
Taking actions on urban freight and logistics	x	x	

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	Y	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit	Y	Y	50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target	Y	Y	1 ng/m3 by 2012

General Information (to obtain from database)

City	Malmö
Country	Sweden
Latitude (°N)	55,599
Longitude (°E)	13,008
Population	290000
Area (km2)	160
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for *City*)

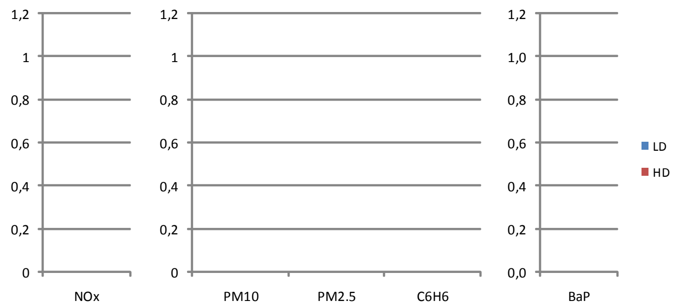
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from *database*)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

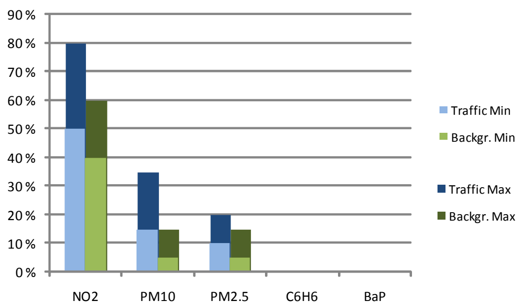
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	50 %	80 %	40 %	60 %
PM10	15 %	35 %	5 %	15 %
PM2.5	10 %	20 %	5 %	15 %
C6H6				
BaP				

(Information from *questionn City*)

Assessment year

Pollutants available

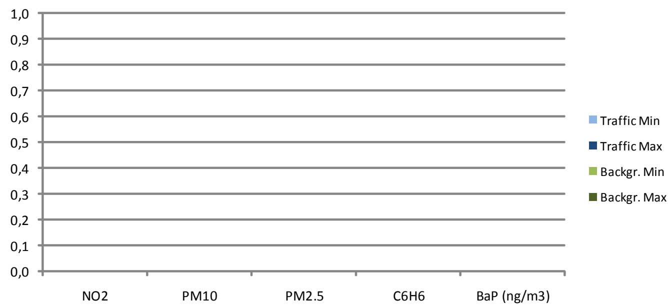
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	15 mi	35 mi	8 mi	12 mi
PM10	3 mi	10 mi	1 mi	4 mi
PM2.5	0 mi	1 mi	0 mi	1 mi
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		x
Road charges or tolls			x
Speed moderation, traffic calming	x	x	x
Parking related measures	x	x	
Promoting collective transport	x	x	x
Taking action on public fleets	x		x
Encouraging cleaner fuels and vehicles	x		x
Landuse measures intending to limit car dependency			x
Travel plans with a view to reducing private car use	x	x	
Flexible innovative and demand responsive transport systems	x		x
Promoting cycling	x		x
Promoting walking	x	x	
Taking actions on urban freight and logistics	x		x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	0-5 %	5-10%
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit	Y	Y	50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target	Y	Y	1 ng/m3 by 2012

General Information (to obtain from database)

City	Mannheim
Country	Germany
Latitude (°N)	49,489
Longitude (°E)	8,469
Population	330000
Area (km2)	145
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

Annual emissions from road sources (tons per year)

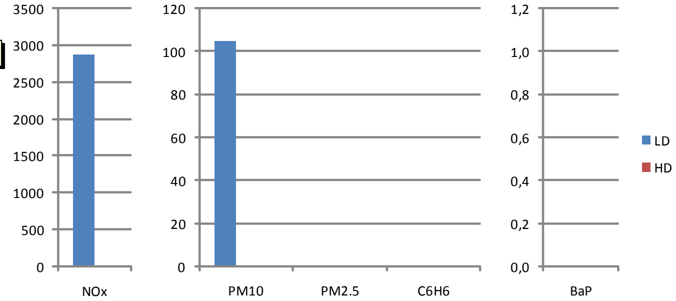
	LD	HD	N-Ex	Total
NOx	2879			
PM10	105			
PM2.5				
C6H6				
BaP				
CO2				

incl. N-Ex

(Information from *clean air plan*)

Assessment year 2002

Pollutants available: CO, NOx, NMVOC, Total PM, PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

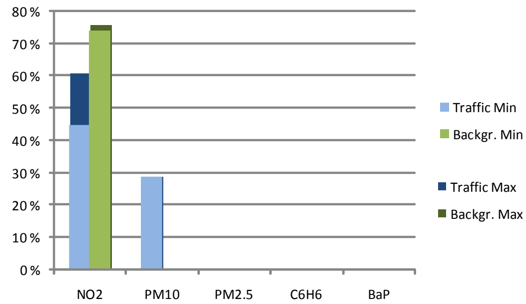
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	45 %	61 %	74 %	76 %	
PM10	29 %	29 %			
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2002, 2004, 2007

Pollutants available: NO2, PM10

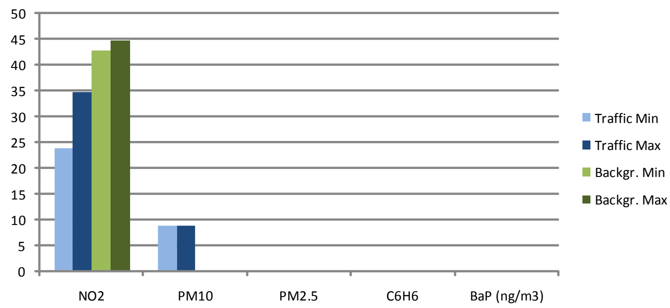
Traffic stations 1
Background stations 3 maybe they are no bg stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	23,9	34,8	42,9	44,8
PM10	9,0	9,0		
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures			
Promoting collective transport		x	
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling		x	
Promoting walking		x	
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	Y?		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Marseille
Country	France
Latitude (°N)	43,298
Longitude (°E)	5,377
Population	840000
Area (km2)	240
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	2,46E+09	96 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,10E+08	4 %	(heavy goods vehicles, incl. buses, coaches)
Total	2,57E+09		

(Information valid for *City*)

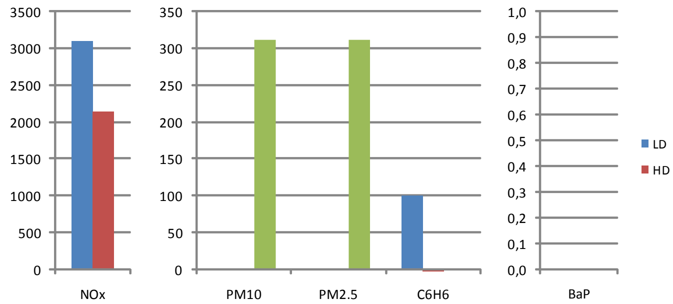
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	3106	2142		
PM10			312	
PM2.5			312	
C6H6	101	0		
BaP	0	0		
CO2	840232	198824		

(Information from *questionn City*)

Assessment year 2004

Pollutants available NOx
PM10 N-Ex
PM2.5 N-Ex
NMVOC C6H6
PAH CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

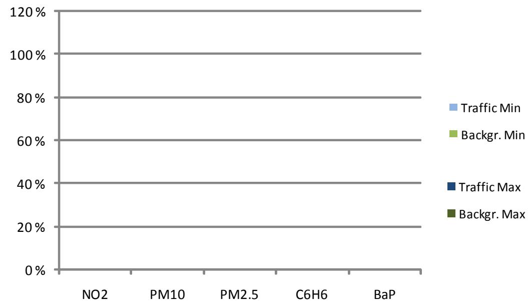
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

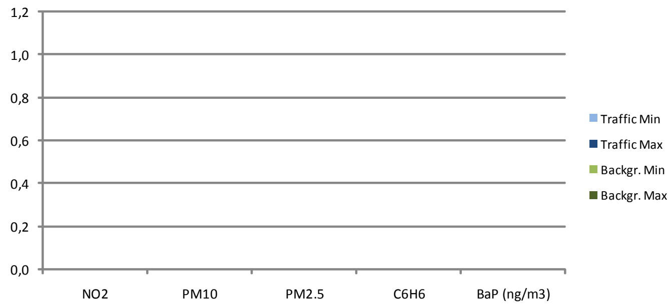
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Milano
Country	Italy
Latitude (°N)	45,464
Longitude (°E)	9,192
Population	1500000
Area (km2)	182
Site character	Po Basin, limited ventilation; Frequent stable atmospheric conditions in winter

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

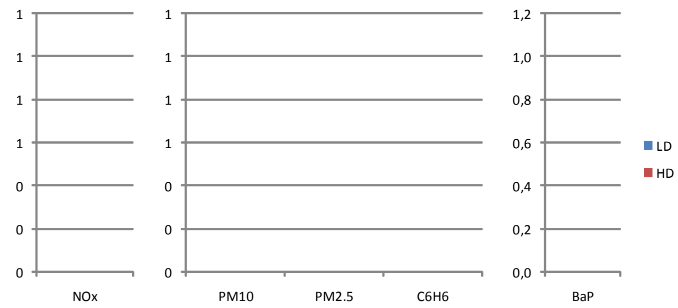
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				7945
PM10				612
PM2.5				503
C6H6				
BaP				
CO2				1751000

(Information from *presentation*)

Assessment year 2008

Pollutants available: NOx, PM10, PM2.5, CO2, NMVOC



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

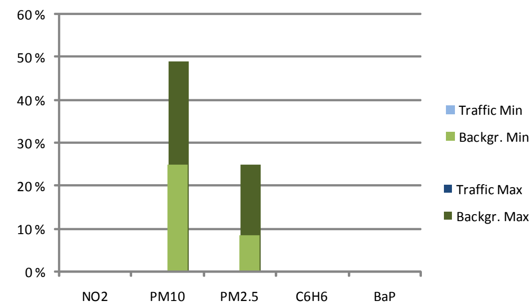
	percental				
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max	Traff Nex
NO2					
PM10			25 %	49 %	20 %
PM2.5			9 %	25 %	
C6H6					
BaP					

(Information from *database*)

Assessment year 2001 2004

Pollutants available: PM10, PM2.5

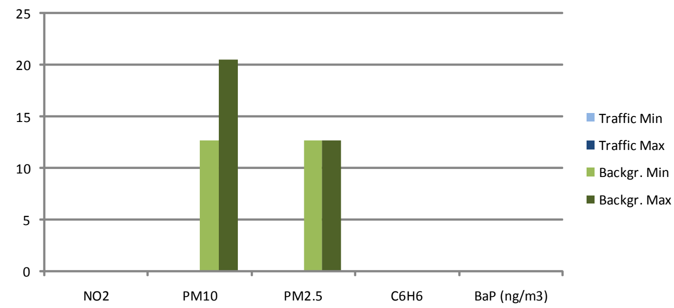
Traffic stations	0
Background stations	3



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max
NO2				
PM10			12,8	20,5
PM2.5			12,8	12,8
C6H6				
BaP (ng/m3)				

(Information from *database* 2001 2004)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	München
Country	Germany
Latitude (°N)	48,138
Longitude (°E)	11,576
Population	1360000
Area (km2)	310
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

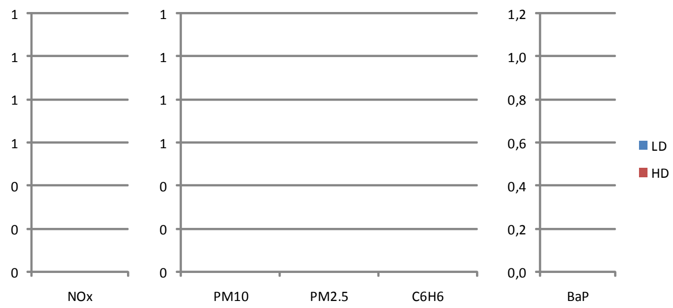
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				6932
PM10				347
PM2.5				
C6H6				192
BaP				
CO2				

(Information from *clean air plan*)

Assessment year 2000, 2003

Pollutants available NOx as NO2; PM10, PM; CO, C6H6; SO2; soot



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

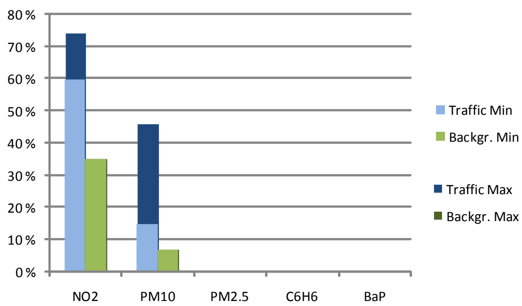
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	60 %	74 %	35 %	35 %	
PM10	15 %	46 %	7 %	7 %	
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2005

Pollutants available NO2; PM10

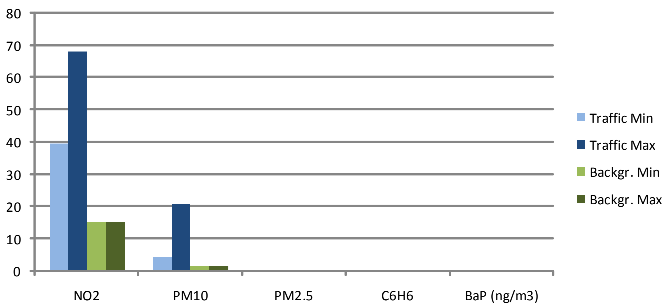
Traffic stations	4
Background stations	1



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	39,6	68,1	15,4	15,4
PM10	4,4	20,7	1,8	1,8
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures	x		
Promoting collective transport	x	x	
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles		x	x
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x	x	
Promoting walking	x		
Taking actions on urban freight and logistics		x	

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Münster
Country	Germany
Latitude (°N)	51,963
Longitude (°E)	7,629
Population	273000
Area (km2)	303
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	1,78E+09	91 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,74E+08	9 %	(heavy goods vehicles, incl. buses, coaches)
Total	1,96E+09		

(Information valid for *City*)

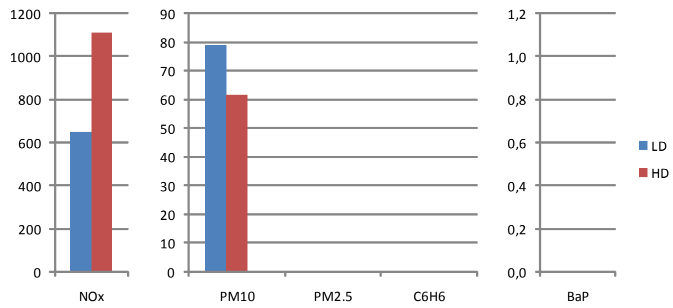
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	652	1113		
PM10	79	62		
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air plan*)

Assessment year 2006

Pollutants available NOx, PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

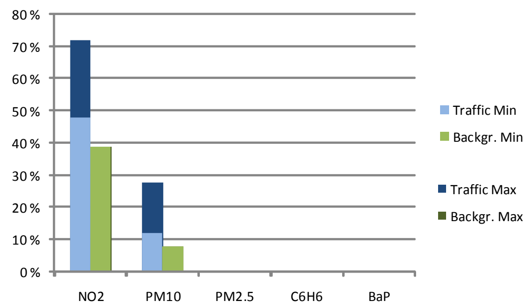
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	48 %	72 %	39 %	39 %
PM10	12 %	28 %	8 %	8 %
PM2.5				
C6H6				
BaP				

(Information from *database*)

Assessment year

Pollutants available NO2, PM10

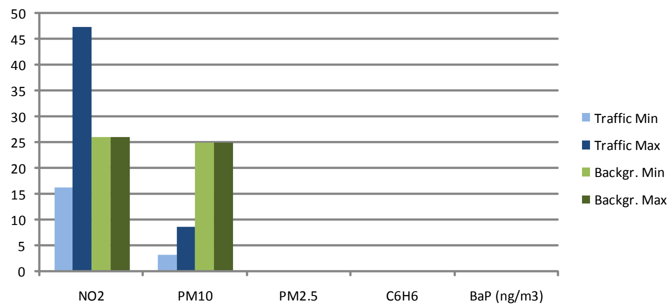
Traffic stations 4
Background stations 1



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	16,3	47,5	26,0	26,0
PM10	3,2	8,7	25,0	25,0
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions		x	
Road charges or tolls			
Speed moderation, traffic calming	x		x
Parking related measures			
Promoting collective transport	x	x	
Taking action on public fleets	x	x	
Encouraging cleaner fuels and vehicles	x		
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x	x	
Promoting walking			
Taking actions on urban freight and logistics		x	

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	Y		40 µg/m3 by 2010
Hourly NO2 limit	Y		200 µg/m3 by 2010
Annual PM10 limit	Y		40 µg/m3 by 2005
Daily PM10 limit	Y		50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Nantes
Country	France
Latitude (°N)	47,218
Longitude (°E)	-1,553
Population	283000
Area (km2)	65
Site character	

Annual transport volume (km per year)

	km/(veh yr)			
Light traffic	2,03E+09		99 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,90E+07	(buses on	1 %	(heavy goods vehicles, incl. buses, coaches)
Total	2,05E+09			

(Information valid for *LUZ* 2002)

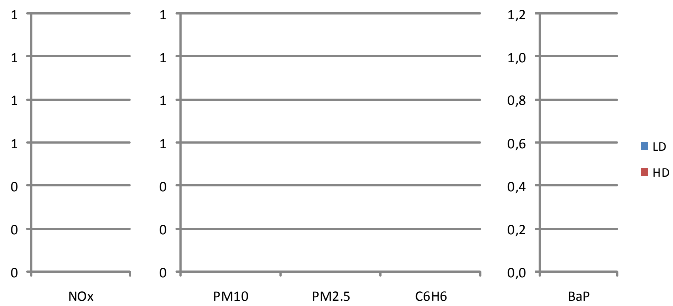
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2	568548	191043		

(Information from *questionnaire*)

Assessment year

Pollutants available CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

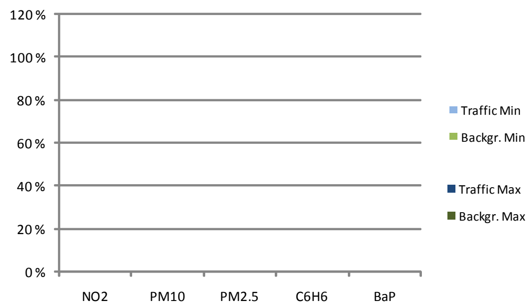
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

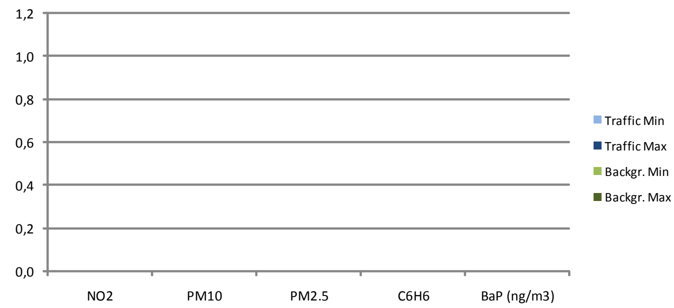
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x	x	x
Road charges or tolls			
Speed moderation, traffic calming	x	x	x
Parking related measures	x	x	x
Promoting collective transport	x	x	x
Taking action on public fleets			
Encouraging cleaner fuels and vehicles	x	x	
Landuse measures intending to limit car dependency	x	x	x
Travel plans with a view to reducing private car use	x	x	
Flexible innovative and demand responsive transport systems	x	x	x
Promoting cycling	x	x	
Promoting walking	x	x	
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	Y	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	N	Y	40 µg/m3 by 2005
Daily PM10 limit	Y	Y	50 µg/m3 by 2005
Annual PM2.5 target	N	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	N	Y	5 µg/m3 by 2010
Annual BaP target		Y	1 ng/m3 by 2012

General Information (to obtain from database)

City	Nice
Country	France
Latitude (°N)	43,698
Longitude (°E)	7,281
Population	350000
Area (km2)	72
Site character	

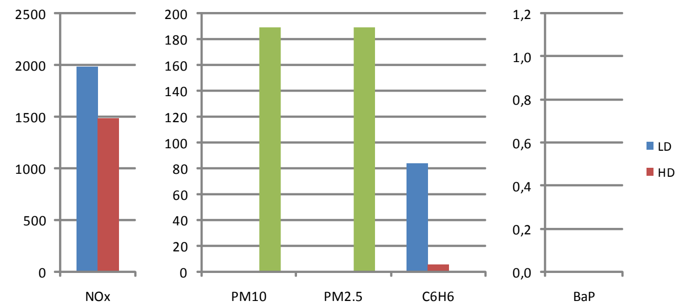
Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	1,17E+09	95 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	6,56E+07	5 %	(heavy goods vehicles, incl. buses, coaches)
Total	1,24E+09		

(Information valid for *City* 2004)

Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	1986	1488		
PM10			190	
PM2.5			190	
C6H6	85	6		
BaP				
CO2	554952	139106		



(Information from *questionn City*)

for all graphs, unit = tons per year

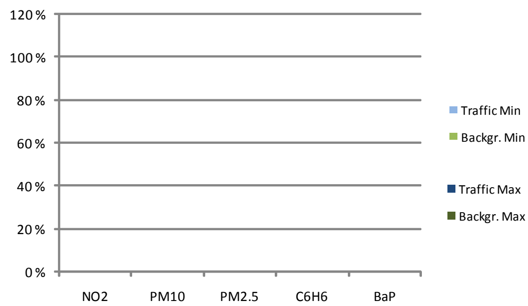
blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Assessment year 2004

Pollutants available	NOx	
	PM10 N-Ex	PM2.5 N-Ex
	NMVOC	C6H6
	PAH	BaP
	CO2	

Contributions of road traffic to pollutant concentrations in city

	percental			
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				



(Information from *questionnaire*)

Assessment year

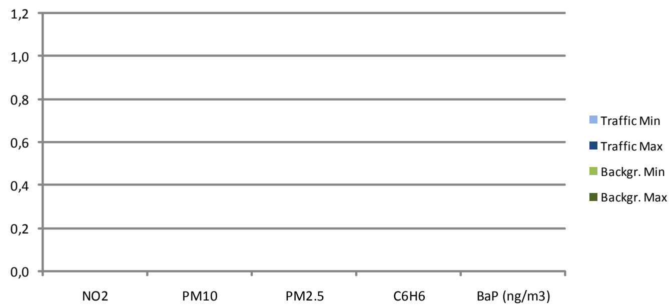
Pollutants available

Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

Traffic stations
Background stations

	absolute (µg/m3)			
	Traffic Min	Traffic Max	Backgr. Min	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Osnabrück
Country	Germany
Latitude (°N)	52,279
Longitude (°E)	8,043
Population	164000
Area (km2)	120
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

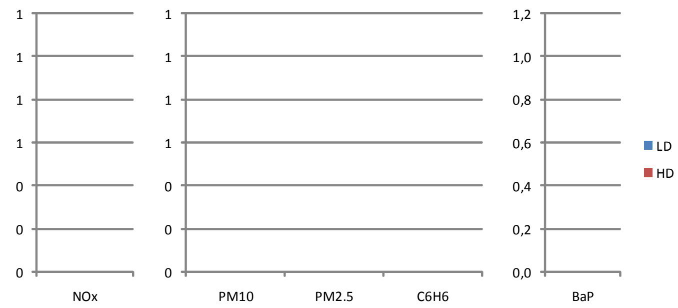
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				1436
PM10				123
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air plan*)

Assessment year 2006

Pollutants available NOx
PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

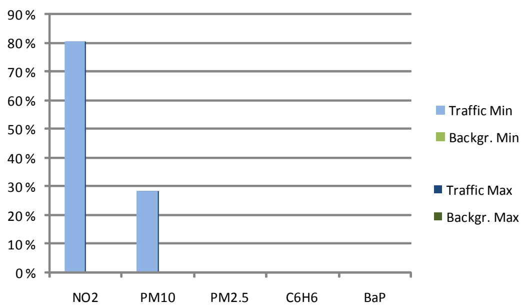
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	81 %	81 %			
PM10	29 %	29 %			
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2006

Pollutants available PM10
NOx

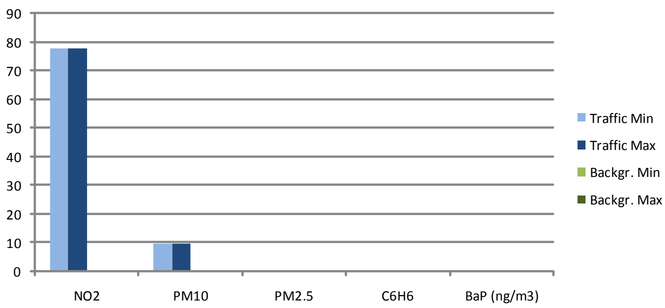
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	78,0	78,0		
PM10	9,8	9,8		
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Oslo
Country	Norway
Latitude (°N)	59,912
Longitude (°E)	10,734
Population	575000
Area (km2)	430
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for *City*)

Annual emissions from road sources (tons per year)

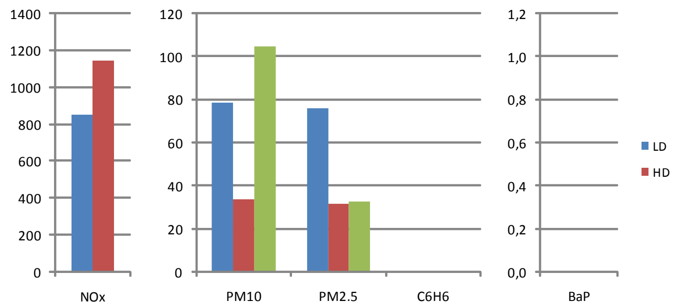
	LD	HD	N-Ex	Total
NOx	855	1147		
PM10	79	34	105	
PM2.5	76	32	33	
C6H6				
BaP				
CO2	504000	164000		

includes light commercial vehicles

(Information from *questionn City*)

Assessment year 2006

Pollutants available: NOx; PM10, PM2.5; NMVOC; CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

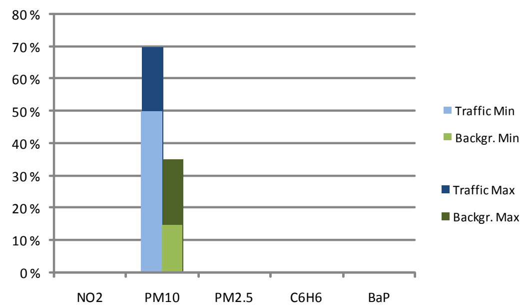
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	>88%	>88%		
PM10	50 %	70 %	15 %	35 %
PM2.5				
C6H6				
BaP				

(Information from *questionn City*)

Assessment year

Pollutants available

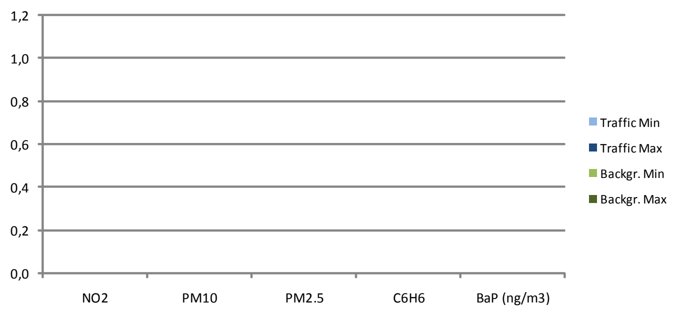
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			x
Road charges or tolls	x		
Speed moderation, traffic calming	x		
Parking related measures	x		
Promoting collective transport	x		
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x	x	
Landuse measures intending to limit car dependency	x		
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x	x	
Promoting walking	x	x	
Taking actions on urban freight and logistics			x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	N	40 µg/m3 by 2010
Hourly NO2 limit	N	N	200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit	Y	Y	50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Prague
Country	Czech Republic
Latitude (°N)	50,083
Longitude (°E)	14,436
Population	1220000
Area (km2)	496
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for *City*)

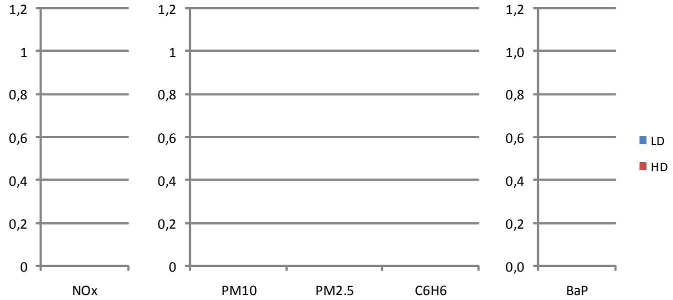
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from *database*)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	25 %	75 %	10 %	25 %
PM10	20 %	60 %		
PM2.5				
C6H6	15 %	75 %	15 %	30 %
BaP				

(Information from *questionn City*)

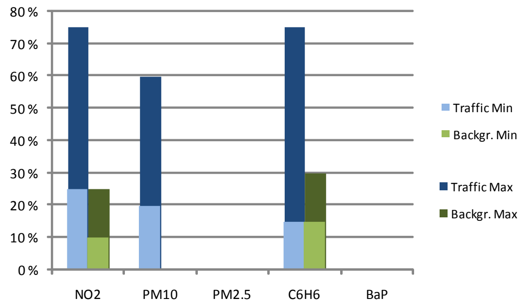
Assessment year

Pollutants available

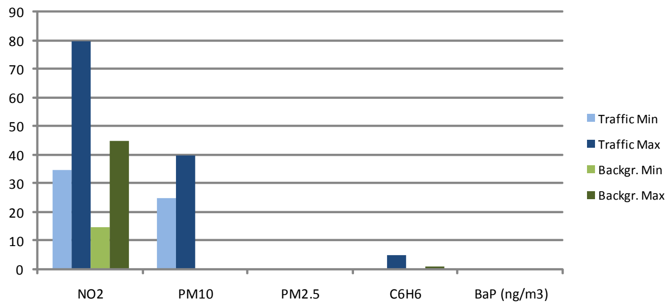
Traffic stations
Background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	35,0	80,0	15,0	45,0
PM10	25,0	40,0		
PM2.5				
C6H6	0,5	5,0	0,5	1,0
BaP (ng/m3)				

(Information from *questionnaire*)



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls		x	
Speed moderation, traffic calming	x	x	
Parking related measures	x		
Promoting collective transport	x		x
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x	x	x
Landuse measures intending to limit car dependency	x	x	
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems			x
Promoting cycling	x		
Promoting walking	x	x	
Taking actions on urban freight and logistics			x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N		40 µg/m3 by 2010
Hourly NO2 limit	N		200 µg/m3 by 2010
Annual PM10 limit	N		40 µg/m3 by 2005
Daily PM10 limit	N		50 µg/m3 by 2005
Annual PM2.5 target	Y		25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y		5 µg/m3 by 2010
Annual BaP target	N		1 ng/m3 by 2012

General Information (to obtain from database)

City	Roma
Country	Italy
Latitude (°N)	41,893
Longitude (°E)	12,483
Population	2730000
Area (km2)	1290
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

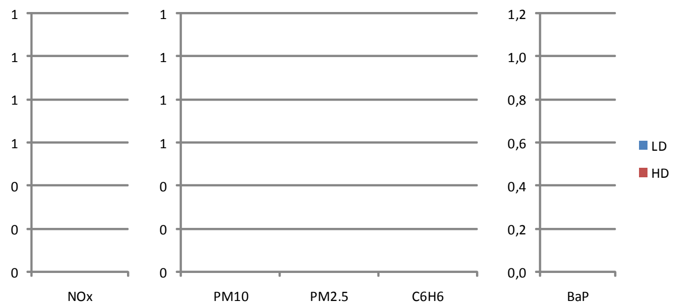
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				
PM10				
PM2.5				
C6H6				
BaP				
CO2				

(Information from)

Assessment year

Pollutants available



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

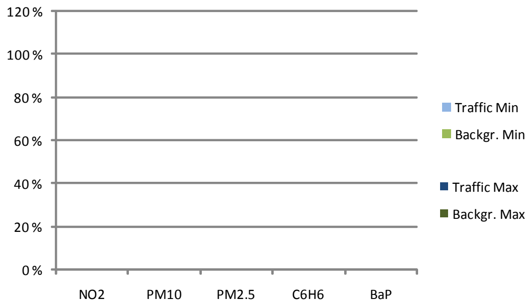
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2					
PM10					43 %
PM2.5					31 %
C6H6					
BaP					

(Information from *database*)

Assessment year 2004/2005

Pollutants available PM10
PM2.5

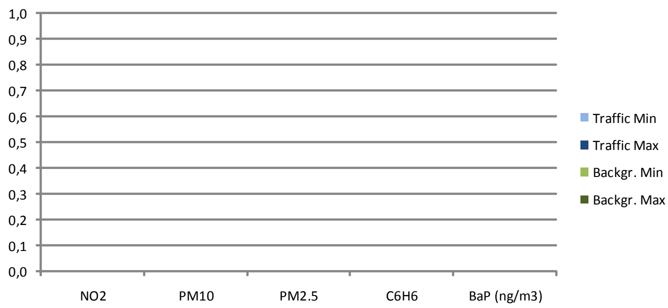
Traffic stations 1
Background stations 1



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2					
PM10					17,0
PM2.5					8,1
C6H6					
BaP (ng/m3)					

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Rotterdam
Country	Netherlands
Latitude (°N)	51,923
Longitude (°E)	4,479
Population	585000
Area (km2)	304
Site character	

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total	6,43E+09	

(Information valid for *LUZ*)

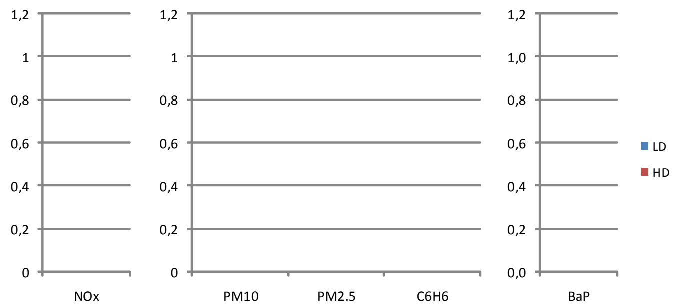
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				6260
PM10				320
PM2.5				
C6H6				
BaP				
CO2				1550000

(Information from *questionn LUZ*)

Assessment year 2006

Pollutants available: NOx, PM10, CO2, NMVOC



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

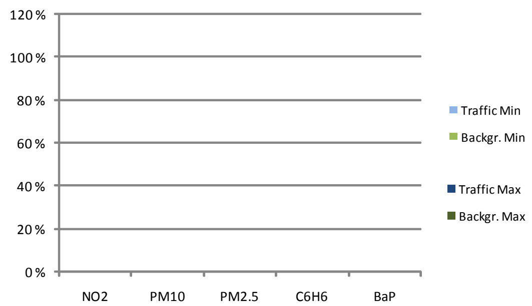
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

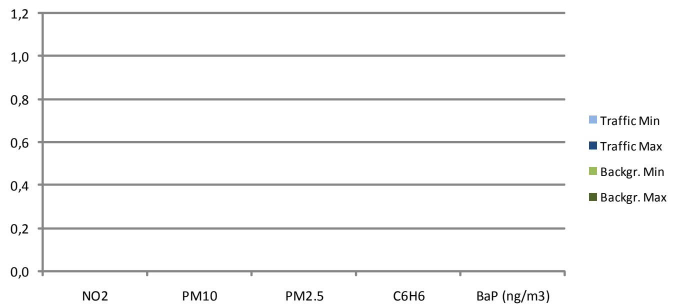
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures	x		
Promoting collective transport	x	x	x
Taking action on public fleets	x	x	x
Encouraging cleaner fuels and vehicles	x	x	x
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use	x	x	
Flexible innovative and demand responsive transport systems			
Promoting cycling	x	x	x
Promoting walking	x	x	
Taking actions on urban freight and logistics			x

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	N	Y	40 µg/m3 by 2005
Daily PM10 limit	N	Y	50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target	Y	Y	1 ng/m3 by 2012

General Information (to obtain from database)

City	Stockholm
Country	Sweden
Latitude (°N)	59,328
Longitude (°E)	18,055
Population	810000
Area (km2)	380
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	3,02E+09	95 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	1,76E+08	6 %	(heavy goods vehicles, incl. buses, coaches)
Total	3,20E+09		

(Information valid for *City*)

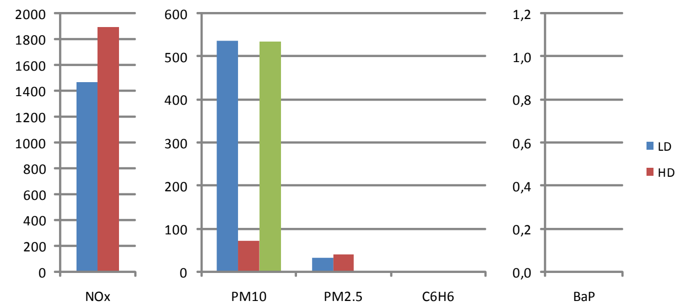
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	1468	1893		
PM10	538	72	534	
PM2.5	34	42		
C6H6				
BaP				
CO2	761737	208792		

(Information from *questionn City*)

Assessment year 2007

Pollutants available: NOx, PM10, PM2.5, NMVOC, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

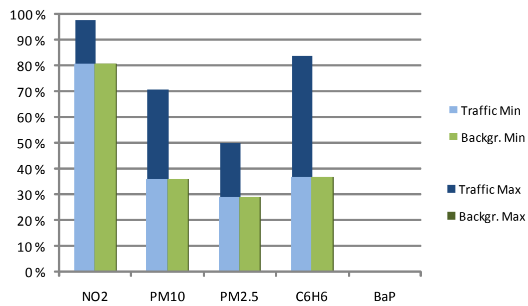
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	81 %	98 %	81 %	81 %
PM10	36 %	71 %	36 %	36 %
PM2.5	29 %	50 %	29 %	29 %
C6H6	37 %	84 %	37 %	37 %
BaP				

(Information from *questionn City*)

Assessment year

Pollutants available

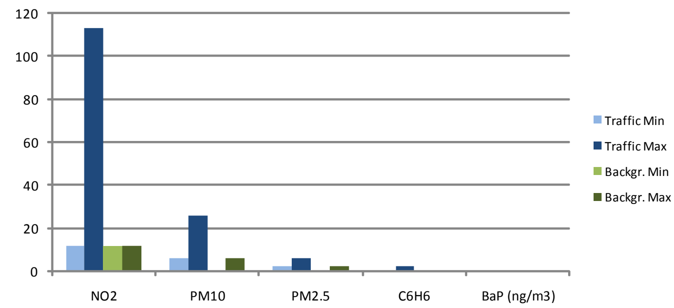
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	12,0	113,0	12,0	12,0
PM10	6,0	26,2	0,0	6,0
PM2.5	2,5	6,3	0,0	2,5
C6H6	0,3	2,6	0,0	0,3
BaP (ng/m3)				

(Information from *questionn City*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x	x	x
Road charges or tolls	x		x
Speed moderation, traffic calming	x	x	
Parking related measures			x
Promoting collective transport	x	x	x
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x	x	
Landuse measures intending to limit car dependency	x		
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling	x	x	
Promoting walking		x	
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	>10%	>10%
PM10	0-5%	0-5%
PM2.5	>10%	>10%
CO2	5-10%	5-10%
NMVOC	>10%	>10%
PAH	>10%	>10%

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	Y	40 µg/m3 by 2010
Hourly NO2 limit	Y	Y	200 µg/m3 by 2010
Annual PM10 limit	Y	Y	40 µg/m3 by 2005
Daily PM10 limit	N	N	50 µg/m3 by 2005
Annual PM2.5 target	Y	Y	25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target	Y	Y	1 ng/m3 by 2012

General Information (to obtain from database)

City	Stuttgart
Country	Germany
Latitude (°N)	48,774
Longitude (°E)	9,180
Population	600000
Area (km2)	207
Site character	City located in basin, insufficient ventilation

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	3,84E+09	93 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	3,08E+08	7 %	(heavy goods vehicles, incl. buses, coaches)
Total	4,15E+09		

(Information valid for *City*)

Annual emissions from road sources (tons per year)

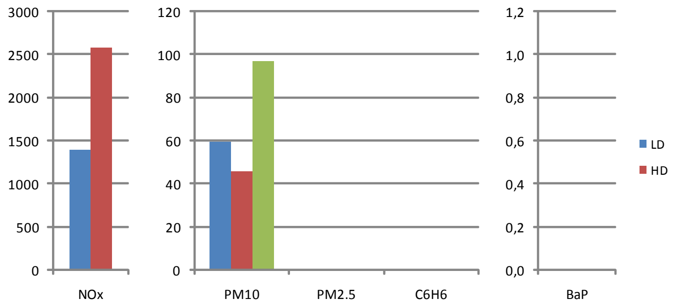
	LD	HD	N-Ex	Total
NOx	1398	2579		
PM10	60	46	97	
PM2.5				
C6H6				
BaP				
CO2	1188	236		

??? Both values are very low

(Information from *questionn City*)

Assessment year 2007

Pollutants available: NOx, PM10, NMVOC, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

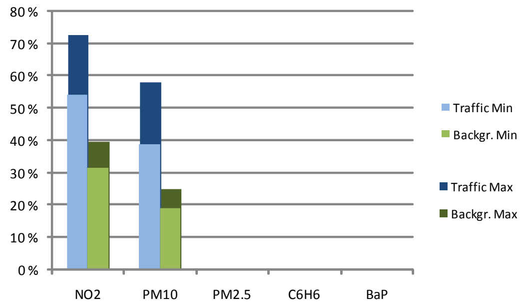
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	54 %	73 %	32 %	40 %
PM10	39 %	58 %	19 %	25 %
PM2.5				
C6H6				
BaP				

(Information from *questionn City*)

Assessment year

Pollutants available

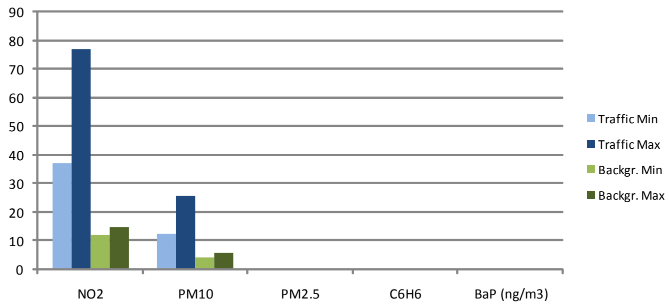
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2	37,0	77,0	12,0	15,0
PM10	12,5	25,7	4,4	5,8
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionn City*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x	x	
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures	x		
Promoting collective transport	x	x	
Taking action on public fleets	x	x	
Encouraging cleaner fuels and vehicles	x	x	
Landuse measures intending to limit car dependency	x	x	
Travel plans with a view to reducing private car use	x		
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x		
Promoting walking	x		
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx	0-5%	5-10%
PM10	0-5%	5-10%
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit	N	Y	40 µg/m3 by 2010
Hourly NO2 limit	N	Y	200 µg/m3 by 2010
Annual PM10 limit	N	Y	40 µg/m3 by 2005
Daily PM10 limit	Y	Y	50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit	Y	Y	5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Thessaloniki
Country	Greece
Latitude (°N)	40,623
Longitude (°E)	22,954
Population	764000
Area (km2)	100
Site character	Surrounded by high mountains on two sides; located in a gulf; Often calm wind: inefficient pollutant dispersion

Annual transport volume (km per year)

	km/(veh yr)	
Light traffic		(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		(heavy goods vehicles, incl. buses, coaches)
Total		

(Information valid for)

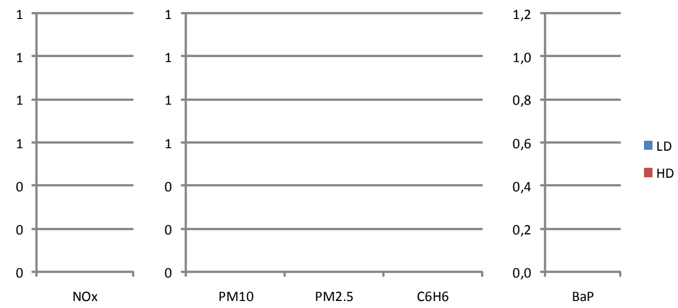
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx				15944
PM10				732
PM2.5				
C6H6				
BaP				
CO2				

(Information from *scientific article*)
Greater Thessaloniki Area

Assessment year 2002

Pollutants available NO2
O3
SO2
CO
PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

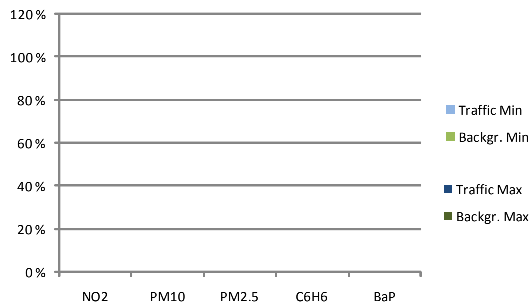
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2					
PM10					
PM2.5					
C6H6					
BaP					

(Information from)

Assessment year

Pollutants available

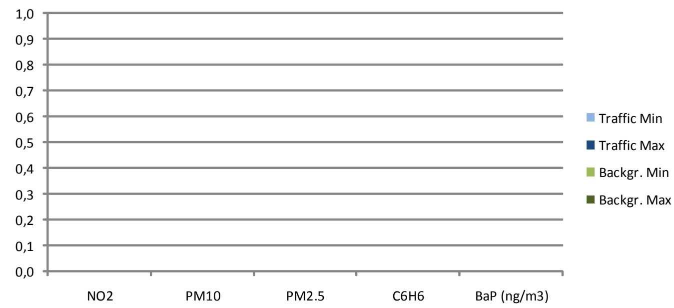
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations
of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations
of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015		
Annual NO2 limit	Y		40 µg/m3 by 2010	not in the city centre
Hourly NO2 limit	Y		200 µg/m3 by 2010	
Annual PM10 limit	N		40 µg/m3 by 2005	
Daily PM10 limit			50 µg/m3 by 2005	
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015	
Annual C6H6 limit			5 µg/m3 by 2010	
Annual BaP target			1 ng/m3 by 2012	

see article by Moussiopoulos et al., 2009 (Atmos. Environ.)

General Information (to obtain from database)

City	Ulm (only the part of the city that lies in Baden-Württemberg)	
Country	Germany	
Latitude (°N)	48,396	
Longitude (°E)	9,993	
Population	121000	plus another 52000 in the part that lies in Bayern (there it is called Neu-Ulm)
Area (km2)	120	plus 80 km2 in Bayern
Site character		

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic		93 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic		7 %	(heavy goods vehicles, incl. buses, coaches)
Total			
(Information valid for	2004)		

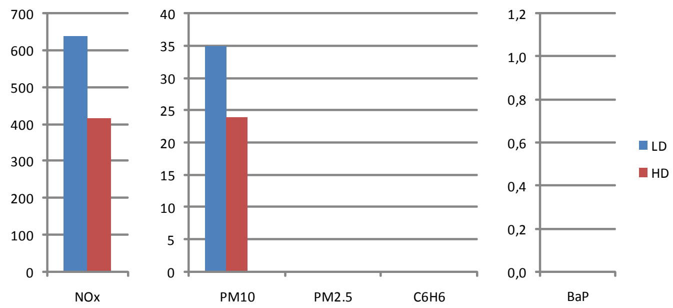
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	640	418		
PM10	35	24		
PM2.5				
C6H6				
BaP				
CO2				

(Information from *clean air plan*)

Assessment year 2004

Pollutants available: CO, NOx, NMVOC, Total PM, PM10



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

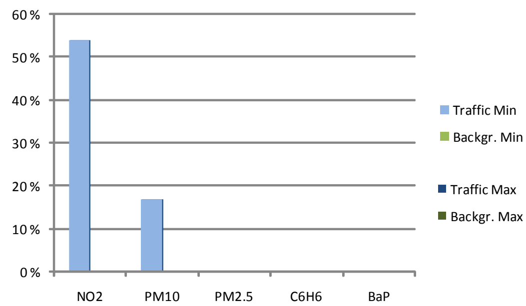
	percental				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	54 %	54 %			
PM10	17 %	17 %			24 %
PM2.5					
C6H6					
BaP					

(Information from *database*)

Assessment year 2007

Pollutants available: PM10, NO2

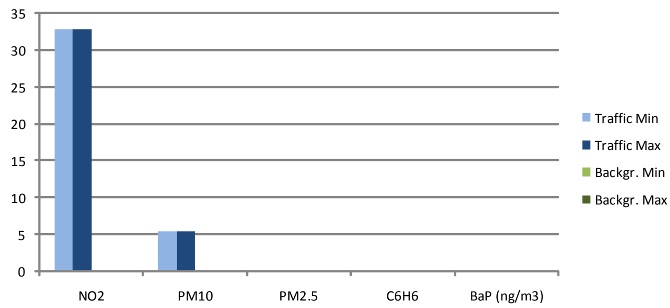
Traffic stations	1
Background stations	0



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)				
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Ma	Traff N-Ex
NO2	32,9	32,9			
PM10	5,4	5,4			7,7
PM2.5					
C6H6					
BaP (ng/m3)					

(Information from *database*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions			
Road charges or tolls			
Speed moderation, traffic calming			
Parking related measures			
Promoting collective transport			
Taking action on public fleets			
Encouraging cleaner fuels and vehicles			
Landuse measures intending to limit car dependency			
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems			
Promoting cycling			
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

General Information (to obtain from database)

City	Wien
Country	Austria
Latitude (°N)	48,211
Longitude (°E)	16,357
Population	1700000
Area (km2)	415
Site character	

Annual transport volume (km per year)

	km/(veh yr)		
Light traffic	1,69E+07	95 %	(passenger cars, incl. SUVs, taxis, incl. light commercial vehicles, incl. mopeds, motorbikes)
Heavy traffic	9,29E+05	5 %	(heavy goods vehicles, incl. buses, coaches)
Total	1,78E+07		

(Information valid for *City*)

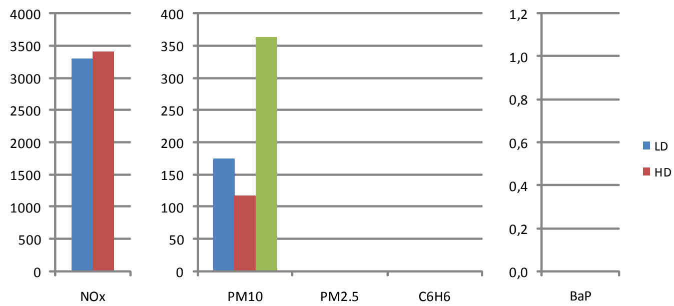
Annual emissions from road sources (tons per year)

	LD	HD	N-Ex	Total
NOx	3310	3415		
PM10	176	118	364	
PM2.5				
C6H6				
BaP				
CO2	1334000	326000		

(Information from *questionn City*)

Assessment year 2008

Pollutants available: NOx, PM10, NMVOC, CO2



for all graphs, unit = tons per year

blue: light duty, red: heavy duty
green: non-exhaust (applies only to PM)

Contributions of road traffic to pollutant concentrations in city

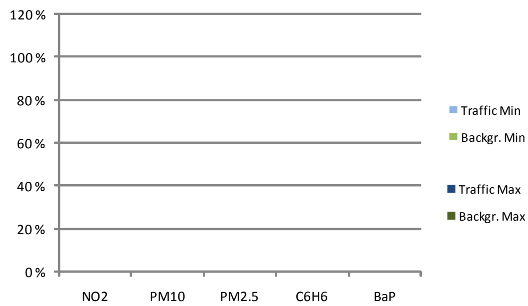
	percental			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP				

(Information from *questionnaire*)

Assessment year

Pollutants available

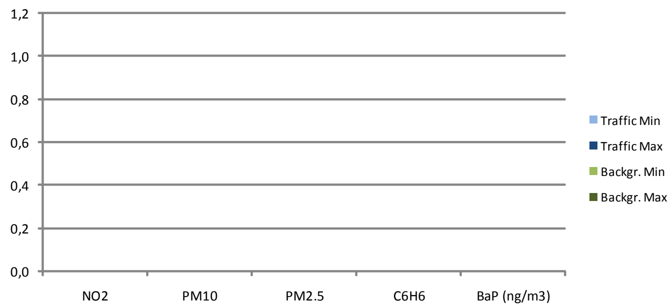
Traffic stations
Background stations



Percental (minimum and maximum) traffic contributions to concentrations of several pollutants at traffic and urban background stations

	absolute (µg/m3)			
	Traffic Mi	Traffic Ma	Backgr. Mi	Backgr. Max
NO2				
PM10				
PM2.5				
C6H6				
BaP (ng/m3)				

(Information from *questionnaire*)



Absolute (minimum and maximum) traffic contributions (µg/m3) to concentrations of several pollutants at traffic and urban background stations

Transport related actions and measures

	implem.	planned	envision.
Road access restrictions	x		
Road charges or tolls			
Speed moderation, traffic calming	x		
Parking related measures	x		
Promoting collective transport	x		
Taking action on public fleets	x		
Encouraging cleaner fuels and vehicles	x	x	
Landuse measures intending to limit car dependency	x		
Travel plans with a view to reducing private car use			
Flexible innovative and demand responsive transport systems	x		
Promoting cycling	x		
Promoting walking			
Taking actions on urban freight and logistics			

see detailed overview of measures for all cities in the worksheet 'Table of measures (all cities)'

Expected intervals of emission reduction

	2005-2010	2005-2015
NOx		
PM10		
PM2.5		
CO2		
NMVOC		
PAH		

Expected conformance to EU air quality standards

	2010	2015	
Annual NO2 limit			40 µg/m3 by 2010
Hourly NO2 limit			200 µg/m3 by 2010
Annual PM10 limit			40 µg/m3 by 2005
Daily PM10 limit			50 µg/m3 by 2005
Annual PM2.5 target			25 µg/m3 target by 2010, limit by 2015
Annual C6H6 limit			5 µg/m3 by 2010
Annual BaP target			1 ng/m3 by 2012

Appendix D

Detailed Mitigation Strategies

City	Road access restrictions	applying to passenger cars	applying to light commercial vehicles	applying to heavy goods vehicles	applying to buses/coaches	applying to motorbikes/mopeds	based upon emissions of vehicles	Road charges or tolls	applying to passenger cars	applying to light commercial vehicles	applying to heavy goods vehicles	applying to buses/coaches	applying to motorbikes/mopeds	differentiated according to emissions of vehicles	Speed moderation, traffic calming	zones 10, 20, 30 km/h	traffic light coordination	adaptive speed control systems	automatic detection and sanction of speeding	Parking related measures	parking restrictions for most polluting vehicles	parking restrictions for commuters	parking fees differentiated according to emissions	standards limiting parking supply in new buildings
Aachen (DE)		◇	◇	◇	◇	-	◇										◈					◈		
Amsterdam (NL)				◈			◈												◈				◆	
Augsburg (DE)		◆	◆	◆	◆	-	◆	N								◆	◆	◈	◇					
Barcelona (ES)	Y								◈					◈			◈	◆				◇		
Belfast (UK)									◇	◇	◇	◇				◈	◈	◈	◈			◈		◈
Berlin (DE)		◈	◈	◈	◈	-	◈									◇	◈							
Bielefeld (DE)																								
Bologna (IT)																								
Bonn (DE)				◈			◇									◆	◈					◆		
Bordeaux (FR)	no information given in questionnaire																							
Braunschweig (DE)				◈												◆	◈							
Bremen (DE)		◆	◆	◆	◆	-	◆				◆					◆	◆		◆					
Bristol (UK)		◈	◈	◈	◈		◈		◈	◈	◈	◈		◈		◈	◈					◈		
Brno (CZ)		◆	◆	◆	◆											◆	◆	◈						
Bruxelles / Brussel (BE)			◇	◇										◈		◆	◆		◆			◇		◆
Budapest (HU)																								
Cardiff (UK)		◆					◈	N									◆	◆	◆			◇		◈
Chemnitz (DE)		◇	◇	◇	◇		◇									◆	◆							
Darmstadt (DE)		◇	◇	◆	◇	-	◇										◈							
Dresden (DE)																								
Erfurt (DE)		◈	◈	◈	◈	◈	◇									◆	◆					◆		
Frankfurt am Main (DE)		◆	◆	◆	◆	-	◆		-	-	◆	-	-	◆		◆	◆					◆		◆
Freiburg im Breisgau (DE)		◈	◈	◈	◈	-	◈	N								◈	◆							
Gdansk (PL)																								
Genève (CH)		◈	◈	◈	◈	◈	◈									◆	◆					◈		◆
Genova (IT)																								
Göteborg (SE)				◆	◆		◆																◆	
Grenoble (FR)																◆	◆	◆	◆			◆		◆
Hamburg (DE)						-	◈	◈			◇					◆	◆		◈					
Heilbronn (DE)		◆	◆	◆	◆		◆										◈							
Helsinki (FI)				◆	◈		◈									◆	◆	◆	◆				◈	◆
Karlsruhe (DE)		◈	◈	◈	◈		◈										◆							
Köln (DE)																								
Kraków (PL)	y																							
Lyon (FR)			◆	◆			◆		◇	◇	◇		◇	◇		◆	◆		◆					
Madrid (ES)		◆	◆	◆	◆	◆	◇		◇	◇	◇	◇	◇	◆		◇		◇	◆				◈	◆
Malmö (SE)				◆	◆											◆	◆	◇						◈
Manchester (UK)																◆			◆			◇		
Mannheim (DE)		◆	◆	◆	◆		◆										◆							
Milano (IT)									◆															
München (DE)		◆	◆	◆	◆		◆	N								◆	◆					◆		
Münster (DE)		◈	◈	◈	◈	-	◈									◆	◆		◇					
Nantes (FR)		◆	◆	◆												◆	◆		◆			◆		◈
Nottingham (UK)																◆			◆					
Odense (DK)																								
Oslo (NO)				◇					◆	◆	◆	◆		◆		◆			◆					◆
Osnabrück (DE)		◈	◈	◈	◈	-	◈									◆	◆							
Praha (CZ)		◆	◆	◆	◆	◆	◆		◈	◈	◈	◈	◈	◈		◆	◆	◈	◆			◆		
Rotterdam (NL)				◆			◆										◆	◆	◆					
Stockholm (SE)		◈	◈	◆	◆		◇		◆	◆	◆	◆		◇		◆	◆	◆	◆				◇	
Stuttgart (DE)		◆	◆	◆		-	◆									◆	◆	◆				◆		◆
Ulm (DE)																								
Utrecht (NL)				◆			◆																	
Wien (AT)				◆												◆	◆		◆					
Wiesbaden (DE)		◇	◇	◈	◈		◈										◈							

City	Promoting collective transport	setting targets on increasing public transport modal share	densification and extension of network	increasing frequency	increasing speed (right of way, dedicated lanes)	improving comfort (stops, stations, vehicles)	improving security	improving passengers information	improving ticketing systems	developing demand responsive collective transport	Taking actions on public fleets	setting emission standards for purchase of new vehicles	setting emission standards for rental of vehicles	setting standards for transport fuels used in public fleets	inspection of emissions and maintenance programme	Encouraging cleaner fuels and vehicles	economic incentives for cleaner vehicles and fuels	developing facilities for electric vehicles	developing facilities for hydrogen vehicles	developing facilities for biofuels	developing facilities for CNG vehicles	inspecting emissions of vehicles	retrofitting scheme for most polluting vehicles	raising public awareness on cleaner fuels and vehicles	setting up demonstration projects	promoting use of cleaner taxis	promoting use of cleaner buses and coaches	promoting use of cleaner vehicles for deliveries
Aachen (DE)		◆	◈		◈							◆	◆	◆									◆					
Amsterdam (NL)												◈					◆	◆	◈				◆			◆		◆
Augsburg (DE)		◈	◆	◆	◆				◆			◆		◆									◈					
Barcelona (ES)		◆	◆	◆	◆	◈		◆	◈			◈		◈			◈			◈	◈					◆	◆	
Belfast (UK)		◈	◈	◈	◈	◈		◈	◈	◈		◈		◈	◈		◈						◈	◈				
Berlin (DE)			◈		◈							◆	◇	◆			◆				◆		◆			◆		
Bielefeld (DE)																												
Bologna (IT)																												
Bonn (DE)			◈									◆									◈							
Bordeaux (FR)																												
Braunschweig (DE)		◆	◈	◈	◆	◆		◆	◆			◆																
Bremen (DE)			◆	◆	◆	◆	◆	◆	◆			◆					◆	◇			◆			◆	◆	◆	◆	◆
Bristol (UK)		◆	◆	◈	◆	◈		◆	◈	◆		◈	◈	◈			◈					◈	◈	◈				◈
Brno (CZ)		◇	◈	◈	◆	◆						◆		◆	◆						◆		◆			◆	◆	
Bruxelles / Brussel (BE)		◆	◆	◆	◆	◆		◆	◆	◆		◈			◆		◆					◆	◆	◆		◇	◇	
Budapest (HU)			◈																									
Cardiff (UK)		◆	◆		◆			◆	◈	◆					◆													
Chemnitz (DE)		◈	◆		◆	◆		◆	◆			◆									◆		◆					
Darmstadt (DE)		◆	◆									◆	◆	◆	◆								◆	◆			◆	
Dresden (DE)																												
Erfurt (DE)			◆		◆	◆		◆				◆																
Frankfurt am Main (DE)		◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆				◇	◆	◆	◆	◆		◆	◆	◆	◆	◆
Freiburg im Breisgau (DE)		◆	◈	◈	◆							◆					◆				◆							
Gdansk (PL)		◈	◈			◈																						
Genève (CH)		◆	◆	◆	◆	◆	◆	◆	◆	◆		◈					◆					◈		◆			◆	
Genova (IT)		◆			◆			◆	◆	◆																		
Göteborg (SE)																	◆											
Grenoble (FR)		◆	◆	◆	◆	◆	◆	◆	◆	◆		◈					◆	◆		◆	◆						◆	
Hamburg (DE)		◆	◈		◆			◈				◈		◈			◈		◈			◆	◈	◆				◈
Heilbronn (DE)				◈		◈			◈			◆	◆										◆					
Helsinki (FI)		◆	◆	◆	◆	◆	◆	◆	◆	◆		◈	◈	◈	◆		◈	◈		◈	◈	◆	◈	◈	◆	◈	◈	
Karlsruhe (DE)			◆		◆	◆		◈	◈			◈	◈										◆					
Köln (DE)																												
Kraków (PL)																												
Lyon (FR)		◆	◆	◆	◆	◆	◆	◆	◆															◆	◆		◆	◆
Madrid (ES)		◈	◈		◆	◈		◈				◆	◆	◆	◆		◆	◈	◈	◇	◈	◆		◆	◆	◆	◆	◆
Malmö (SE)		◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆			◆	◇	◆	◇	◆		◆	◆	◆		◆	
Manchester (UK)			◈	◈	◈	◈		◈		◆		◆	◆				◈					◆	◆	◆				
Mannheim (DE)			◈	◈	◈			◈	◈			◆											◆					
Milano (IT)		◈	◈																									
München (DE)		◆	◆	◈	◆	◈		◆				◆		◆			◇							◇				◈
Münster (DE)		◈	◈	◈	◆							◆	◆	◈			◆						◆	◆		◆		
Nantes (FR)		◆	◆	◆	◆	◆	◆	◆	◆												◆						◆	
Nottingham (UK)			◆		◆		◈	◈	◆															◈				
Odense (DK)		◆	◈		◈							◈																
Oslo (NO)		◆	◆	◆	◆	◆		◆	◆			◆	◆	◆				◆		◈			◆				◆	
Osnabrück (DE)		◆	◈		◈	◈						◆	◆															
Praha (CZ)		◆	◆	◆	◆	◆	◆	◆	◆	◇		◆			◆			◇					◈	◇			◆	
Rotterdam (NL)			◆	◇		◈		◆	◆	◇		◆		◇				◆		◆			◆	◆	◆	◆	◆	◇
Stockholm (SE)		◆	◈	◈	◈	◈	◈	◈	◈	◇		◆		◆			◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	◆
Stuttgart (DE)		◆	◈		◆	◆	◆	◆	◆			◈		◈	◆			◆	◆	◆	◆	◆	◆	◆			◆	
Ulm (DE)																												
Utrecht (NL)																												
Wien (AT)		◆	◆	◆	◆	◆	◆	◆	◆			◆		◆			◆							◆		◈		
Wiesbaden (DE)		◆	◆									◆	◆	◆									◆					

LEGEND:

Implemented	◆	Questionnaire	q	general 'yes'	Y
Planned	◈	Action plan	ap	dismissed explicitly	N
Envisioned	◇				

	Landuse measures intending to limit car dependency	controlling land prices with a view to limiting suburban sprawl	setting urban density standards to avoid low density extensions	orienting new housing and offices along railway corridors and cycling network	making urban extensions conditional to access to public transport and cycling network	favouring compact and dense urban forms	planning car free housing areas	**Travel plans with a view to reducing private car use**	promoting travel plans for schools	promoting travel plans for work places	**Flexible innovative and demand responsive transport systems**	car sharing	van pooling	collective taxis, taxi-buses	vélo-taxis	**Promoting cycling**	setting targets on increasing cycling modal share	densifying and extending the cycling network and improving continuity	making road crossings safer for cyclists	providing parking areas and facilities for bikes	setting up bike sharing scheme	reallocation of road space to cycling lanes and tracks	promoting cycling at schools	promoting cycling at work places	**Promoting walking**	setting quantitative targets aiming to increase walking modal share	densifying and extending walking network and improving continuity	making road crossings safer for walkers	reallocation of road space to walking paths and strolling zones	promoting walking at schools	promoting walking at work places	**Taking actions on urban freight and logistics**	promoting round deliveries instead of parallel deliveries to reduce last miles	setting up 'nearby deliveries areas'	solutions and standards aiming to maximise loading of vehicles and avoid empty journeys	setting up green logistics centres aiming to coordinate deliveries and limit miles	**Providing advice to the public on sustainable urban mobility solutions**		Source		Year
Aachen (DE)				◈	◈					◆		◆					◈	◈	◈	◆						◈			◈				◆		◆				ap	1	2009
Amsterdam (NL)						◈														◈			◆							◆						◆			ap		2006, 2008
Augsburg (DE)										◈							◈	◆		◈			◈			◈	◈	◈		◈			◈		◈	◈			ap	1	2009
Barcelona (ES)			◈	◈	◇	◈				◆		◆	◇				◆	◈		◆	◆			◆		◆	◆				◆				◇			◆	q	1	2009
Belfast (UK)										◈								◈	◈	◈		◈		◈			◈	◈	◈		◈								ap	1	2006
Berlin (DE)																	◆									◆									◆				ap	1	2005
Bielefeld (DE)																																		no clean air plan, no action plan exists to date							
Bologna (IT)					◆							◈																											www		
Bonn (DE)										◆				◆						◆		◆	◆	◆		◇													ap	1	2009
Bordeaux (FR)																																									-
Braunschweig (DE)		◆		◆	◆					◆								◈		◆		◆					◈		◈										ap	1	2006
Bremen (DE)		◆		◆	◆	◆	◆		◆	◈		◈										◆	◆																q	1	2009
Bristol (UK)									◆	◆		◈		◆			◆	◈		◈			◈	◆			◈	◆	◈	◈				◈		◈			ap	1	2004
Brno (CZ)			◈	◈	◈	◈	◆					◇					◈	◈	◈	◈		◈	◈	◈															q	1	2009
Bruxelles / Brussel (BE)						◇			◆	◆		◆		◆			◆	◈		◆	◈	◆	◆	◆		◈	◈		◈	◈	◈					◈			q	1	2009
Budapest (HU)																																							www		
Cardiff (UK)			◈	◈	◈	◈			◆	◈				◆			◆	◆	◆	◆			◆	◆		◆	◈	◆	◇	◆									ap	1	2000, 2009
Chemnitz (DE)			◈			◈				◇							◈	◆	◈	◆						◈	◈	◆	◆										ap	1	2006, 2008
Darmstadt (DE)			◆			◆						◇					◆	◆						◆												◇			ap	1	2007
Dresden (DE)										◆		◆																											ap		2008
Erfurt (DE)																		◆		◈																			ap	1	2004
Frankfurt am Main (DE)		-	◆	◆	◆	◆	-		◆	◆		◆	-	-	◆		◆	◆	◆	◆	◆	◆	◆	◆		-	◆	◆	◆	◆			◇	◇	◇	◆			q	1	2009
Freiburg im Breisgau (DE)			◈	◈	◈	◈						◆					◈	◈		◈		◈					◈	◆	◆										ap	1	2008
Gdansk (PL)																																							ap		2006
Genève (CH)				◈	◈	◈	◈			◆		◆			◆		◆	◆	◆	◆		◆		◆			◆	◆											q	1	2009
Genova (IT)																										◆	◆					Y							www		
Göteborg (SE)																																							www		
Grenoble (FR)		◇	◆	◈	◈	◈			◆	◆		◆	◈	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	◆		◇	◇					q	1	2009
Hamburg (DE)														◈			◈	◈						◆		◈													ap	1	2004
Heilbronn (DE)										◈		◇					◈	◆		◈				◇															ap	1	2008
Helsinki (FI)				◆	◆	◆	◈			◈		◈					◆	◆	◆	◆	◆		◆	◈			◆	◆	◈	◆	◈								q	1	2009
Karlsruhe (DE)										◆							◆	◈	◈	◈	◈	◈																	ap	1	2006
Köln (DE)									◈	◈																													ap		2006
Kraków (PL)																																							www		
Lyon (FR)			◆	◆	◆	◆			◆	◆		◆			◆		◆	◆	◆	◆	◆	◆				◆	◆	◆	◆	◆			◇	◇	◇	◇			q	1	2009
Madrid (ES)					◇				◆	◆		◆	◆	◈			◆	◆	◆	◆	◈	◆	◆	◆		◆	◆	◆	◆	◆	◈		◆	◆	◈				q	1	2009
Malmö (SE)			◇				◇		◆	◈		◆					◆	◆	◆	◆	◇	◆	◆	◆		◈	◆	◆	◆	◆			◆	◆	◆	◇			q	1	2009
Manchester (UK)									◈	◆		◆					◆	◈	◈	◈						◆	◈	◈	◈										ap	1	2004
Mannheim (DE)																		◈		◈		◈					◈	◈	◈										ap	1	2006
Milano (IT)																			◈								◈	◆	◆												
München (DE)									◆	◆				◆				◆		◈							◆						◈			◈			ap	1	2004
Münster (DE)										◆		◆		◆			◆	◈	◈	◆		◆		◆											◈				ap	1	2009
Nantes (FR)			◆	◆	◆	◆			◆	◆		◆	◇		◆		◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆									q	1	2009
Nottingham (UK)			◈	◈		◈			◈	◈								◈									◈												ap		2006, 2008
Odense (DK)										◇		◇					◆		◈	◈														◈					ap		2008
Oslo (NO)				◆		◆			◆	◆		◆					◆	◆		◆	◆			◆			◆			◆					◇				q	1	2009
Osnabrück (DE)										◈							◆	◈		◈																			ap	1	2008
Praha (CZ)			◆	◈	◆	◈			◆			◇					◆	◆	◆	◆	◆	◆	◆			◈	◈	◆	◈	◆		◇							q	1	2009
Rotterdam (NL)									◆	◆							◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆					◇	◇				q	1	2009
Stockholm (SE)				◆	◆	◆											◆	◈	◈	◆	◆	◆		◆				◈											q	1	2009
Stuttgart (DE)			◆	◆	◆	◆	◈			◆		◆					◆	◆	◆	◆		◆						◆	◆										q	1	2009
Ulm (DE)										◈																													ap		2008
Utrecht (NL)																																							www		
Wien (AT)				◆		◆	◆					◆		◆			◆	◆	◆	◆	◆	◆	◆	◆															q	1	2009
Wiesbaden (DE)												◇					◆	◆						◆												◇			ap		2004
																																								38	
LEGEND:																																									
Implemented																																									
Planned																																									
Envisioned																																									

Appendix E

Advanced Analysis of Emissions/Contributions and Mitigation Strategies

	NOxTotal Emissions			NO2 Contributions				NO2 Limits				Actions			Implemented													
	(tons per year)	(tons per year and km2)	(tons per year and 1000 inh.)	min traffic	max traffic	min bg	max bg	Annual 2010	Hourly 2010	Annual 2015	Hourly 2015	impl.	plann.	envis.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	
Aachen (DE)	1222	8	4,86672	62 %	62 %			N				7	6	1	0	0	0	0	1	1	1	0	1	1	1	0	1	
Amsterdam (NL)												5	6		0	0	0	1	0	0	1	0	0	0	1	1	1	
Augsburg (DE)	816	5	2,96727												0	0	0	0	0	0	0	0	0	0	0	0	0	
Barcelona (ES)	37827	378	23,64188									8	9	5	0	0	1	0	1	0	1	1	1	1	1	1	0	
Berlin (DE)	8876	10	2,61059	54 %	54 %			N							0	0	0	0	0	0	0	0	0	0	0	0	0	
Bonn (DE)	1046	7	3,31947	62 %	76 %	38 %		N				6	4	2	0	0	1	1	0	1	0	0	1	1	1	0	0	
Bordeaux (FR)	6996	140	27,98400												0	0	0	0	0	0	0	0	0	0	0	0	0	
Braunschweig (DE)				50 %	50 %			N	Y			6	5		0	0	1	0	1	1	0	1	1	0	1	0	0	
Bremen (DE)				58 %	58 %	43 %	43 %	N				7	2	1	1	0	1	0	1	1	1	1	1	0	0	0	0	
Bristol (UK)				97 %	97 %							5	11		0	0	0	0	1	0	0	0	1	1	1	1	0	
Brno (CZ)	4537	20	11,34250	70 %	75 %	67 %	70 %	Y	Y	Y	Y	6	4	2	1	0	1	0	1	1	1	1	0	0	0	0	0	
Bruxelles (BE)	2347	15	2,27662	36 %	52 %	30 %	38 %	N	Y	N?	Y	8	5	4	0	0	1	1	1	1	1	0	1	1	1	0	0	
Chemnitz (DE)	1640	7	6,74897	46 %	81 %	20 %	20 %	N		N		6	4	2	0	0	1	0	1	1	1	0	0	0	1	1	0	
Clermont-Ferrand (FR)															0	0	0	0	0	0	0	0	0	0	0	0	0	
Darmstadt (DE)	1079	9	7,70714	59 %	67 %							6	1	3	1	0	0	0	1	1	1	1	0	0	1	0	0	
Edinburgh (UK)															0	0	0	0	0	0	0	0	0	0	0	0	0	
Erfurt (DE)*	167816	622	799,12381	46 %	46 %							5	2	1	0	0	1	1	1	1	0	0	0	0	1	0	0	
Frankfurt a.M. (DE)								N	Y	Y	Y	13	3	5	1	1	1	1	1	1	1	1	1	1	1	1	1	
Freiburg (DE)	1177	8	5,35000	55 %	66 %			N				6	6		0	0	1	0	1	1	1	0	0	1	0	1	0	
Genève (CH)	314	20	1,66809					N	Y			8	5		0	0	1	1	1	0	1	0	1	1	1	1	0	
Genova (IT)	1999	8	2,85571												0	0	0	0	0	0	0	0	0	0	0	0	0	
Grenoble (FR)	3046	169	19,52500					Y	Y	N	N	9	4	3	0	0	1	1	1	0	1	1	1	1	1	1	0	
Hamburg (DE)	9800	13	5,76471	50 %	60 %			Y	Y	Y	Y				0	0	0	0	0	0	0	0	0	0	0	0	0	
Heilbronn (DE)	1039	10	8,65833	51 %	64 %			N				4	6	2	1	0	0	0	0	1	1	0	0	0	1	0	0	
Helsinki (FI)	2277	11	3,92586	66 %	80 %	59 %	65 %	N	Y	Y	Y	9	9	1	1	0	1	1	1	1	1	1	0	0	1	1	0	
Karlsruhe (DE)	2569	15	8,85862	58 %	60 %							5	4		0	0	1	0	1	0	1	0	1	0	1	0	0	
Lisboa (PT)															0	0	0	0	0	0	0	0	0	0	0	0	0	
Lodz (PL)	8844	30	11,59073												0	0	0	0	0	0	0	0	0	0	0	0	0	
London (UK)															0	0	0	0	0	0	0	0	0	0	0	0	0	
Lyon (FR)	10888	227	23,06843					N	N	N	N	9		2	1	0	1	0	1	0	1	1	1	1	1	1	0	
Madrid (ES)	20874	34	6,42281					Y	Y	Y	Y	12	7	5	1	1	1	1	1	1	1	0	1	1	1	1	1	
Malmö (SE)				50 %	80 %	40 %	60 %	N	Y	Y	Y	11	5	10	1	0	1	1	1	1	1	0	1	1	1	1	1	
Mannheim (DE)	2879	20	8,72424	45 %	61 %	74 %	76 %	Y?				4	3		1	0	1	0	0	1	1	0	0	0	0	0	0	
Marseille (FR)	5249	22	6,24830												0	0	0	0	0	0	0	0	0	0	0	0	0	
Milano (IT)	7945	44	5,29667												0	0	0	0	0	0	0	0	0	0	0	0	0	
München (DE)	6932	22	5,09706	60 %	74 %	35 %	35 %	N				9	4	1	1	0	1	1	1	1	0	0	1	1	1	1	0	
Münster (DE)	1765	6	6,46520	48 %	72 %	39 %	39 %	Y	Y			6	5	1	0	0	1	0	1	1	1	0	0	1	1	0	0	
Nantes (FR)								Y	Y	Y	Y	10	10	6	1	0	1	1	1	0	1	1	1	1	1	1	0	
Nice (FR)	3474	48	9,92579												0	0	0	0	0	0	0	0	0	0	0	0	0	
Osnabrück (DE)	1436	12	8,75610	81 %	81 %			N							0	0	0	0	0	0	0	0	0	0	0	0	0	
Oslo (NO)	2002	5	3,48174	>88%	>88%			N	N	N	N	11	3	2	0	1	1	1	1	1	1	1	1	1	1	1	0	
Praha (CZ)				25 %	75 %	10 %	25 %	N	N			10	5	4	1	0	1	1	1	1	1	1	1	0	1	1	0	
Roma (IT)															0	0	0	0	0	0	0	0	0	0	0	0	0	
Rotterdam (NL)	6260	21	10,70085					N	Y	Y	Y	9	6	5	1	0	1	1	1	1	1	0	1	0	1	1	0	
Stockholm (SE)	3361	9	4,14938	81 %	98 %	81 %	81 %	N	Y	Y	Y	8	6	4	1	1	1	0	1	1	1	1	0	0	1	0	0	
Stuttgart (DE)	3977	19	6,62900	54 %	73 %	32 %	40 %	N	N	Y	Y	11	5		1	0	1	1	1	1	1	1	1	1	1	1	0	
Thessaloniki (GR)	15944	159	20,86911					Y	Y						0	0	0	0	0	0	0	0	0	0	0	0	0	
Ulm (DE)	1058	9	8,74380	54 %	54 %										0	0	0	0	0	0	0	0	0	0	0	0	0	
Wien (AT)	6725	16	3,95588									9	1		1	0	1	1	1	1	1	1	0	1	1	0	0	
*the emission values obtained from the				green cells: minimum contribution			no (high em)	4	1	2	2	6,56	4,22	2,22	0,56	0,00	0,89	0,33	0,78	0,56	0,89	0,44	0,56	0,33	0,78	0,44	0,00	>avg pc:
Erfurt clean air plan were unrealistically high,				lower than average minimum			yes (high em)	4	4	2	2	8,13	4,73	1,73	0,47	0,20	0,87	0,60	0,93	0,93	0,87	0,40	0,53	0,73	0,93	0,53	0,13	<avg pc:
so that they are left out from the analysis				contribution			no (low em)	12	2	2	1	7,75	3,75	2,75	0,25	0,00	1,00	0,50	1,00	0,25	0,75	0,75	0,75	0,75	1,00	0,75	0,00	>avg p km2:
							yes (low em)	3	7	5	6	7,50	4,70	1,75	0,55	0,15	0,85	0,50	0,85	0,90	0,90	0,35	0,50	0,55	0,85	0,45	0,10	<avg p km2:
				red cells: maximum contribution								7,85	5,23	2,23	0,62	0,15	0,92	0,54	0,85	0,92	0,77	0,46	0,54	0,54	0,85	0,62	0,08	>avg cont
				higher than average maximum			answ low	15	9	8	7	7,08	4,54	2,08	0,46	0,00	0,92	0,54	0,77	1,00	0,69	0,23	0,54	0,54	0,85	0,46	0,08	<avg cont
				contribution			answ high	8	5	4	4																	
							no (high cont)	10	3	2	1																	
							yes (high cont	2	5	5	5																	
							no (low cont)	11	2	2	0																	
							yes (low cont)	2	5	3	4																	

	PM10 Total Emissions			PM10 Contributions				PM10 Limits				Actions			Implemented													
	(tons per year)	(tons per year and km2)	(tons per year and 1000 inh.)	min traffic	max traffic	min bg	max bg	Annual 2010	Daily 2010	Annual 2015	Daily 2015	impl.	plann.	envis.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	
Aachen (DE)	101	0,6	0,40326	29 %	29 %	0 %	0 %	Y				7	6	1	0	0	0	0	1	1	1	0	1	1	1	0	1	
Amsterdam (NL)				0 %	0 %	0 %	0 %					5	6		0	0	0	1	0	0	1	0	0	0	1	1	1	
Augsburg (DE)	30	0,2	0,10909	0 %	0 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Barcelona (ES)	2675	26,8	1,67194	0 %	0 %	0 %	0 %					8	9	5	0	0	1	0	1	0	1	1	1	1	1	1	0	
Berlin (DE)	1424	1,6	0,41882	50 %	52 %	0 %	0 %	Y	N						0	0	0	0	0	0	0	0	0	0	0	0	0	
Bonn (DE)	99	0,7	0,31550	28 %	38 %	8 %	0 %	Y				6	4	2	0	0	1	1	0	1	0	0	1	1	1	0	0	
Bordeaux (FR)	446	8,9	1,78400	0 %	0 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Braunschweig (DE)				7 %	7 %	0 %	0 %	Y	?			6	5		0	0	1	0	1	1	0	1	1	0	1	0	0	
Bremen (DE)				45 %	45 %	0 %	0 %	N				7	2	1	1	0	1	0	1	1	1	1	1	0	0	0	0	
Bristol (UK)				0 %	0 %	0 %	0 %					5	11		0	0	0	0	1	0	0	0	1	1	1	1	0	
Brno (CZ)	278	1,2	0,69525	95 %	98 %	95 %	95 %	Y	Y	Y	Y	6	4	2	1	0	1	0	1	1	1	1	0	0	0	0	0	
Bruxelles (BE)	198	1,2	0,19195	18 %	25 %	7 %	9 %	Y	N	Y	N?	8	5	4	0	0	1	1	1	1	1	0	1	1	1	0	0	
Chemnitz (DE)	156	0,7	0,64198	20 %	41 %	12 %	12 %	Y		Y		6	4	2	0	0	1	0	1	1	1	0	0	0	1	1	0	
Clermont-Ferrand (FR)				0 %	0 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Darmstadt (DE)	42	0,3	0,30000	29 %	46 %	0 %	0 %					6	1	3	1	0	0	0	1	1	1	1	0	0	1	0	0	
Edinburgh (UK)				0 %	0 %	21 %	21 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Erfurt (DE)*	6260	23,2	29,80952	25 %	28 %	0 %	0 %					5	2	1	0	0	1	1	1	1	0	0	0	0	1	0	0	
Frankfurt a.M. (DE)				0 %	0 %	0 %	0 %	Y	Y	Y	Y	13	3	5	1	1	1	1	1	1	1	1	1	1	1	1	1	
Freiburg (DE)	94	0,6	0,42727	40 %	40 %	0 %	0 %	Y		Y		6	6		0	0	1	0	1	1	1	0	0	1	0	1	0	
Genève (CH)	44	2,8	0,23511	0 %	0 %	0 %	0 %	Y	N			8	5		0	0	1	1	1	0	1	0	1	1	1	1	0	
Genova (IT)	210	0,9	0,30000	23 %	34 %	21 %	21 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Grenoble (FR)	214	11,9	1,37115	0 %	0 %	0 %	0 %	N	N	N	N	9	4	3	0	0	1	1	1	0	1	1	1	1	1	1	0	
Hamburg (DE)				11 %	11 %	0 %	0 %	?	?						0	0	0	0	0	0	0	0	0	0	0	0	0	
Heilbronn (DE)	43	0,4	0,35833	31 %	41 %	0 %	0 %		N			4	6	2	1	0	0	0	0	1	1	0	0	0	1	0	0	
Helsinki (FI)	123	0,6	0,21207	36 %	63 %	19 %	29 %	Y	N	Y	Y	9	9	1	1	0	1	1	1	1	1	1	0	0	1	1	0	
Karlsruhe (DE)	105	0,6	0,36207	34 %	36 %	0 %	0 %					5	4		0	0	1	0	1	0	1	0	1	0	1	0	0	
Lisboa (PT)				0 %	0 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Lodz (PL)	4911	16,8	6,43653	0 %	0 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
London (UK)				37 %	37 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Lyon (FR)	725	15,1	1,53686	0 %	0 %	0 %	0 %	N	N	N	N	9		2	1	0	1	0	1	0	1	1	1	1	1	1	0	
Madrid (ES)	2114	3,5	0,65051	0 %	0 %	0 %	0 %	Y	Y	Y	Y	12	7	5	1	1	1	1	1	1	1	0	1	1	1	1	1	
Malmö (SE)				15 %	35 %	5 %	15 %	Y	Y	Y	Y	11	5	10	1	0	1	1	1	1	1	0	1	1	1	1	1	
Mannheim (DE)	105	0,7	0,31818	29 %	29 %	0 %	0 %	Y		Y		4	3		1	0	1	0	0	1	1	0	0	0	0	0	0	
Marseille (FR)	312	1,3	0,37179	0 %	0 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Milano (IT)	612	3,4	0,40800	0 %	0 %	25 %	49 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
München (DE)	347	1,1	0,25515	15 %	46 %	7 %	7 %					9	4	1	1	0	1	1	1	1	0	0	1	1	1	1	0	
Münster (DE)	141	0,5	0,51648	12 %	28 %	8 %	8 %	Y	Y			6	5	1	0	0	1	0	1	1	1	0	0	1	1	0	0	
Nantes (FR)				0 %	0 %	0 %	0 %	N	Y	Y	Y	10	10	6	1	0	1	1	1	0	1	1	1	1	1	1	0	
Nice (FR)	190	2,6	0,54257	0 %	0 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Osnabrück (DE)	123	1,0	0,75000	29 %	29 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Oslo (NO)	218	0,5	0,37913	50 %	70 %	15 %	35 %	Y	Y	Y	Y	11	3	2	0	1	1	1	1	1	1	1	1	1	1	1	0	
Praha (CZ)				20 %	60 %	0 %	0 %	N	N			10	5	4	1	0	1	1	1	1	1	1	1	0	1	1	0	
Roma (IT)				0 %	0 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Rotterdam (NL)	320	1,1	0,54701	0 %	0 %	0 %	0 %	N	N	Y	Y	9	6	5	1	0	1	1	1	1	1	0	1	0	1	1	0	
Stockholm (SE)	1144	3,0	1,41235	36 %	71 %	36 %	36 %	Y	N	Y	N	8	6	4	1	1	1	0	1	1	1	1	0	0	1	0	0	
Stuttgart (DE)	202	1,0	0,33667	39 %	58 %	19 %	25 %	N	Y	Y	Y	11	5		1	0	1	1	1	1	1	1	1	1	1	1	0	
Thessaloniki (GR)	732	7,3	0,95812	0 %	0 %	0 %	0 %	N							0	0	0	0	0	0	0	0	0	0	0	0	0	
Ulm (DE)	59	0,5	0,48760	17 %	17 %	0 %	0 %								0	0	0	0	0	0	0	0	0	0	0	0	0	
Wien (AT)	658	1,6	0,38706	0 %	0 %	0 %	0 %					9	1		1	0	1	1	1	1	1	1	0	1	1	0	0	
				green cells: minimum contribution			no (high em)	3	3	2	3	7,80	4,20	3,00	0,40	0,20	1,00	0,40	1,00	0,40	0,80	0,80	0,60	0,60	1,00	0,60	0,00	>avg pc:
				lower than average minimum			yes (high em)	1	0	1	0	7,47	4,63	1,63	0,53	0,11	0,84	0,53	0,84	0,89	0,89	0,32	0,53	0,58	0,84	0,47	0,11	<avg pc:
				contribution			no (low em)	2	6	0	1	7,75	3,75	2,75	0,25	0,00	1,00	0,50	1,00	0,25	0,75	0,75	0,75	0,75	1,00	0,75	0,00	>avg p km2:
							yes (low em)	13	5	10	6	7,50	4,70	1,75	0,55	0,15	0,85	0,50	0,85	0,90	0,90	0,35	0,50	0,55	0,85	0,45	0,10	<avg p km2:
				red cells: maximum contribution								8,75	4,63	2,13	0,88	0,25	0,88	0,63	1,00	1,00	0,88	0,88	0,50	0,38	0,88	0,63	0,00	>avg cont
				higher than average maximum			answ low	15	11	10	7	7,67	4,40	2,13	0,47	0,07	0,87	0,60	0,87	1,00	0,73	0,40	0,60	0,53	0,93	0,47	0,13	<avg cont
				contribution			answ high	4	3	3	3																	

	PM2.5 Total Emissions			PM2.5 Contributions				PM2.5 Target / Limit				Actions		
	(tons per year)	(tons per year and km2)	(tons per year and 1000 inh.)	min traffic	max traffic	min bg	max bg	Annual 2010		Annual 2015		impl.	plann.	envis.
Aachen (DE)												7	6	1
Amsterdam (NL)						30 %						5	6	
Augsburg (DE)														
Barcelona (ES)												8	9	5
Berlin (DE)														
Bonn (DE)												6	4	2
Bordeaux (FR)														
Braunschweig (DE)												6	5	
Bremen (DE)												7	2	1
Bristol (UK)												5	11	
Brno (CZ)								Y		Y		6	4	2
Bruxelles (BE)	198	1,2	0,19166	9 %	20 %	4 %	20 %	N		N?		8	5	4
Chemnitz (DE)								Y		Y		6	4	2
Clermont-Ferrand (FR)														
Darmstadt (DE)												6	1	3
Edinburgh (UK)						19 %	19 %							
Erfurt (DE)*						36 %	43 %					5	2	1
Frankfurt a.M. (DE)								Y		Y		13	3	5
Freiburg (DE)												6	6	
Genève (CH)												8	5	
Genova (IT)				23 %	23 %									
Grenoble (FR)								N		N		9	4	3
Hamburg (DE)														
Heilbronn (DE)												4	6	2
Helsinki (FI)				20 %	25 %	14 %	15 %	Y		Y		9	9	1
Karlsruhe (DE)												5	4	
Lisboa (PT)						22 %	22 %							
Lodz (PL)														
London (UK)														
Lyon (FR)								N		N		9		2
Madrid (ES)	1748	2,9	0,53783					Y		Y		12	7	5
Malmö (SE)				10 %	20 %	5 %	15 %	Y		Y		11	5	10
Mannheim (DE)												4	3	
Marseille (FR)	312	1,3	0,37179											
Milano (IT)	503	2,8	0,33533			9 %	25 %							
München (DE)												9	4	1
Münster (DE)												6	5	1
Nantes (FR)								N		Y		10	10	6
Nice (FR)	190	2,6	0,54257											
Osnabrück (DE)														
Oslo (NO)	141	0,3	0,24522					Y		Y		11	3	2
Praha (CZ)								Y				10	5	4
Roma (IT)														
Rotterdam (NL)								Y		Y		9	6	5
Stockholm (SE)	76	0,2	0,09383	29 %	50 %	29 %	29 %	Y		Y		8	6	4
Stuttgart (DE)												11	5	
Thessaloniki (GR)														
Ulm (DE)														
Wien (AT)												9	1	