Air4EU

Air Quality Assessment for Europe: from local to continental scale

6th Framework Programme- Policy oriented Research
Priority 8.1 Topic 1.5 Task 2

Inception report

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5	University of Hertfordshire	UH	UK
6	Universidade de Aveiro	UAVR	PT
7	AIRPARIF	AIRPARIF	FR
8	Servizi per la Mobilità del Comune di Roma S.p.A.	STA	IT
9	Environment Agency	EA	UK
10	City Development Authority of Prague	URM	CZ
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EXCECUTIVE SUMMARY

AIR4EU addresses the needs for policy-orientated research on integrated air quality assessment by monitoring methods and modelling at different temporal and spatial scales for regulated pollutant components in Europe: PM10 (and PM2.5), NO_2, CO, SO_2, O_3 and benzene.

The aim of AIR4EU is to provide recommendations on integrated air quality assessment for different temporal and spatial scales: ranging from hourly to annual and from “hotspot”/street to continental scale. This will directly benefit EU stakeholders including policy makers and city, national and regional users.

This Inception Report gives a detailed overview of the workplan of the project Air Quality Assessment for Europe. This report is based upon and consistent with the Technical Annex of AIR4EU.

Sections 1-3 provide a general overview about the project encompassing the detailed description of the objectives and the management structure.

Section 4 delivers a detailed description of the project workplan. In sections 4.1 – 4-3 a general overview about the project workplan is given. Sections 4.4 – 40.1 provide detailed workplans of the WPs 2-8. Tasks to be performed are described, including the persons primarily responsible for these tasks.

Section 5 outlines the way how the five cross-cutting issues will contribute to the thematic workpackages 3-5.

The intention of the Inception Report is to be a living document throughout the project. The report will be regularly updated, encompassing detailed and updated workplans for the different workpackages and cross-cutting issues as they will be carried out during the project.

Table of Content

1 Project summary

AIR4EU addresses the needs for policy-orientated research on integrated air quality (AQ) assessment by monitoring methods and modelling at different temporal and spatial scales for regulated pollutant components in Europe: PM10 (and PM2.5), NO_2, CO, SO_2, O_3 and benzene. AIR4EU is designed to meet the research objectives of Topic 1.5, Task 2 of SSP priority 8.1.

In respect to AQ assessment, AIR4EU strengthens the links between research and policy, which has been recognised as a priority within the "Clean Air for Europe" (CAFE) programme. There are a wide variety of assessment methods to provide reliable and accurate AQ data, but the methods depend on the spatial and temporal scales, and are often not or only partially compatible. Monitoring and modelling methods are usually used separately and consequently yield results that are not mutually consistent. There is an obvious demand for scientific sound and practical recommendations on how to integrate measuring and modelling techniques into internally consistent, comprehensive and cost-effective assessment methods.

The aim of AIR4EU is to provide recommendations on integrated AQ assessment for different temporal and spatial scales: ranging from hourly to annual and from "hotspot"/street to continental scale. This will directly benefit EU stakeholders including policy makers and city, national and regional users. Research objectives in AIR4EU are directed to review the benefits and drawbacks of existing modelling and monitoring methods for different spatial and temporal scales. Criteria for the review are parameters such as uncertainty and accuracy, costs, input requirements and representativeness of the data. These parameters are evaluated against the requirements for different policy purposes. This will result in recommended methods for AQ assessment with emphasis on the combined use of monitoring and modelling. AIR4EU will also prepare AQ maps at different scales in Europe based upon available data sets (monitoring, meteorology and emissions) and the recommended methods.

AIR4EU will bring together European top-scientists with complementary skills in the field of AQ assessment together with relevant stakeholders. The cooperation of researchers from six member states representing four universities and two research institutes, as well as eight user partners will support the establishment of the European Research Area. Authorities, practitioners and policy makers at urban, regional, national and European level will be consulted, as well as a high level Expert group. A vital aspect of Air4EU are 'case studies' to test and further develop the recommendations. Case studies, which will address the "hotspot", urban and national scales, will be implemented in Paris, Rome, Prague, London, Athens, Rotterdam and Oslo in close cooperation with user partners and other interested parties.

AIR4EU will co-operate with on-going relevant projects (e.g. ENV-e-CITY; OSCAR; CLEAR; MERLIN) and networks (e.g. INTEGAIRE, CITY-Delta; POLIS), and specific liaison will be established with the CAFE programme. AIR4EU will also disseminate its results by a Website and through Newsletters and Workshops to the scientific community, environmental authorities, policy makers and other stakeholders in AQ in Europe.

2 Project objectives

The following overall aims of the project AIR4EU have been defined:

1. *To formulate a guidance document on best practices for the combined use of monitoring methods and models to assess AQ in Europe from hotspot/street level to continental level for various users on local, regional, national and European level and for various purposes*.

2. *To prepare maps of air quality in Europe based on the available European wide data sets and best technique of assessment*. AIR4EU will present AQ maps covering the European scale, including examples of the hotspot/street, urban/agglomeration and regional level for PM10, PM2.5, NO_2, O_3, CO, SO_2 and benzene. These maps will illustrate the application of the recommendations, which have been validated in a number of case studies.

In order to achieve these overall aims, a set of operational measurable objectives have been specified, each linked to one or more of the work packages and contributing to one or more of the project products and deliverables. These measurable objectives, the means to achieve them, the baseline and the measure of success together with the relevant milestones are as follows:

1. *Co-ordination of the overall project*
   Establishment of and carrying out the overall management. Starting point is the Technical Annex and the Inception Report (D1.1). Progress and quality of management will be reviewed and assessed by the EU-project officer, using the required progress reports.

2. *a.) To set the policy framework for AIR4EU and identify the user needs in relation to air quality assessment methods.*

   b.) To establish and implement the consultation with the high-level Expert group, policy makers, authorities, practitioners and other stakeholders. This will be performed by studying and evaluating of the available information about the policy purposes and subsequently detailed consultation with the end users (Application Group) and Expert Group. Starting point is the current AQ-frame work and methods and current experiences of the users. The draft final report containing the policy framework and the requirement analysis (D2.1) will be reviewed and assessed by the Application group and the High Level Expert group. The D2.1 will be available by month 6

3-5 a)*To review and examine the benefits and drawbacks, including the variability and uncertainty of a range of monitoring and modelling air quality assessment methods relevant to local/ hotspot, urban/agglomeration and regional/EU spatial scales and at various temporal scales.*

   b.) *To review and assess the procedures for quantifying the main natural and anthropogenic sources and emissions and to estimate the quality of such data relevant to local/hotspot, urban/agglomeration and regional/EU spatial scale air quality assessment.* The establishment will be made by studying and evaluating of current methods to assess AQ methods at hotspot/street level scale (objective 3), urban/agglomeration scale (objective 4) and regional/ European scale (objective 5) by monitoring and modelling. The detailed analysis will result in first recommendations for conducting AQ assessments at hotspot/street level scale (objective 3), urban/agglomeration scale (objective 4) and regional/European scale (objective 5). Starting point are current assessment methods.
   The draft final reports on the review of current methods (D3.1; D4.1 and D5.1) will be reviewed by the Application and the High Level Expert group. The final reports will be available by month 13.
   The draft final reports about the first recommendations (D3.2; D4.2 and D5.2) will be reviewed by the Application and the High Level Expert group. The final reports will be available by month 17

   To create and maintain the coherence between the (horizontal) operational objectives nr 3-5 (see aforementioned), the following cross-cutting (vertical) operational goals a-e are defined:

a) *Emission and data needs on all spatial scales*
The aim is to provide a comprehensive methodology to generate emission inventories by developing spatial integration methods and to establish good practice/guidelines for emissions and scenario's including QA/QC. Starting point are current emission methodologies. The draft final report (M6.4) will be reviewed by the High Level Expert group. The final report will be available by month 18.

b) Determination of uncertainties of models and monitoring
The aim is to provide uncertainty estimates by applying data-quality indicators and data-quality objectives. Starting point is the current expertise concerning methods to determine uncertainties. The draft final report (M6.5) will be reviewed by the High Level Expert group. The final report will be available by month 18.

c) Determination of representativeness of model outputs and monitoring data
The aim is to provide a better concept of representativeness and integration of modelling and monitoring data and a statistical framework for generalisation. Starting point is current assessment practice. The draft final report (M6.6) will be reviewed by the High Level Expert group. The final report will be available by month 18.

d) Scale interactions
The aim is to provide a review of the current modelling methods used to describe the interaction between the different spatial scales and to improve these methods. Starting point are the current methods. The draft final report (M6.7) will be reviewed by the High Level Expert group. The final report will be available by month 18.

e) Data assimilation
The aim is to identify data assimilation methods adequate to combine model results and observations. Starting point are the current methods. The draft final report (M6.8) will be reviewed by the High Level Expert group. The final report will be available by month 18.

An internal workshop will be held by month 12-14, with participation of all partners, the application group and the high expert level group to present the intermediate results of work packages 3-5 and cross-cutting issues a-e obtained so far to provide guidance in the finalisation of the reports by month 15 and month 18.

6. *a) To synthesise and harmonise the benefits and drawbacks of AQ assessment methods and their variabilities and uncertainties, as well as procedures for quantification of natural and anthropogenic emissions.*

   b) To prepare draft recommendations on best techniques for assessment of air quality relevant to local/hotspot, urban/agglomeration and regional/EU spatial scales and at various temporal scales.

   c) To specify the criteria and develop the protocols for case studies: objectives, contents and types of results. The aim is to synthesis/harmonise/integrate the first recommendations made by combining the relevant information of the work packages 3-5 and the cross-cutting issues a-e, and to analyse and integrate the results of the case studies leading to the final recommendations. Starting point are the results/final reports of the above mentioned work packages and cross-cutting issues to arrive at harmonised first recommendations and the protocols for the test cases, and the final results of the case studies to arrive at the harmonised final recommendations.
   The draft final report on the protocols for the case studies (D6.1) will be reviewed by the application group and the high level expert group. The final report will be available by month 18.
   The draft final report on the harmonised final recommendations covering all scales (D6.2) will be reviewed by the application group and the high level expert group. The final report will be available by month 33.

7. *a) To prepare, implement and evaluate case studies in the seven application cities according to the protocols and reflect the appropriateness of the draft recommendations.*

b) *To formulate final recommendations on best techniques for assessment of air quality relevant to local/hotspot, urban/agglomeration and regional/EU spatial scales and at various temporal scales.*

c) To develop a GIS-based mapping framework visualised through a web portal, intended as an operative system for air quality map and data retrieval and access, by policy makers, experts and the public.

d) To prepare maps of air quality relating to various spatial and temporal scales, based upon available Europe-wide data sets, results from the case study cities and other available data.
The aim is to perform case studies for each participating city/area using the protocols based upon the harmonised first recommendations, and to create a mapping framework. Starting point is the protocol to perform the test cases.
The draft final summary report of the case studies (D7.2) will be reviewed by the application and high level expert group. The final report will be available by month 33
The draft final report on the mapping framework (D7.3) will be reviewed by the application and the high level expert group. The final report will be available by month 24

8. *a) To widely disseminate and exploit the projects interim and final results to a wider public target groups including policy makers, member states, authorities, practitioners and other relevant national and international stakeholders.*

   b) To raise awareness amongst stakeholders of the current challenges faced in relation to AQ management at the final conference.
   The objective is to disseminate relevant information on a continuous basis to stake-holders and the general public by an internet site, newsletter and open workshops. Starting point is the continuous flow of information created within the project. The webpage will be in operation by month 5. An open workshop will be held by month 18, and by month 36.

3 Project Management

The consortium considers good project management as a key task to achieve the project objectives in the most efficient way. The project is managed by TNO. Both TNO as a research organisation, and the designated project manager within TNO, Peter Builtjes, have considerable experience in project management and co-ordination activities, particularly with EU-projects in the 4th and 5th Framework Programme. The project management is strengthened by the input of the subcontractor Hermann Heich (Heich Consult), who also has gained considerable experience in the management of EU project within the last decade. In addition, all core partners have strong track records of working in large collaborative EU projects and will contribute to a sound and efficient project management process.
An appropriate management structure has been set up to make important managerial and strategic decisions, and ensure quality of work.

3.1 Management structure

An effective project management structure is crucial to the success of the project. Experience with previous international projects has shown that a management structure split into defined levels provides effective decision-making and also facilitates good internal communication. The management structure of AIR4EU consists of two levels:

Technical management Committee
The Technical Management Committee (TMC) consists of the project manager, the workpackage leaders and the core-group partner UAVR (not leading a workpackage, but involved in cross-cutting issues). The TMC meets regularly to review the technical progress of the project, identify need for corrective actions where necessary, take strategic decisions and ensure concerns are resolved. The TMC meetings will be organised and prepared by those concerned with project management. In advance of meetings the TMC will receive a progress report so that problems can be anticipated and potential project risks identified.

The project management
The project management is provided by TNO as the co-ordinating contractor. TNO will therefore be the single contact point for the European Commission and ensures the day-to-day management, financial, administrative and contractual activities, as well as the preparation of regular reports on work progress, the annual project review and the final report. The project management is strengthened by Heich Consult who provides technical support in the day-to-day management of the project. The responsibilities of the project management comprise the following:

- conduct formal negotiations between the consortium and the Commission as well as between the partners;
- close liaison with DG RES and other DGs eg. ENV;
- appropriate establishment of communication channels among the project partners;
- co-ordination of the development and implementation of the workplan and periodical review of the project progress against the workplan;
- preparation of reports on work progress to the TMC;
- organisation and lead of regular meetings of the TMC;
- collection and cross-check of cost statements and attend to administrative matters.

The WP-leaders are in charge of the co-ordination of their respective workpackages, interaction with their partners and are responsible for the implementation of the agreed workplan on the WP level. In close co-operation with the project manager the WP leaders follow up the progress, identify risks and develop contingency plans whenever necessary.

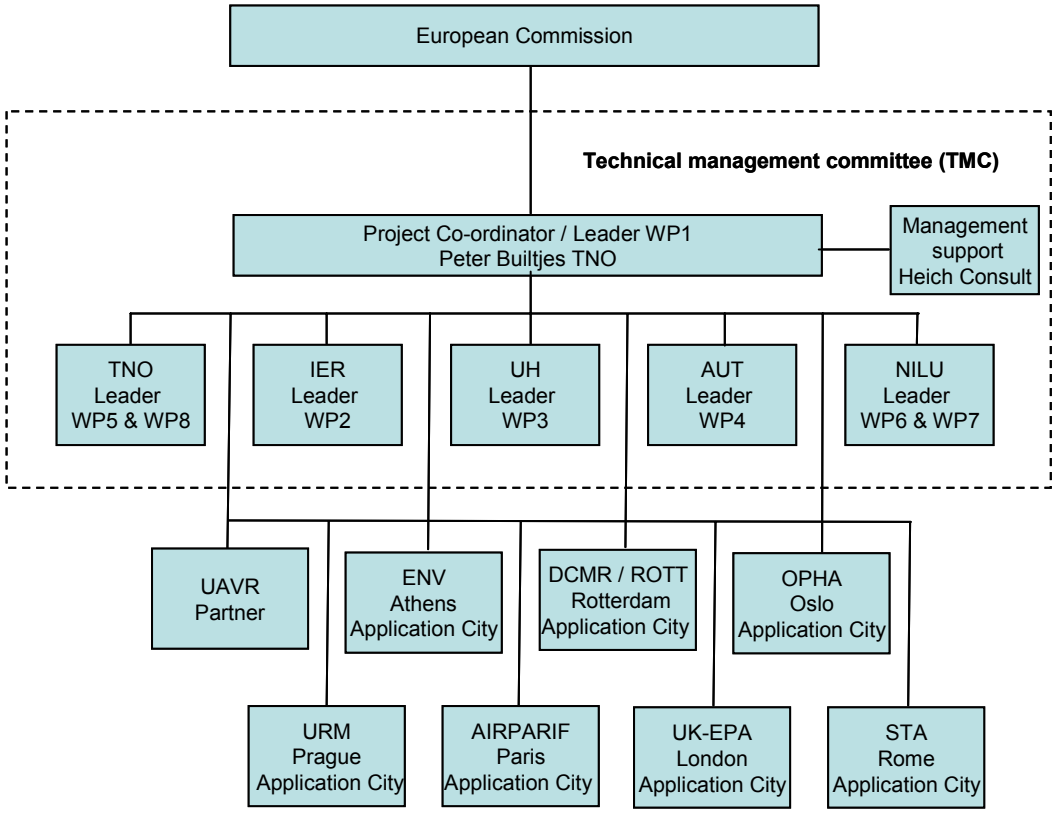

Figure 1: Project management structure

3.2 Decision process and Consortium agreement

The clear division of responsibilities between the Technical Management Committee and the project management will ensure that decisions are taken appropriately and decisively. Decisions will be taken by a simple majority of the members of the Technical Management Committee. If no majority is reached with regard to a decision, then the project manager will decide the vote.

3.3 Communication flow

Frequent and reliable communication between consortium members and the Commission is fundamental issue in the management of the project. Appropriate communication structures reflecting the management structure of the project will be established. The project management is responsible for communication between the project partners. Also the Project Manager is the contact point for the Commission and for strategic issues outside the project (i.e. related projects, clusters).

Besides utilisation of telephone and fax, the necessary communication will be accelerated through all partner´s use of electronic mail and use of the project website. This will enhance near real-time information flow not only between partners but also between the Project Manager and the Commission and it facilitates the quick exchange of documents, reports, etc. Personal meetings will be complemented by telephone conferences if suitable to make efficient use of resources.

The project management will prepare and lead regular TMC meetings and smaller team meetings whenever necessary. It is planned to have at least two TMC meetings per year.

3.4 Quality assurance measures

Procedures are established to assure the quality of all work and deliverables produced as part of the project and to ensure integrity during the day-to-day activities of the project. These procedures include a peer review of all deliverables by a colleague within the team and the final authorisation by the co-ordinator. The development of the main products of the project, namely the “Recommendations of best techniques for AQ assessment” (Del. 6.1) and the “Maps of Air Quality of Europe” (Del. 7.4) will be guided and finally reviewed by the high-level Expert Group. All partners will be required to agree on procedures and consent to work to them. These procedures cover areas such as contract control, document control and trace-ability, standards for documentation format and information exchange, contact with the team and with the EC, and project auditing. Review criteria to be applied to deliverables include: technical content, language, readability and consistency. TNO will be responsible throughout the project for coordination of the final QA assessment of deliverables.

4 Workplan

In order to achieve the identified objectives of AIR4EU as described under 2 and implement the work, the project has been divided into eight workpackages. Each of them has clearly defined objectives and is divided in a number of tasks. The nature of each workpackage is described in the text below, the timing of the workpackages is shown in a Gantt-chart (section 4.3) and the interrelations of the workpackages are shown in another diagram (Figure 2). The workplan distinguishes: horizontal and thematic workpackages, and so-called “cross-cutting” issues:

Horizontal workpackages 1, 2, 6, 7 and 8 include activities on project management (WP1), policy needs assessment (WP2), synthesis (WP6), case studies (WP7) and dissemination (WP8);

Thematic workpackages 3-5 deal with specific thematic challenges on tools and methods for AQ assessment addressing the different spatial and temporal scales: hotspot/local (WP3), urban/agglomerate (WP4) and regional/European (WP5);

Five cross-cutting issues, which are common to the thematic workpackages 3-5, namely: a) Emission & Data needs, b) Uncertainty of Models & Monitoring, c) Representativity of Models & Monitoring, d) Scale Interactions and e) Data Assimilation.

4.1 General overview of Work packages

In the following the nature and content of the eight workpackages will be briefly described while in Sections 4.4 – 4.10 they are described in deeper detail.

WP1 – Management
This WP ensures timely and adequate delivery of the expected outputs of AIR4EU throughout the lifetime of the project. WP1 will manage the financial, technical and communication aspects of the project, including reporting and contacts with DG RES.

WP2 – Policy Framework & Requirements
This WP has aims to define the needs and requirements regarding assessment methodologies for various purposes and applications by users. The WP defines the policy framework which will be addressed and defines the nature of recommendations developed by AIR4EU. This work is crucial for the success of the project and will be undertaken in close co-operation with the workpackage leaders of WP3-8.

WP3 – 5 – AQ Assessment at different scales
WP3 – Local/hotspot
WP4 – Urban/agglomeration
WP5 – Regional/EU

The assessment of methodologies is split into the Workpackges 3, 4 and 5 according to the spatial scales to be addressed by AIR4EU. These Workpackages will jointly work on a number of cross-cutting themes (details are described below) such as:

- Emission & Data needs (coordinated by IER);
- Uncertainty of Models & Monitoring (coordinated by UAVR);
- Representativity of Models & Monitoring (coordinated by TNO);
- Scale Interactions (coordinated by AUT);
- Data Assimilation (coordinated by NILU).

In order to avoid duplication of work and exploit synergies these three workpackages 3-5 will perform their work according to a joint workplan, will closely co-operate with each other and will interact with the application-group consisting of partners from application cities. To cover the cross-cutting issues appropriately, it is ensured that the same partner is responsible for an issue in all three WP´s. Each WP leader of WP3-5 will ensure adequate inputs in the workpackage by the pool of researchers (with expertise on the cross-cutting issues) by preparing a workplan in consultation with the coordinators of the cross-cutting issue, as well as other WP-leaders of WP3-5. The planning of these inputs will feed into the joint workplan for WP3-5. WP3-5 will deliver the first recommendations on AQ assessment best techniques, which will be reviewed in WP6 before being applied in WP7.

In addition to the cooperation between core-group researchers and cross-cutting experts in WP3-5, the core-group partners will also work with the application-group partners. This will ensure that AQ assessment at the different scales is reviewed in relation to end user and policy needs, as identified in WP2.

WP6 – Synthesis
This workpackage has the role to generalise the findings of WP3 – 5 on assessment methods across the different spatial and temporal scales and to integrate the requirements set out in WP2 with the results of WP 3-5. In addition WP6 will specify the criteria for the case studies from a policy perspective, as they will be performed in WP7. The final outcome of WP6 will be the recommendations of the best techniques for AQ assessment, including the protocol for case studies.

WP7 – Case studies and mapping

In WP 7 the case studies will be performed using the output of WP6 as a starting point. As the case studies for the cities Athens, Oslo, Rotterdam, London, Paris, Berlin, and Prague address mainly the Urban/agglomeration scale it should be noted that all these cities take also the regional scale (up to 300 km) into account as they have to consider background concentrations in their assessment of air quality. For the UK case study the implications of sources such as industrial stacks on national and regional scales will be investigated. In addition to these city case studies, the possibility of developing/using statistical methods for extrapolating the results of the case studies to other European cities will be investigated. Such methods can be used to enhance the mapping of AQ in Europe.

WP8 – Exploitation and Dissemination

This workpackage is in charge to disseminate and exploit the interim and final results of AIR4EU to different groups in Europe and beyond. Dissemination media are a project webpage, newsletters, as well as publications and papers at conferences and in scientific magazines. Interaction with the Expert Group will liaise with relevant users of the deliverables of AIR4EU: JRC, Topic Centre on Air and Climate Change, CAFE, EMEP and DG Res. In addition, three workshops will be organised during the project lifetime; this will be an excellent platform for disseminating and exploiting the projects results. Figure 2 provides the graphical presentation of the WPs, the cross-cutting issues and their interrelations

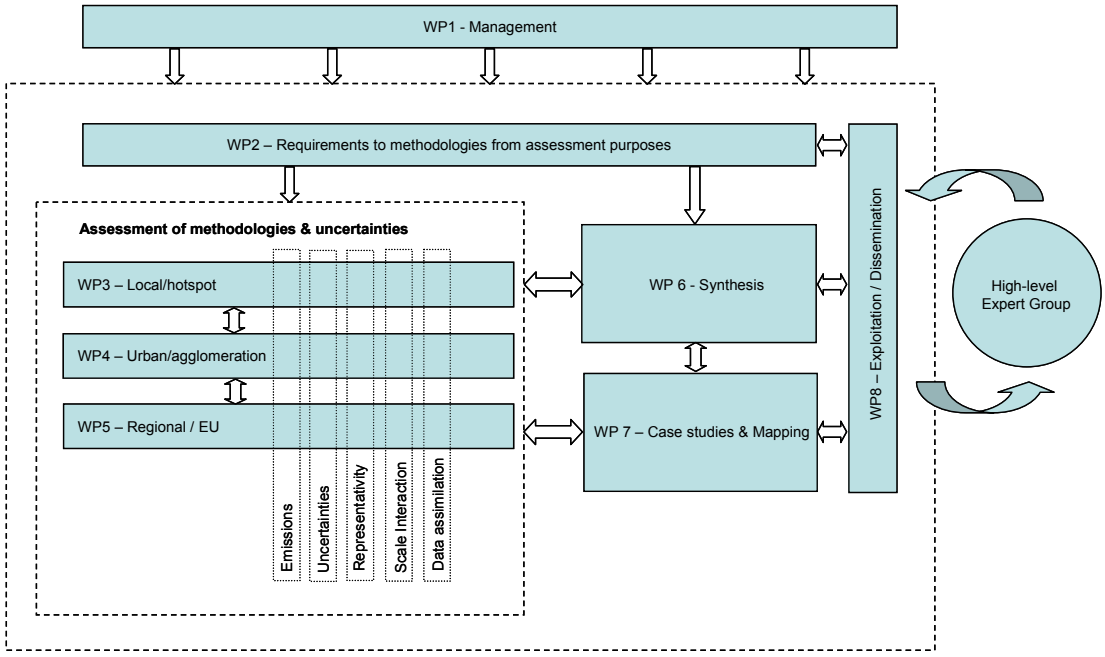

Figure 2: Interrelation of workpackages

4.2 List of deliverables

The following table provides an overview about all project deliverables, their nature, delivery date and the dissemination level. In contrast to the Technical Annex, D1.1 will be delivered in month 4 and D2.1 will be delivered in month 6.

Table 1: List of deliverables

Del. no.	**Deliverable name**	**WP no.**	**Lead particip-ant**	**Estimated person months**		**Dissemination level**	**Delivery date** (project month)
D 1.1	Inception report	1	TNO	8,5	R	CO	4
D 1.2	Mid Term Assessment Report	1	TNO	2	R	CO	18
D 1.3	Final Report	1	TNO	3	R	PU	36
D 2.1	Policy framework and requirement analysis report	2	IER	11	R	PU	6
D 3.1	Report on review of monitoring and modelling methods to hotspot/local scales identifying benefits, drawbacks variability and uncertainties of current methods	3	UH	26,75	R	PU	13
D 3.2	Report on first recommendations for best methods and techniques for conducting air quality assessment at hotspot/local scale	3	UH	13	R	PU	17
D 4.1	Report on review of monitoring and modelling methods to urban/agglomeration scales identifying benefits, drawbacks variability and uncertainties of current methods	4	AUT	28,75	R	PU	13
D 4.2	Report on first recommendations for best methods and techniques for conducting air quality assessment at urban/agglomeration scale	4	AUT	14	R	PU	17
D 5.1	Report on review of monitoring and modelling methods to regional/continental scales identifying benefits, drawbacks variability and uncertainties of current methods	5	TNO	19	R	PU	13
D 5.2	Report on first recommendations for best methods and techniques for conducting air quality assessment at regional/continental scale	5	TNO	10	R	PU	17
D 6.1	Protocols for implementation of case studies	6	NILU	15	R	PU	18
D 6.2	Recommendations of best techniques for AQ assessment related to spatial and temporal scales	6	NILU	18,5	R	PU	33
D 7.1	Report from individual case studies	7	NILU	21	R	PU	33
D 7.2	Summary report of case study findings and recommendations	7	NILU	16,5	R	PU	33
D 7.3	Description of mapping framework	7	NILU	12	R	PU	24
D 7.4	Maps of air quality in Europe	7	NILU	32	R	PU	33
D 8.1	Project website	8	TNO	3	O	PU	5
D 8.2	Good practice database	8	TNO	7	O	PU	35
TOTAL				261			

4.3 Gantt-chart

Workpackage / Task	1st year												2nd year												2nd year											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1. Management																																				
Task 1.1 Overall co-ordination and management																																				
Task 1.2 Contractual and financial management																																				
M 1.1 - M 1.7	1.1				1.2										1.3					1.4						1.5				1.6						1.7
D1.1 - D1.3				1.1														1.2																	1.3
2. Policy framework & requirements																																				
Tasks 2.1 - 2.4																																				
M 2.1 - M 2.3			2.1	2.2	2.3																															
D 2.1						2.1																														
3. Local & hotspot scale																																				
Task 3.1 Selection of models & methods for review																																				
Task 3.2 Conduct review																																				
M 3.1 - M 3.3						3.1						3.2			3.3																					
D 3.1 - D 3.2													3.1				3.2																			
4. Urban/agglomeration scale																																				
Task 4.1 Selection of models & methods for review																																				
Task 4.2 Conduct review																																				
M 4.1 - M 4.3						4.1						4.2			4.3																					
D 4.1 - D 4.2													4.1				4.2																			
5. Regional/EU scale																																				
Task 5.1 Selection of models & methods for review																																				
Task 5.2 Conduct review																																				
M 5.1 - M 5.3						5.1						5.2			5.3																					
D 5.1 - D 5.2													5.1				5.2																			
6. Synthesis																																				
Task 6.1 Synthesis																																				
Task 6.2 Case studies protocol																																				
M 6.1 - M 6.3																			6.1		6.2									6.3						
M 6.4 - M 6.8																		6.4-8																		
D 6.1 - D 6.2																			6.1														6.2			
7. Case studies & mapping																																				
Task 7.1 Case studies																																				
Task 7.2 Mapping																																				
M 7.1 - M 7.4																								7.1						7.2-4						
D 7.1 - D 7.4																								7.3								7.1	7.2	7.4		
8. Dissemination & Exploitation																																				
Task 8.1 Website																																				
Task 8.2 Good practice database																																				
M 8.1																																			8.2	
D 8.1 - D 8.2					8.1																														8.2	

4.4 Detailed Workplan WP2 – Policy Framework and requirements

4.4.1 Objectives and scope of work

The objectives of the workpackage are:

- To facilitate and structure the 'dialogue' between researchers, policy makers and the European Commission on AQ assessment for various policy purposes;
- To identify user needs and requirements in relation to air quality assessment methods.
- To identify the "features" (e.g. uncertainty; accuracy; representativeness; quality control) of AQ data for different policy purposes such as assessment of AQ in member states, availability of information for the public, preparation of action plans, future scenarios within the CAFE process and cost-benefit analysis of air pollution reduction measures.

The work is broken down into the following tasks:

Task 2.1: The work will start with an analysis on the available information about the policy purposes mentioned (text and explanation of directives and CAFE process, available exposure-response-relationships). Special emphasis will be laid on the analysis of the quality that AQ data should have (quality measures, quality target measures).

Task 2.2: The results of the analysis will be discussed in a meeting between the work package leaders of WP3-8, as this analysis will guide the activities in AIR4EU. The initial findings will then be presented at a workshop with representatives of urban, regional and national policymakers (Application Group). Feedback of the policymakers is an important input to identify the policy needs for AQ assessment. Both the analysis and the consultation of policymakers will result in specifications to guide research in WP3-5. The Expert Group will be consulted on the outcome of the specifications.

4.4.2 Detailed task breakdown and milestones

Table 2 provides an overview about the detailed task breakdown for the activities of WP2. A brief summary of the tasks and their interrelationship is given in the following. The work starts with the analysis of AQ assessment requirements for different policy purposes (task 2.1). This task is split in 4 subtasks as follows:

Task 2.1.1: AQ data required for AQ directive and daughter directives
Task 2.1.2: AQ data required for impact assessment
Task 2.1.3: AQ data required for the CAFE process
Task 2.1.4: Additional AQ data needs of application group

The completion of the analysis (M2.1) is planed by month 5. The discussion of the results will be proceeded in two layers.

Task 2.2.1: Internal discussion with the research partners and the expert group (M2.3)
Task 2.2.2: Discussion with policy makers (M2.2), Workshop in Month 5

Based on the results of the analysis and the following discussions the deliverable D2.1 – Policy framework and requirements analysis report – will be generated by month 6. This report will give kind of target specifications for the further work within the project.

Table 2: Workpackage 2 – Task breakdown

Task No.	Workpackage 2 - Task breakdown Description	first year 1	2	3	4	5	6
2.1	**Data reqirements analysis**					M2.1	
2.1.1	AQ framework directive and daughter directives						
2.1.2	Impact assesment						
2.1.3	CAFE process						
2.1.4	additional AQ data needs of application group						
2.2	**Discussion of results**						
2.2.1	Discussion of results						M2.3
2.2.2	Workshop preparation					M2.2	

4.4.3 Allocation of resources

The TA specifies the allocation of resources for WP2 across partners, table 3 provides this breakdown and nominates the key personnel of each partner who will conduct the work in WP2.

Table 3: Allocation of resources for WP2

	Partner	mm	Key personnel involved
1	TNO	0.5	Task 2.1.1:Dick vd Hout
		0.5	Task 2.1.3:Dick vd Hout
		0.5	Task 2.2.1:Menno Keuken
		0.5	Task 2.2.2:Menno Keuken
	Subtotal	**2**	
2	NILU	0.5	Task 2.1.1: S.Larssen
		0.5	Task 2.1.3: S.Larssen
		0.5	Task 2.2.1: B.Denby
		0.5	Task 2.2.2: S.Larssen
	Subtotal	**2**	
3	AUTH	0.5	Task 2.1.2: Douros
		0.5	Task 2.2.1: Moussiopoulos
	Subtotal	**1**	
4	IER	1,5	Task 2.1.2: Daniel Nicklaß, Peter Bickel
		1,5	Task 2.1.4: Daniel Nicklaß
		0,5	Task 2.2.1: Daniel Nicklaß, Peter Bickel
		0,5	Task 2.2.2: Daniel Nicklaß
	Subtotal	**4**	
5	UH	0.5	Task 2.1.1: Ekaterina Batchvarova, Ranjeet Sokhi
		0.5	Task 2.2.1: Ekaterina Batchvarova, Ranjeet Sokhi
	Subtotal	**1**	
6	UAVR	0.5	Task 2.1.1:Mafalda Sousa
		0.5	Task 2.2.1:Carlos Borrego
	Subtotal	**1**	
	Total	**11**	

4.5.0 General objectives of WP3,4,5

Work packages 3, 4 and 5 focus on AQ-assessment, on different spatial scales ranging from hotspot via urban to regional scale.

Integrated AQ-assessment is based on monitoring and modelling. The AQ-assessment is performed to fulfil the requirements according to the EU AQ-directives and the daughter directives including a possible Action Plan, to fulfil the more general requirements for the CAFE process, and to fulfil requirements with respect to environmental impact assessment and related permits.

Integrated AQ-assessment requires the analysis of the lay-out of the monitoring (network design, spatial representativeness), determination of the proper emission data and their uncertainty, accurate

meteorological and topographical/land use information needed for the modelling, and reliable background concentrations.

In addition the model itself should be fitted for the purpose, and its model-performance should be known based on previous model evaluation studies.

For all the three spatial scales these aspects have to be addressed in an-as far as possible-common way, emphasising common aspects, and paying attention to special scale-dependent phenomena.

These aspects will be reviewed and examined based on current practise and state-of-the-art. Based on this review recommendations and (minimum) requirements (D5.2) for the methods to be used will be formulated.

4.5 Detailed workplan WP3 – AQ assessment at hotspot/local scales

4.5.1 Objectives of WP and scope of work

To meet the overall objectives of WP3 the following operational objectives have been defined:

- To review and examine the current monitoring at local and hot-spot stations, in the light of the spatial representativeness and the adequacy of the network structures;
- To review and examine current modelling approaches/tools for predicting air quality at hotspot and local scales, model performances and their inherent uncertainties;
- To review the treatment of point source, traffic and emission data which are used as input to hotspot and local scale models, including inherent uncertainties, limitations and gaps;
- To review the current meteorological input/pre-processors used to drive stability parameters for hotspot and local scale models and for interpreting monitoring data;
- To review current practice concerning other input data for hotspot and local scale models: buildings, street geometry and terrain;
- To examine approaches for describing the chemistry on local scales (eg NO_2/NO_x ratio and for O_3);
- To examine the treatment of urban background concentrations (including O_3) as input to hotspot and local scale models and their uncertainties and limitations;
- To formulate recommendations and minimum requirements for monitoring and modelling approaches for hotspot and local scales in light of policy requirements.

4.5.2 Detailed task breakdown and milestones

The work is broken down into the following tasks:

Task 3.1: Monitoring methods on a hotspot and local scale will be reviewed and examined, with the final aim to formulate recommendations and minimum requirements. Aspects such as siting, instrumentation, representativeness and uncertainty of measurements and the need for supplementary data will be considered.

Task 3.2: Modelling methods on a hotspot and local scale will be reviewed and examined including their uncertainty, with the final aim to formulate recommendations and minimum requirements. Aspects including mathematical approaches, main dispersion processes appropriate to street situations, treatment of traffic and industrial sources, traffic induced turbulence and flow patterns, local meteorology, topography influences as well as user interface and data analysis requirements will be examined. Links with projects such as OSCAR also addressing street level air pollution will be beneficial. The type of modelling approaches addressed will include empirical, parametric and Gaussian methods, in view of the demand to arrive at cost-effective recommendations. The more detailed approaches based on for example on CFD will only be touched upon briefly.

Task 3.3: Hotspot and local scale emission data and their uncertainty (including traffic and point sources) will be reviewed. In relation to traffic emission factors again interaction with OSCAR will be exploited.

Task 3.4: Meteorological input data relevant to hotspot and local scales will be reviewed including the pre-processing approaches and the treatment of the data for interpreting air pollution concentrations.

Task 3.5: Review of how other input data, such as street geometry, building characteristics and terrain, is employed in local scale and hotspot models will be performed.

Task 3.6: The usefulness of simple approaches describing for chemical reactions on local scales, for example, estimating O_3 and NO_2/NO_x ratios, will be examined.

Task 3.7: Methods for estimating urban and regional scale background as input in hotspot and local scale models will be reviewed.

Task 3.8: Recommendations and minimum requirements for modelling and monitoring at hotspot and local scales will be formulated.

4.5.3 Allocation of resources

The TA specifies the allocation of resources for WP3 across partners; Table 3 provides this breakdown and nominates the key personnel of each partner who will conduct the work in WP3.

Table 4: Allocation of resources for WP3

	Partner	mm	Key personnel involved
1	TNO	2.0	Task 3.1 Thijsse
		2.0	Task 3.2 Wesseling
		1.0	Task 3.3 Denier vd Gon
		1.0	Task 3.6 vdHout
		2.0	Task 3.7 Builtjes
		2.0	Task 3.8 Keuken
	Subtotal	**10**	
2	NILU	0,5	Task 3.1 S.Larrsen
		1,5	Task 3.2 B.Denby
		0,5	Task 3.3 D.Tønnesen
		1,0	Task 3.4 B.Denby
		0,5	Task 3.5 B.Denby
		0,5	Task 3.7L.H.Slørdal
		0,5	Task 3.8 B.Denby
	Subtotal	**5**	
3	AUTH	2.5	Task 3.2, Fragkou
		0.5	Task 3.2, Moussiopoulos
		1.0	Task 3.6, Papathanasiou
		1.5	Task 3.7, Douros
		0.5	Task 3.7, Moussiopoulos
	Subtotal	**6**	
4	IER	3,5	Task 3.3 Daniel Nicklaß
		0,75	Task 3.8 Daniel Nicklaß, Stefan Reis
	Subtotal	**4.25**	
5	UH	1.0	Task 3.1 Lakhumal Luhana
		2.0	Task 3.2 Lakhumal Luhana
		1.0	Task 3.3 Lakhumal Luhana
		1.0	Task 3.4 Ekaterina Batchvarova
		1.0	Task 3.5 Ekaterina Batchvarova
		1.0	Task 3.6 Ekaterina Batchvarova
		1.0	Task 3.7 Ekaterina Batchvarova
		1.75	Task 3.8 Ekaterina Batchvarova
	Subtotal	**9.75**	
6	UAVR	1.0	Task 3.1 Mafalda Sousa
		1.0	Task 3.2 Ana Margarida Costa
		0.5	Task 3.3 Oxana Tchepel
		0.4	Task 3.4 Ana Margarida Costa
		0.4	Task 3.5 Ana Margarida Costa
		0.4	Task 3.6 Ana Margarida Costa
		0.4	Task 3.7 Alexandra Monteiro
		0.65	Task 3.8 Carlos Borrego
	Subtotal	**4.75**	
	Total	**39.75**	

4.6 Detailed workplan WP4 – AQ assessment urban/agglomerate scale

4.6.1 Objectives of WP and scope of work

To meet the overall objectives of WP4 the following operational objectives have been defined:

- To review and examine the current monitoring at urban background stations, in the light of the spatial representativeness and the adequacy of the network structure
- To review and examine the current modelling at urban scales, the model performance and its inherent uncertainty
- To review the current emission data, mainly anthropogenic but also biogenic and natural which are used as input to urban models, including their uncertainty and weak/missing points
- To review the current meteorological input/models used to drive the urban models, including their weak points and uncertainties
- To review the current practice concerning other input data for urban models: boundary conditions, land cover data
- To determine the accuracy by which current urban models can produce boundary conditions for local scale models
- To formulate recommendations and minimum requirements for monitoring and modelling approaches at the urban scale in the light of the policy requirements

4.6.2 Detailed task breakdown and milestones

The work is broken down into the following tasks:

Task 4.1: Monitoring methods on an urban scale will be reviewed and examined, with the final aim to formulate recommendations and minimum requirements

Task 4.2: Modelling methods on an urban scale will be reviewed and examined, with the final aim to formulate recommendations and minimum requirements

Task 4.3: Urban scale emission data will be reviewed

Task 4.4: Urban meteorological input data will be reviewed

Task 4.5: Land cover data and boundary conditions for urban modelling will be reviewed

Task 4.6: The usefulness of various tools and techniques for the urban scale will be assessed, including (i) data assimilation (ii) time series Fourier analysis (iii) principal components analysis and classification trees (iv) regression, ARIMA and neural networks methodologies.

Task 4.7: Methods for optimising the representation of subscale fluxes will be evaluated and tested for application at the urban scale

Task 4.8: Accuracy and methodology to determine boundary conditions for local scale models will be determined

Task 4.9: Recommendations and minimum requirements for modelling and monitoring at the urban scale will be formulated

In all tasks interaction with the local and regional scale workpackages will be taken care off. This will be guided by the cross-cutting issues: Emissions and data needs, uncertainties in models and monitoring, representativeness of model outputs and monitoring data, scale interactions and data-assimilation

4.6.3 Allocation of resources

The TA specifies the allocation of resources for WP4 across partners; table 5 provides this breakdown and nominates the key personnel of each partner who will conduct the work in WP4.

Table 5: Allocation of resources for WP4

	Partner	mm	Key personnel involved
1	TNO	1.0	Task 4.1 Keuken
		2.2	Task 4.2 Wesseling
		1.0	Task 4.3 Denier van der Gon
	Subtotal	**4**	
2	NILU	0,5	Task 4.1 S.Larrsen
		0,5	Task 4.2 S.H.Slørdal
		0,5	Task 4.3 S.Larrsen
		0,5	Task 4.4 S.H.Slørdal
		0,5	Task 4.5 S.H.Slørdal
		2,5	Task 4.6 S.E.Walker
		2,0	Task 4.7 B.Denby
		1,0	Task 4.8 S.E.Walker
		0,5	Task 4.9 B.Denby
	Subtotal	**8,5**	
3	AUTH	2.5	Task 4.2, Douros
		0.5	Task 4.2, Moussiopoulos
		1.0	Task 4.3, Vlahocostas
		1.5	Task 4.4, Papathanasiou
		1.0	Task 4.5, Douros
		3.0	Task 4.6, Slini
		2.5	Task 4.7, Fragkou
		1.0	Task 4.7, Moussiopoulos
		1.0	Task 4.8, Douros
		0.5	Task 4.8, Moussiopoulos
		1.0	Task 4.9, Douros
		0.5	Task 4.9, Moussiopoulos
	Subtotal	**16,0**	
4	IER	4.0	Task 4.3 Daniel Nicklaß
		0,75	Task 4.9 Daniel Nicklaß, Stefan Reis
	Subtotal	**4,75**	
5	UH	0.5	Task 4.1
		1.0	Task 4.2
		0.5	Task 4.3
		1.0	Task 4.4
		0.5	Task 4.5
		0.5	Task 4.6
		0.5	Task 4.7
		0.5	Task 4.8
		0.75	Task 4.9
	Subtotal	**5,75**	
6	UAVR	1.0	Task 4.1 Mafalda Sousa
		1.0	Task 4.2 Alexandra Monteiro
		0.4	Task 4.3 Alexandra Monteiro
		0.4	Task 4.4 Alexandra Monteiro
		0.4	Task 4.5 Alexandra Monteiro
		0.55	Task 4.8 Ana Isabel Miranda
	Subtotal	**3,75**	
	Total	**42,75**	

4.7 Detailed workplan WP5 – AQ assessment regional/continental scale

4.7.1 Objectives of WP and scope of work

To meet the overall objectives of WP5 the following operational objectives have been defined:

- To review and examine the current monitoring at background stations, in the light of the spatial representativeness and the adequacy of the network structure
- To review and examine the current modelling at regional scales, the model performance and its inherent uncertainty
- To review the current emission data, anthropogenic, biogenic and natural which are used as input to regional models, including their uncertainty and weak/missing points
- To review the current meteorological input/models used to drive the regional models, including their weak points and uncertainties
- To review the current practice concerning other input data for regional models: boundary conditions, land cover data
- To determine the accuracy by which current regional models can produce boundary conditions for urban scale models
- To formulate recommendations and minimum requirements for monitoring and modelling approaches at the regional scale in the light of the policy requirements

4.7.2 Detailed task breakdown and milestones

The work is broken down into the following tasks:

Task 5.1: Monitoring methods on a regional scale will be reviewed and examined, with the final aim to formulate recommendations and minimum requirements

Task 5.2: Modelling methods on a regional scale will be reviewed and examined, with the final aim to formulate recommendations and minimum requirements

Task 5.3: Regional scale emission data will be reviewed

Task 5.4: Regional meteorological input data will be reviewed

Task 5.5: Land cover data and boundary conditions for regional modelling will be reviewed

Task 5.6: Data-assimilation methods will be evaluated and tested for application at the regional scale

Task 5.7: Accuracy and methodology to determine boundary conditions for urban scale models will be determined

Task 5.8: Recommendations and minimum requirements for modelling and monitoring at the regional scale will be formulated

In all tasks interaction with the local and urban scale workpackages will be taken care off. This will be guided by the cross-cutting issues: Emissions and data needs, uncertainties in models and monitoring, representativeness of model outputs and monitoring data, scale interactions and data-assimilation

4.7.3 Allocation of resources

The TA specifies the allocation of resources for WP5 across partners; table 6. provides this breakdown and nominates the key personnel of each partner who will conduct the work in WP5.

Table 6: Allocation of resources for WP5

	Partner	mm	Key personnel involved
1	TNO	0,5	Task 5.1, Keuken
		2,5	Task 5.2, Schaap
		0,5	Task 5.2, Builtjes
		0,5	Task 5.5, Schaap
		2,5	Task 5.6, Schaap
		0,5	Task 5.7, Schaap
		0,5	Task 5,7, Builtjes
		0,5	Task 5,8, Schaap
		1,0	Task 5,8, Builtjes
	Subtotal	**9**	
2	NILU	0,5	Task 5.2 B.Denby
		2,25	Task 5.6 S.E. Walker
		2.0	Task 5.7 L.H.Slørdal
		0,5	Task 5.8 B.Denby
	Subtotal	**5,25**	
3	AUTH	0.5	Task 5.2, Douros
		1.0	Task 5.6, Slini
		2.0	Task 5.7 Douros
		0.5	Task 5.7 Moussiopoulos
	Subtotal	**4,0**	
4	IER	2,25	Task 5.3 Daniel Nicklaß
	Subtotal	**2,25**	
5	UH	0.5	Task 5.1
		1.0	Task 5.2
		0.5	Task 5.3
		1.0	Task 5.4
		1.0	Task 5.5
		1.0	Task 5.7
		0.75	Task 5.8
	Subtotal	**5,75**	
6	UAVR	0.9	Task 5.1 Mafalda Sousa
		0.9	Task 5.2 Mafalda Sousa
		0.2	Task 5.3 Mafalda Sousa
		0.2	Task 5.4 Mafalda Sousa
		0.2	Task 5.7 Alexandra Monteiro
		0.35	Task 5.8 Ana Isabel Miranda
	Subtotal	**2,75**	
	Total	**10**	

4.8 Detailed Workplan WP6 – Synthesis

4.8.1 Objectives and scope of work

To meet the overall objectives of WP6 the following operational objectives have been defined:

- To harmonise methods/recommendations from WP 3-5 for the different spatial/temporal scales by coupling WP2 requirements with WP3-5 recommendations.
- To specify the criteria and develop the protocols for the case studies: objectives, contents and types of results.
- To interact with the Application and Experts Groups to ensure user involvement and input, and relevance of results.
- To formulate final recommendations on best techniques for assessment of air quality at various spatial scales.

4.8.2 Detailed task breakdown

Task 6.1 Harmonise WP3-5 recommendations with WP2 requirements; develop methods framework.

The WP2 requirements to the contents of air quality assessment for various policy-related purposes is the starting point for the work in WP3-5 to investigate and recommend best techniques for AQ assessment at the various spatial and temporal scales. In Task 6.1 the first recommendation from WP3-5 will be compared with the WP2 requirements and a methods framework for AQ assessment synthesised/ constructed, which will take into account topics such as scale interactions, uncertainties and representativeness. There is interaction with the Experts and Application Groups during this process, through Workshops and papers.

Task 6.2 Prepare draft recommendations on best techniques for air quality assessment

Based on the analysis in Task 6.1, a draft report on recommendations for best techniques will be developed.

Task 6.3 Specify criteria and develop protocols for implementation of the case studies.

The purpose of the case studies is that they shall function as a "test bench" for the recommended best techniques for AQ assessment. It is foreseen that the case studies will provide feedback for improving the recommendations from WP3-5 (on the local, urban and European scales). The case study area partners will provide information and data on monitoring techniques, networks and measured concentrations, emissions inventory and air quality modelling methods used and results, and meteorological data. The preferable coverage and time resolution the data to be provided by the cities in that of time series with hourly resolution, over a period of one year.

The case study areas have been selected to provide a European geographical coverage, and a coverage of various aspects of the European air pollution problems: cites in northern, central and southern Europe. The cities have various levels of AQ assessment in relation to monitoring and modelling.

The work on this task will be performed in two phases: In a Phase 1 fairly early in the project, the case study areas will specify the methods they use for air quality assessments, and the extent of data and modelling results which are available from already carried out assessments. Based upon this, a first version of criteria and case study protocols will be developed, and cities start the preparation of a data base with their own data, based upon this 1st version. In a Phase 2, results from the WP3-5 work will be used to modify the draft, if necessary, and to complete a final protocol. The interaction with the Application Group during this process will be ensured, through discussions in Workshops, and commenting on working papers.

Task 6.4 Development of final recommendations

The results from the case studies will be used to improve and refine the draft recommendations, and a report of final recommendations of best techniques will be produced.

4.8.3 Allocation of resources

The TA specifies the allocation of resources for WP6 across all partners. Table 7 provides the detailed breakdown and nominates the key personnel of partner who will conduct the work in WP6.

Table 7: Allocation of resources for WP 6

	Partner	Mm	Key personnel involved
1	TNO	3.0	Task 6.1 Keuken
		2.0	Task 6.2 vdHout
		3.0	Task 6.3 Schaap
		1.0	Task 6.4Builtjes
	Subtotal	**9.0**	
2	NILU	3.0	Task 6.1: S. Larssen
		2.5	Task 6.2: S. Larssen
		3.0	Task 6.3: Larssen, Denby
		2.0	Task 6.4: Larssen, Denby
	Subtotal	**10,75**	
3	AUTH	1.0	Task 6.1: Douros
		0.5	Task 6.2: Moussiopoulos
		1.0	Task 6.3: Douros
		0.5	Task 6.4: Moussiopoulos
	Subtotal	**3.0**	
4	IER	1.0	Task 6.1: Daniel Nicklaß
		1.0	Task 6.2: Daniel Nicklaß
		0,75	Task 6.3: Daniel Nicklaß
		1.0	Task 6.4: Daniel Nicklaß
	Subtotal	**3,75**	
5	UH	1.0	Task 6.1: Lakhumal Luhana
		1.75	Task 6.2: Ekaterina Batchvarova
		1.0	Task 6.3: Ekaterina Batchvarova
			Task 6.4:
	Subtotal	**3,75**	
6	UAVR	1.0	Task 6.1: Carlos Borrego
		0.75	Task 6.2: Carlos Borrego
		1.0	Task 6.3: Ana Isabel Miranda
		1.0	Task 6.4: Carlos Borrego
	Subtotal	**3,75**	
	Total	**33,5**	

4.9 Detailed Workplan WP7 – Case Studies and mapping

4.9.1 Objectives and scope of work

This work package can be split into two separate major tasks. The first involves the preparation, implementation and interpretation of case studies. This major task will feedback into WP6 to help determine the final recommendations for best techniques. The second major task is the technical development of the web-based mapping portal and the preparation of sample maps for presentation through this portal. In summary the tasks can be split into the following subtasks:

Task 7.1: To prepare and implement case studies, according to protocols from WP 6.

Task 7.2: To evaluate and summarise case study results; feedback to WP 6

Task 7.3: To prepare a framework for GIS-based mapping of air quality on various scales, with a basis in available Europe-wide data sets and the recommended assessment methods from WP 6.

Task 7.4: To prepare examples of maps of air quality relating to various spatial and temporal scales, based upon available Europe-wide data sets, results from the case study cities and other available data.

4.9.2 Detailed task breakdown

Task 7.1: Prepare and implement case studies.
The case studies will be carried out, for each city/area, by the relevant pair of partners (core partner and city partner). They will be prepared and implemented according to the protocols recommended in WP6. The city partner will make the database of relevant/agreed data available and the core partners will run the analysis, in collaboration with the city partner. The analysis will include the assessment and comparison of the uncertainty, related to spatial resolution associated with various assessment methods. This will depend on the contents of the database for that city: by the monitoring data; by the modelling results available, and by the combination methods reviewed and recommended in WP3-5 and WP6.

As the exact form of the protocol and best techniques recommended will not be determined before WP6 has been, to some extend, completed it is important to have a continuous interaction between WP 6 and 7 to prepare for the implementation in WP 7.

Reports from the individual case studies will be collected in deliverable D7.3.

Task 7.2: Discussion of results in Workshops, with Expert and Application Groups.
Results from all case studies will be summarised with the objective of identifying common conclusions that point to needed modifications of the preliminary recommendations on best techniques. This will then feedback into the final recommendations in WP6. Discussions will be carried out in the form of workshops and a summary document will be prepared, D7.2.

Task 7.3: Prepare a GIS-based mapping framework
A GIS based mapping framework will be developed and visualised through a web portal. Selected maps on the various scales, as described in WP3 – 5, will be retrievable through a web-based system, allowing both images and data to be accessed. A protocol for data input, modelled and measured, as well as GIS input will be established in conjunction with the contributing application groups to facilitate inclusion of data into the mapping framework. The maps will be prepared using advanced GIS tools, such as MapObjects, and will be comparable with common GIS formats, such as ArcView.

The structure of the mapping framework will allow the inclusion of maps and data at all scales as they become available, allowing for future expansion based on newly available data. The resulting web site will be a continuously operating tool for data access by experts, public and policy makers. The system, its use and application will be described in the deliverable D7.1.

Task 7.4: Prepare maps
Maps will be prepared within the GIS based mapping framework. These maps will include results from the case studies as well as maps available from other sources of data, e.g. EMEP and EEA, based on the recommendations of WP6. They will display :

1. Air quality indicators as spatially distributed maps
2. A presentation of the variability of the indicators for the designated time and spatial scale
3. The uncertainty of the indicators, based on the results from WP3 –5
4. A description of the available data used for map construction and the methodology employed

4.9.3 Allocation of resources

The TA specifies the allocation of resources for WP7 across all partners. Table 8 provides the detailed breakdown for the research partners and nominates the key personnel of each partner who will conduct the work in WP7.

Table 8: Allocation of resources for WP 7

	Partner	mm	Key personnel involved
1	TNO	6	Task 7.1: J.Wesseling, S. Teeuwisse
		2	Task 7.2: M.Keuken
		4	Task 7.3: S.Teeuwisse
		3	Task 7.4: S.Teeuwisse, J.Wesseling
	Subtotal	**15**	
2	NILU	6	Task 7.1: B.Denby, L.Slørdal
		1	Task 7.2: S. Larssen, B. Denby
		8	Task 7.3: B.Denby, G.Endregard
		5	Task 7.4: B.Denby, G.Endregard
	Subtotal	**20**	
3	AUTH	3	Task 7.1: Vlahocostas 2.5 & Douros 0.5
		1	Task 7.2: Douros 0.5 & Moussiopoulos 0.5
	Subtotal	**4**	
4	IER	1,5	Task 7.1: Daniel Nicklaß
		0,5	Task 7.3: Daniel Nicklaß
	Subtotal	**2**	
5	UH	1,0	Task 7.1: Lakhumal Luhana
		1,0	Task 7.2: Lakhumal Luhana
		1,0	Task 7.3: Ekaterina Batchvarova
		1,0	Task 7.4: Ekaterina Batchvarova
	Subtotal	**4**	
6	UAVR	1	Task 7.1 Mafalda Sousa
		1.5	Task 7.3 Oxana Tchepel
		1.5	Task 7.4 Oxana Tchepel
	Subtotal	**4**	
7	Airparif	4	Task 7.1: Dominique Gombert
		0,5	Task 7.2:Dominique Gombert
	Subtotal	**4,5**	
8	STA	4	Task 7.1: Fabio Nussio
		0,5	Task 7.2: Fabio Nussio
	Subtotal	**4,5**	
9	UK/EA	4	Task 7.1: Bernhard Fisher
		0,5	Task 7.2: Bernhard Fisher
	Subtotal	**4,5**	
10	URM	4	Task 7.1: Maria Kazmukova
		0,5	Task 7.2: Maria Kazmukova
	Subtotal	**4,5**	
11	ENVECO	4	Task 7.1: Spyridon Papagrirou
		0,5	Task 7.2: Spyridon Papagrirou
	Subtotal	**4,5**	
12	GW	1,5	Task 7.1: Lien de Voogd
		0,5	Task 7.2: Lien de Voodg
	Subtotal	**2**	

	Partner	mm	Key personnel involved
13	DCMR	2	Task 7.1: Leo Hermans
		0,5	Task 7.2: Leo Hermans
	Subtotal	**2,5**	
14	OPHA	4	Task 7.1: Susanne Lützenkirchen
		0,5	Task 7.2: Susanne Lützenkirchen
	Total	**4,5**	
	Total	**51**	

4.10 Detailed workplan WP8 – Dissemination and Exploitation

4.10.1 Objectives of WP and scope of work

The objectives of the workpackage are:

- To disseminate key results of the project in a targeted manner to initiate scientific discussion on AQ assessment for policy purposes;
- To assist consensus building amongst key stakeholders and support the creation of new partnerships:
- To continuously inform, the wider public target groups including local authorities, member states, and other relevant international organisations, about the progression of Working Group discussions based on Newsletters, articles, and discussion fora.;
- To raise awareness amongst stakeholders of the current challenges faced in relation to AQ management at the final conference;
- To be the focal point for local authorities, scientific experts, researchers and other stakeholders with concerns for AQ policy and AQ assessment;
- To provide a platform for information on the key results of pan European AQ research and demonstration projects as well as best practice exchange;
- To provide information through a specific web site.

The work is broken down into the following tasks:

Task 8.1: Internet site: An interactive Internet Site will be designed and maintained in the framework of the project. The work on the design and development of the Web site will commence following the signature of contracts and will be operational within the first three months of the project. Key stakeholders, public target groups, international organisations and relevant research groups will be identified and notified about the Web site. Following this, work on the maintenance and updating of the site will continue throughout the project. The site will include:

Task 8.2: AIR4EU Good Practice Database: targeted at the presentation of good practice in respect of policy relevant, integrated, comprehensive and innovative tools, methods, systems and instruments for AQ management.

Task 8.3: Open workshops will be held half way throughout the project, month 18, and at the end of the project, month 36

Task 8.4: AIR4EU Newsletter: a regular newsletter service will be established to disseminate email notices of new articles and news items. An Email network of the wider user group (policy makers, authorities, practitioners and other relevant stakeholders will be established to facilitate wide dissemination.

4.10.2 Detailed task breakdown and milestones

Table 8 provides an overview about the detailed task breakdown for the activities of WP8. A brief summary of the tasks and their interrelationship is given in the following. The work starts with the development and implementation of the *project website (Task 8.1)*. In accordance with the TA the website has to be available by the end of month 5 of project lifetime. The website will be regularly updated each six month. *Task 8.2* deals with the setup and implementation of the *good practice database*. It is envisaged to collect throughout the project lifetime a number of cases which demonstrate good practices of the main topics AIR4EU is addressing. The database will be integral part of the project website. Another task in the dissemination strategy of AIR4EU are the two *workshops (Task 8.3)* planned for month 18 and month 36. The nature and content of both workshops will reflect the interim and final results the project has gained. As a means for informing interested parties on the project progress in a targeted way the project will publish four *newsletters (Task 8.4)* in electronical format

4.10.3 Allocation of resources

The TA specifies the allocation of resources for WP8 across partners, table 10.2 provides this breakdown and nominates the key personnel of each partner who will conduct the work in WP8. The research partners will contribute to the newsletters, the workshops in month 18 and 33, the good practice database and info on relevant web sites to be linked to the aIR4EU site

Table 9: Allocation of resources for WP8

	Partner	Mm	Key personnel involved
1	TNO	3	Task 8.1-8.4 Keuken
		2	Task 8.1-8.4 Heich
	Subtotal	**5**	
2	NILU	0,5	Task 8.1-8.4 S. Larrsen
		0,5	Task 8.1-8.4 B. Denby
	Subtotal	**1**	
3	AUTH	0.5	Task 8.1-8.4 Moussiopoulos
		0.5	Task 8.1-8.4 Douros
	Subtotal	**1**	
4	IER	1	Task 8.1-8.4 Daniel Nicklaß
	Subtotal	**1**	
5	UH	0,5	Task 8.3: Ekaterina Batchvarova
		0,5	Task 8.4: Ekaterina Batchvarova
	Subtotal	**1**	
6	UAVR	0.25	Task 8.1 Ana Isabel Miranda
		0.25	Task 8.2 Carlos Borrego
		0.25	Task 8.3 Carlos, Ana
		0.25	Task 8.4 Ana Isabel Miranda
	Subtotal	**1**	
	Total	**10**	

5 Cross-cutting issues

As already outlined in section 4.1 the project has been organised in a way the thematic WPs 3-5 which are addressing the spatial scales and temporal scales will address the five common cross-cutting issues:

- Emission & Data needs (coordinated by IER);
- Uncertainty of Models & Monitoring (coordinated by UAVR);
- Representativity of Models & Monitoring (coodinated by TNO);
- Scale Interactions (coordinated by AUT);
- Data Assimilation (coordinated by NILU).

The concrete contributions each cross-cutting issue is going to deliver to the thematic workpackages are described in the following.

5.1 Emission and Data needs

The overall aim of the cross-cutting task on emission data is to provide a comprehensive methodology to generate emission inventories, advantages/disadvantages, as well as assessing the uncertainties of emission estimates. Regarding the different spatial domains, this has to be done for hot-spot/local, urban/agglomeration and regional/continental scale, thus the tasks have as main objectives to recommend methodologies for emission inventories on all scales, to develop means for a spatial integration of inventories and to establish good practice/guidelines for generating emission scenarios, contributing to generalisation procedures. On the hotspot/street scale, we will evaluate possibilities to generate street canyon emissions including traffic measurements. For hotspots, e.g. point sources such as large combustion plants or industrial installations, the use and analysis of mandatory emission declarations is described. On the scale of urban/agglomerates, procedures for QA/QC, completeness checks and methods to improve spatial and temporal resolutions are described. In a similar way, regional scale emission inventories for the EU, based upon the EMEP inventory are assessed with regard to QA/QC-options in order to improve resolutions (temporal, spatial, species.).

Contribution to WP 3 – Local and Hot-Spots Scale
Task 3.3: Hotspot and local scale emission data and their uncertainty (including traffic and point sources) will be reviewed

- Review and analyse the methods to calculate emissions on local/hot-spot scale already defined (e.g Emission inventory handbook, UNECE Task Force on Emission Inventories and Projections);
- Define Quality targets and Indicators;
- Establish procedures for emission calculation at local/hot-spot scale, based on further analysis results

Contribution to WP 4 – Urban/agglomeration scale
Task 4.3: Urban scale emission data will be reviewed

- Review and analyse the methods to calculate emissions on urban/agglomeration scale already defined (e.g Emission inventory handbook, UNECE Task Force on Emission Inventories and Projections);
- Define Quality targets and Indicators;
- Establish procedures for emission calculation at urban/agglomeration, based on further analysis results

Contribution to WP 5 – Regional/Continental scale
Task 5.3: Regional scale emission data will be reviewed

- Review and analyse the methods to calculate emissions on regional/continental scale already defined (e.g Emission inventory handbook, UNECE Task Force on Emission Inventories and Projections);
- Define Quality targets and Indicators;
- Establish procedures for emission calculation at regional/continental scale, based on further analysis results

5.2. Uncertainty of Models and Monitoring

The credibility of air quality measurements and modelling used in the field of AQ assessment is a crucial issue. For this purpose, quantification of uncertainty as a part of Quality Assurance and Quality Control (QA/QC) procedures play a central role in policy-orientated research. The overall aim of the cross-cutting task on Uncertainty of Models and Monitoring is focused on review of existent methodologies and establishment of a comprehensive approach to uncertainty quantification, both monitoring and modelling, for different scales.

Contribution to WP 3 – Local and Hot-Spots Scale

Uncertainties related to local scale monitoring and modelling methods will be evaluated in this WP. Procedures for estimating uncertainties in the various input datasets will also be examined. This will be done for pollutants measurements of local scale, model results and the use of outputs for evaluating policy measures to reduce pollution levels.

Task 3.1 – Measuring Uncertainty and Variability

- Review and analyse the measuring uncertainty estimation procedures already defined (eg International Organization for Standardization, EUROAIRNET and the 96/62/CE Air quality Framework Directive);
- Understand and analyse the urban air quality monitoring networks uncertainties procedures of AIR4EU cities;
- Define Quality Targets and Indicators;
- Establish a simple uncertainty estimation procedure in order to be integrated in the final AIR4EU report and Recommendations.

Task 3.2 - Modelling Uncertainty

- Review the existent methodologies to estimate modelling uncertainty;
- Understand and analyse the local scale models used by the AIR4EU cities;
- Define Quality targets and Indicators;
- Establish procedures for uncertainty analysis at local scale, based on model physics errors, stochastic uncertainty and data errors.

Contribution to WP 4 – Urban/agglomeration scale

Uncertainties related to urban/agglomeration spatial scale monitoring and modelling methods will be evaluated in this WP. Procedures for estimating uncertainties in the various input datasets will also be examined. This will be done for urban background air quality measurements, urban scale model results and the use of outputs for evaluating policy measures to reduce pollution levels.

Task 4.1 – Measuring Uncertainty and Variability

- Review and analyse the measuring uncertainty estimation procedures already defined (i.e. International Organization for Standardization, EUROAIRNET and the 96/62/CE Air Quality Framework Directive);
- Understand and analyse the urban air quality monitoring networks (background monitoring stations) uncertainties procedures;
- Define Quality Targets and Indicators;

- Establish a simple uncertainty estimation procedure in order to be integrated in the final AIR4EU report and Recommendations.

Task 4.2 - Modelling Uncertainty

- Review the existent methodologies to estimate modelling uncertainty;
- Understand and analyse the urban scale models used by the AIR4EU cities and specifically the input data required by each model;
- Define Quality targets and Indicators;
- Establish procedures for uncertainty analysis, based on model physics errors, stochastic uncertainty and data errors.

Contribution to WP 5 – Regional/Continental scale

Uncertainties related to regional/continental scale monitoring and modelling methods will be evaluated in this WP. Procedures for estimating uncertainties in the various input datasets will also be examined. This will be done for pollutants measurements at regional scale, regional model results and the use of outputs for evaluating policy measures to reduce pollution levels.

Task 5.1 – Measuring Uncertainty and Variability

- Review and analyse the measuring uncertainty estimation procedures already defined (i.e. International Organization for Standardization, EUROAIRNET and the 96/62/CE Air Quality Framework Directive);
- Understand and analyse the regional air quality monitoring networks uncertainties procedures of AIR4EU cities;
- Define Quality Targets and Indicators;
- Establish a simple uncertainty estimation procedure in order to be integrated in the final AIR4EU report and Recommendations.

Task 5.2 - Modelling Uncertainty

- Review the existent methodologies to estimate modelling uncertainty;
- Understand and analyse the regional scale models used by the AIR4EU cities and specifically the input data required by each model;
- Define Quality targets and Indicators;
- Establish procedures for uncertainty analysis at regional scale, based on model physics errors, stochastic uncertainty and data errors.

5.3 Representativeness of models and monitoring

5.3.1. The issue

5.3.1.1 Representing the entire domain by samples

When assessing concentration levels, particularly at scales lower than the regional scale, one of the most crucial difficulties is that measurements or models often cannot cover the entire territory of interest. Especially environmental measurements (other than research-oriented) are almost always done to characterise an 'environment', i.e. an extended domain of interest, and not just the cubic metre from where the sample is taken. This is particularly true for measurements, which are essentially point-wise in space[1]. Also models have such limitations: they are not suitable to calculate the concentration distributions at every street or hot spot or in every city in Europe or a country.

To characterise the concentrations in the entire domain of interest with a limited number of measurements or calculations, one has to invoke in some way the concept of ***representativeness***, sometimes in a formalised way, but much more often in an informal, "common sense" way or implictly.

[1] With the exception of remote-sensing measurements, but these are in their current state more suitable for research purposes than for application in regulatory context.

For measurements, station typology is such a formalised approach: street stations are (rightly or wrongly) regarded as representating all streets, with an implicit notion that they are only representing polluted streets. The same is often done for traffic pollution models: one or a few polluted streets in a city are then modelled in detail and these are treated as representative for traffic hot spots.

The representativeness issue is also relevant in the time domain: measurement campaigns or advanced model calculations during a limited number of days cannot be regarded as representative for the entire year, which is usually the period of interest for regulatory purposes[2].

The representativeness issue for AIR4EU can be defined as follows:

When not all situations (in space or time) of interest can be assessed, but only a subset of these, how can we systematically derive data for all situations from data on the subset?

The general approach

The question to be answered has two main elements:

1. How to **select** a representative subset of situations?
   For measurements, this is the essence of ***measurement strategy***. When we develop approaches in measuring strategy, they will probably be also applicable to modelling: selecting streets representative for all polluted streets in a city is largely independent of the assessment technique to be applied[3].
2. For a given subset of situations, how to **derive** data for the entire set? This is called ***generalisation***.

AIR4EU aims to develop systematic approaches for answering these questions. Interestingly, the solution is scale dependent (cf streets and remote background). The uncertainty analysis in AIR4EU has strong and interesting links with the cross-cutting issue Uncertainty, for which imperfect representativeness is in AIR4EU more relevant that the uncertainty of the instrument (monitor, model). This is because the instrument uncertainty is a well-know and extensively investigated issue, where AIR4EU has little to add, while the representativeness uncertainty is usually larger than or comparable with the uncertainty of the instrument. The uncertainty in representativeness has in turn important implications for the cross-cutting issue Data-assimilation, where the quantification of this uncertainty is a major and largely unresolved challenge.

Contribution to WP 3-Local and Hot-spots scale

Task 3.1: **In the review of methods**, the following aspects will be addressed:

The review of **measuring methods** will focus on network design. The most important task of network design is selecting representative station locations. Important review questions are:

- What network design procedures exist?
- What are purposes of monitoring networks (e.g. exposure assessment, identifying limit value exceedance, public interest)?
- Based on the purposes, which types of areas are intended to be covered (e.g streets, residential areas, ecosystems?
- Do monitoring networks fully represent (cover) all locations/areas of interest in the territory addressed by the network? If not, what are the shortcomings?
- How is representativeness addressed in measurement reports (explictly, implictly or not at all)?

Task 3.2: The review of **modelling methods** will focus on the capabilities of models to calculate air pollution concentrations with the required coverage in time (e.g. full year) and space (e.g. an entire city) and resolution (particularly in space; time resolution is usually sufficient). Important review questions are:

- What are purposes of modelling studies (e.g. exposure assessment, identifying limit value exceedances)?

[2] Also for daily and hourly limit values, the evaluation period is usually a year.
[3] Leaving for now logistic problems aside (infrastructural probems in siting a station, availability of input data for modelling

- Based on the purposes, which types of areas are intended to be covered?
- Do models fully represent (cover) all locations of interest in the territory addressed? And with the appropriate resolution in space and time? If not what are the shortcomings?
- How is the next larger scale incorporated (WP3: urban background; WP4: regional background; WP5: global background)? Is this adequate?
- Methods combining measuring and modelling (contribution to cross-cutting issue 5.5) will also be reviewed. The main review question is:
- How are differences between station types (more generally: station representativeness) taken into account? Is this adequate?

Special points of interest for WP3:

- Is the number of hotspot stations (usually) sufficient to represent the air quality levels of interest (exposure, limit value exceedences) adequately?
- Do assessments by modelling cover all hotspots in the areas or a selection of representative hotspots? In the latter case, how are they selected?
- How are stations exactly 'micro-sited' with respect to the peak location (e.g. near traffic kerbside or building face; near point sources peak location or residential location)? Is this adequate in view of the purposes?

Contribution to WP 4-Urban/agglomeration scale

Task 4.1: **In the review of methods**, the following aspects will be addressed:

The review of **measuring methods** will focus on network design. The most important task of network design is selecting representative station locations. Important review questions are:

- What network design procedures exist?
- What are purposes of monitoring networks (e.g. exposure assessment, identifying limit value exceedance, public interest)?
- Based on the purposes, which types of areas are intended to be covered (e.g streets, residential areas, ecosystems?
- Do monitoring networks fully represent (cover) all locations/areas of interest in the territory addressed by the network? If not, what are the shortcomings?
- How is representativeness addressed in measurement reports (explictly, implictly or not at all)?

Task 4.2: The review of **modelling methods** will focus on the capabilities of models to calculate air pollution concentrations with the required coverage in time (e.g. full year) and space (e.g. an entire city) and resolution (particularly in space; time resolution is usually sufficient). Important review questions are:

- What are purposes of modelling studies (e.g. exposure assessment, identifying limit value exceedances)?
- Based on the purposes, which types of areas are intended to be covered?
- Do models fully represent (cover) all locations of interest in the territory addressed? And with the appropriate resolution in space and time? If not what are the shortcomings?
- How is the next larger scale incorporated (WP3: urban background; WP4: regional background; WP5: global background)? Is this adequate?
- Methods combining measuring and modelling (contribution to cross-cutting issue 5.5) will also be reviewed. The main review question is:
- How are differences between station types (more generally: station representativeness) taken into account? Is this adequate?

Special points of interest for WP4:

- Are non-hotspot locations of interest adequately covered (e.g. urban background, areas where people complain, areas with high exposure, areas of sensitive population such as schools)?
- Is the current practice of network design in cities adequate for all intended purposes (e.g. is a station set up in a school yard to address public concern adequate as urban background station)?
- Are model results expressed in terms of what the user wishes to know (e.g. exposure, limit value exceedance)?

Contribution to WP 5- Regional/Continental scale

Task.5.1: **In the review of methods**, the following aspects will be addressed:

The review of **measuring methods** will focus on network design. The most important task of network design is selecting representative station locations. Important review questions are:

- What network design procedures exist?

- What are purposes of monitoring networks (e.g. exposure assessment, identifying limit value exceedance, public interest)?
- Based on the purposes, which types of areas are intended to be covered (e.g streets, residential areas, ecosystems?
- Do monitoring networks fully represent (cover) all locations/areas of interest in the territory addressed by the network? If not, what are the shortcomings?
- How is representativeness addressed in measurement reports (explictly, implictly or not at all)?

Task 5.2: The review of **modelling methods** will focus on the capabilities of models to calculate air pollution concentrations with the required coverage in time (e.g. full year) and space (e.g. an entire city) and resolution (particularly in space; time resolution is usually sufficient). Important review questions are:

- What are purposes of modelling studies (e.g. exposure assessment, identifying limit value exceedances)?
- Based on the purposes, which types of areas are intended to be covered?
- Do models fully represent (cover) all locations of interest in the territory addressed? And with the appropriate resolution in space and time? If not what are the shortcomings?
- How is the next larger scale incorporated (WP3: urban background; WP4: regional background; WP5: global background)? Is this adequate?
- Methods combining measuring and modelling (contribution to cross-cutting issue 5.5) will also be reviewed. The main review question is:
- How are differences between station types (more generally: station representativeness) taken into account? Is this adequate?

Special point of interest for WP5:

- Are rural and remote background scales well covered and represented in Europe?

After the review of methods, a synthesis of all review results in WP3-5 regarding representativeness will be made. Based on this, the most promising approaches for network design will be selected and further investigated. In a combined effort of WP3-5, criteria and procedures for optimised siting of monitoring stations will be developed. Such procedures anticipate the processing of measuring results with models, using simple or complex data assimilation methods. Similarly, criteria for modelling for improving the representativeness of the results for the concentration levels that the user wishes to know will be developed.

5.4 Scale interactions

Air pollution involves physical and chemical processes over a wide range of space and time scales. Cities have typical spatial scales up to 10 to 20 km, or possibly even larger. Pollutant dispersion from near-ground level sources would be present through much of the atmospheric boundary layer over these distances. Processes at the city scale influence the larger regional scale up to 100 or 200 km. At the same time the regional, or larger, scale physical processes provide the background state for the city scale processes.

In view of the above, the adequate description of scale interactions is a prerequisite for reliable air quality assessments. In particular, the impact of local and urban sources has to be properly quantified compared with the effect of long-range transport. As a cross-cutting issue within the project, the interaction of various scales will be studied.

Work related to this cross-cutting issue is foreseen in the following tasks:

Tasks 3.2, 4.2 and 5.2: Differences of dispersion and transformation processes among the various scales (hotspot, local, urban, agglomerate, regional) will be identified and documented.

Tasks 3.7 and 4.7/8: The methods applied for a two-way interaction between urban and local scale models will be evaluated and tested.

Tasks 4.5 and 5.7: The methods applied for the interaction between regional and urban scale models will be evaluated and tested.

Tasks 3.8, 4.9 and 5.8: The recommendations and minimum requirements for modelling at the various scales will reflect guidelines for multi-scale simulation methods based on nested domains with different models. The intention is to assess at a later stage currently available multi-scale methods in terms of their ability of accurately predicting to what extent air quality in various city parts is affected by sources within the city boundary or can be attributed to long-range transport.

5.5 Data assimilation

Contribution to WP 3 – Local and Hot-Spots Scale

Task 3.1: Monitoring

- Review and examine existing data assimilation methodology with respect to the needs of monitoring
- Describe minimum and recommended requirements with respect to siting, representativeness and uncertainty measures for using different data assimilation methodologies

Task 3.2: Modelling

- Review and examine existing data assimilation methodology with respect to the needs of modelling
- Describe minimum and recommended requirements with respect to model representativeness and uncertainty measures for using different data assimilation methodologies

Task 3.3: Emissions

- Describe how emission data with their uncertainty can be included in different data assimilation procedures to improve model estimates

Task 3.4: Meteorology

- Describe how meteorological data with their uncertainty can be included in different data assimilation procedures to improve model estimates

Task 3.7: Urban and regional scale background

- Describe how urban and/or regional scale background can be estimated as part of a data assimilation procedure

Task 3.8: Modelling and monitoring recommendations

- Describe which data assimilation methodologies seems most relevant to use on a local/hot spot scale, including a procedural description of the selected methodologies

Contribution to WP 4 – Urban/agglomeration scale

Task 4.1: Monitoring

- Review and examine existing data assimilation methodology with respect to the needs of monitoring
- Describe minimum and recommended requirements with respect to siting, representativeness and uncertainty measures for using different data assimilation methodologies

Task 4.2: Modelling

- Review and examine existing data assimilation methodology with respect to the needs of modelling
- Describe minimum and recommended requirements with respect to model representativeness and uncertainty measures for using different data assimilation methodologies

Task 4.3: Emissions

- Describe how emission data with their uncertainty can be included in different data assimilation procedures to improve model estimates

Task 4.4: Meteorology

- Describe how meteorological data with their uncertainty can be included in different data assimilation procedures to improve model estimates

Task 4.6: Usefulness of tools and techniques

- Review existing litterature and describe which data assimilation methodologies seems most relevant to use, contributing to subtask i

Task 4.7: Representation of subscale fluxes

- Describe how subgrid scale models with their uncertainties can be included in a data assimilation procedure for the urban/agglomorate scale

Task 4.8: Determine boundary conditions

- Describe how regional scale background concentrations (boundary conditions) can be estimated as part of a data assimilation procedure

Task 4.9: Modelling and monitoring recommendations

- Describe which data assimilation methodologies seems most relevant to use on an urban/agglomerate scale
- Include a detailed algorithmic description of the selected data assimilation methodologies, and if possible provide software tools to the participating Air4EU cities to perform data assimilation on their own model and monitoring data

Contribution to WP 5 – Regional/Continental scale

Task 5.1: Monitoring

- Review and examine existing data assimilation methodology with respect to the needs of monitoring
- Describe minimum and recommended requirements with respect to siting, representativeness and uncertainty measures for using different data assimilation methodologies

Task 5.2: Modelling

- Review and examine existing data assimilation methodology with respect to the needs of modelling
- Describe minimum and recommended requirements with respect to model representativeness and uncertainty measures for using different data assimilation methodologies

Task 5.3: Emissions

- Describe how emission data with their uncertainty can be included in different data assimilation procedures to improve model estimates

Task 5.4: Meteorology

- Describe how meteorological data with their uncertainty can be included in different data assimilation procedures to improve model estimates

Task 5.6: Evaluation and testing of data assimilation methods

- Describe which data assimilation methodologies seems most relevant to use on a regional scale, including a procedural description of the selected methodologies

Task 5.7: Determine boundary conditions

- Describe how global/continental scale background concentrations can be estimated as part of a data assimilation procedure

Task 5.8: Modelling and monitoring recommendations

- Describe which data assimilation methodologies seems most relevant to use on a regional/continental scale, including a procedural description of the selected methodologies