TWINNING PROJECT

FINAL REPORT

Project Title: Air Quality Improvement

Partners: The Finnish Meteorological Institute and the Ministry of Environment and Physical Planning

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Project Title:	Air Quality Improvement
Twinning Partners (MS and BC)	The Finnish Meteorological Institute and the Ministry of Environment and Physical Planning
Duration of the project:	1.9.2006-31.5.2008
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This section describes the activities of the project. It is divided in nine sub-sections.

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List of Abbreviations and Acronyms

AQ	Air Quality
AQFD	Air Quality Framework Directive
BC	Beneficiary Country
BTEX	An analyzer which measures benzene, toluene and xylene isomers in the air, also called BTEX analyser
CADASTRE	Register maintained by MEPP. Includes information of concentrations and fuel consumption based on inquiries from point sources
CARDS	Community Assistance for Reconstruction, Development and Stabilisation (European Union)
CLRTAP	Convention on Long-Range Transboundary Air Pollution (UN)
Copert 4	MS Windows software program aiming at the calculation of air pollutant emissions from road transport
EEA	European Environment Agency
EPER	European Pollutant Emission Register
E-PRTR	European Pollutant Release and Transfer Register
EU	European Union
EU NEC	European Union - National Emissions Ceiling
FMI	Finnish Meteorological Institute
FCCC	Framework Convention for Climate Change (UN)
GEF	Global Environment Facility
HMA	Hydro-Meteorological Administration
MEPP	Ministry of Environment and Physical Planning (in BC)
MEIC	Macedonian Environmental Information Centre
MS	Member State
NEC	National Emission Ceiling (EU)
QA/QC	Quality Assurance and Quality Control
RIHP	Republic Institute for Health Protection
RTA	Resident Twinning Advisor
SSO	State Statistical Office
SYKE	Finnish Environment Institute
VTT	Technical Research Centre of Finland
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe

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UNFCCC   United Nations Framework Convention for Climate Change

WHO   World Health Organisation

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1 EXECUTIVE SUMMARY

The overall purpose of the project was to improve air quality in the country. To achieve this overall institutional and technical capacity was strengthened in the air quality management and assessment by developing and introducing new methodologies and given intensive practical training to use them. Also legal framework was strengthened by harmonizing the legislation with relevant EU directives. With new methods and improved technical and human capacity it is possible for BC to make more reliable and comprehensive analysis of air quality, produce relevant national and international reports and furthermore to inform general public on air quality more reliable and timely. This enables also better air quality management in the country and establishing measures to improve air quality.

The project had five components: 1. Guidelines and Secondary Legislation, 2. Emission Inventories, 3. Preliminary Environmental Assessment, 4. Air Quality Measurements and Laboratory Work, 5. Dispersion Modelling. These components included practically all elements included in relevant EU Air Quality Directives and significant progress was achieved in each components. All the Mandatory Results set for the project was achieved. Recommendations for short, medium and long term future development were given for each component.

Component 1 was designed to prepare new sub-legislation and guidelines on air quality control, needed to achieve approximation of the national legislation. All activities foreseen were carried out, and the corresponding mandatory results were also achieved, including one that was added during the project. The results will be manifested as new or changed air quality regulations and guidelines, approved by the administration. The component was carried out in close and transparent co-operation between MS experts and MEPP personnel, even if the personnel resources were the main concern for the component.

In the second component the purpose was to improve the information base for air quality related environmental management and the capacity and tools of BC to carry out the regular emission inventory work. The air emission inventory work in BC has so far been only project based. The stakeholders were identified through many meetings with different authorities and institutes, especially in the traffic sector. However, no experts outside MEPP were available because of lack of financial resources. An updatable and expandable database was created by MS for collection and reporting data identical or similar to the EEA during the missions. This enables the continuous emission inventory work on sustainable bases. The international model for traffic emission calculations Copert 4 was implemented and relevant training given. The greatest shortcoming for the permanent emission inventory work is the lack of a national system for air emission inventories. A proposal for the structure of the future Macedonian National Inventory System was prepared by MS expert in this component. A permanent national system would resolve the many problems related to organising resources, expertise and co-operation.

In the third component basic purposes were to improve the methodology for preliminary assessment and revise the zoning for air quality assessment and management according to updated and more reliable results of preliminary assessment. Substantial development in the capacity of performing preliminary assessment in BC was achieved. New methodologies were introduced and relevant practical hands-on trainings were given to use them. Methods to integrate emission, dispersion modelling and measurement results, GIS methods to analyse and illustrate results, new validation methodologies for measurement data were trained and used in the revised assessment. More comprehensive and reliable air quality assessment were used to revise the zoning system and few zones were proposed to achieve more effective and less costly air quality management and assessment in the country. New preliminary assessment results form a good base for future development of the air quality monitoring network in BC.

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Nevertheless, because of limited BC resources it was not possible to carry out all needed and recommended additional measurement campaigns and to get all detailed emission information to compile preliminary assessment for all pollutants included in the EU AQ directives. Also longer data sets are needed in the future to update and conclude the assessment.

The purpose of the project was to enhance the basis for a comprehensive ambient air monitoring system following the provisions of the EU Air Quality Framework Directive 96/62/EC (AQFD) and Daughter Directives. To fill the gaps between BC and EU-MS, a substantial amount of training was conducted to the items in the work plan of the project. By trainings in the component 4 and by visiting at MS BC-experts got a good picture on the air quality measurements and laboratory work according to EU requirements. Even good progress was achieved on adapting the EU-practises in use; there is still much work to do to bring all the learnt practices in the daily work. The way forward for BC is to increase the expertise of the personnel by providing more detailed training and to provide secured working conditions to the trained personnel.

The impact of the project to BC is that the same practices and procedures for obtaining the air quality and emission measurements as required by the EU directives have been trained and in some extent already adapted in daily use. With the help of following all the guidance, the air quality data can be as accurate and comparable with the other air quality data across the Europe. During the project the air quality calibration laboratory has shown the capability by participation of the intercomparison exercises organized by the EC/JRC and the WHO. The participation brought the laboratory in connection with the other European reference laboratories and with other colleagues. Further co-operation is very likely when the expertise of the laboratory is recognized.

The purpose in the fifth component was to provide air quality modelling tools to BC, train the staff to use, understand, and evaluate the results of models and to compile real case studies. All goals were achieved during the project: two local scale dispersion models were implemented and taken into use, relevant training given, basic input datasets needed in the modelling compiled and finally real case studies prepared to assess the air quality caused by stationary and traffic emission. The impact on BC administration depends critically on the resources available for this work after the project has finished. Some substantial resources would be needed to ensure the updated emission information and also the continuous flow of meteorological data necessary for modelling purposes.

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2 BACKGROUND

Starting Point

The Former Yugoslav Republic of Macedonia has been in the process of approximation of EU legislation on air quality and emissions, and for that purpose achieved assistance by CARDS projects and this Twinning project. When the Twinning project started there was, in addition to the Law on the Environment, a Law on Ambient Air Quality (67/2004), Degree on limit values of the levels and types of pollutants in ambient air and alert thresholds, terms for limit values achievement, limit value margins of tolerance, target values andlong-term targets(50/2005) and a Rulebook on Criteria, Methods and Procedures for Evaluating the Ambient Air Quality (82/2006). In addition some CARDS projects were running and producing results that were important also for the Twinning project, as tables of concordance for further alignment of the legislation. But there were still gaps in the sub-legislation, and in corresponding guidelines, that needed work.

The main limiting factor for approximation was the personnel resource situation in MEPP, which was inadequate at the beginning, and was further temporarily reduced at the early stages of the Twinning project.

Air emission inventory work in BC has previously been project based: reporting under the UNFCCC has been funded by the GEF as part of the National Communication (data for the years 1990-2005 included) and reporting under the UNECE CLRTAP funded by the CARDS 2002 Regional Programme and implemented by EEA (data for 2004 included). In addition, a comprehensive point source inventory had been carried out by MEPP with a database created in a project funded by Switzerland Compensation found.

The first draft preliminary assessment report was prepared by the CARDS 2004 project. The assessment was based almost totally on the air quality measurement data. Also the data used in the assessment was not validated properly and partly also analysed improperly. Thus the usability of the results of previous assessment was limited and zoning system based on the results had to be revised. The preliminary assessment by the CARDS 2004 project was made totally as consultancy work. The capacity of MEPP personnel to revise and update the assessment was limited. Also new methods had to be introduced and taken into use to include also emission data and dispersion modelling data in the assessment. The indications and recommendations of CARDS 2004 project to future development of air quality measurement network and components to be measured were not totally clear and well justified.

The air quality network for the measurements of atmospheric pollutants had been established and run by three different organisations. The Republic Health Institute measures by sampling methods at Skopje SO2 and black smoke at 7 station in the city and at Veles at 3 measuring points in the City. In addition Lead, Cadmium, and Zinc are measured at Veles on one measuring point every day and two times per month at six other stations. The Hydro-Meteorological Administration has 10 stations for SO2 and black smoke in Skopje based on sampling methods. Since 1998 the new automatic air quality network for CO, SO2, NO, NO2, NOx, O3, and PM10 was established by MEPP. Altogether 15 automatic stations was founded, five at Skopje and ten around the country. At the same time the calibration laboratory and the mobile emission laboratory was founded.

The work in the calibration laboratory and in the monitoring stations was carried out by two engineers who work on contract base. The laboratory was equipped with facility for maintenance and for preparation of the primary gas mixtures for calibration purposes of the continuous analyzers for carbon monoxide, sulphur dioxide and for nitrogen monoxide, but not for ozone. The experience for using the

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BTEX analyzers was rather weak. Improvements should be addressed to ozone calibration, use of the BTEX analyzer, flow measurement equipment and to increase the technical expertise for the use of the different calibration method in the laboratory and in the field. In addition there was no QA/QC plan for the laboratory and for the field work. However the maintenance plan for the equipments and for the field operation was made by the German expert, but that was not taken into practise in the laboratory. The data management software was old-fashioned enabling real-time data acquisition but did not include data validation methods, methods for real-time data dissemination to the general public or automatic procedures for reporting. Further more the quality chain for the air quality measurement was not functional: calibration laboratory were not in operational use, field calibrations were not performed in regular bases and finally the data validation was made manually. Major part of the measurement stations and their measurement equipments were in bad condition or out of order because of shortage of funding for maintenance and spare parts.

In the emission laboratory of MEPP there was a group which has worked for the emission measurements. However, there have been many changes in the organisation and therefore, many experts have been changed and there has not been possible to form a team working for this task. Also the mobile emission laboratory had been out of order and not used in emission measurements for several years. At the Central Environmental Laboratory there was no experience of PAH analysis or any other gas-chromatographic analysis from air samples. The equipment was inadequate and there were no trained personnel.

No dispersion models were available in MEPP and practically no experience in the use of AQ models for AQ assessment existed in BC. In the HMA there was some experience in using long range dispersion model, but the model was not in operational use. Also the emission and meteorological data were not available or properly processed for the use of dispersion modelling. The co-operation between MEPP and HMA were not functional to enable data exchange or sharing experience.

Objectives

The overall objective of the twinning project was to improve air quality in the country.

The project purposes were:

- approximate the national legislation on air quality

- improve the information base for air quality related environmental management – especially concerning national emission inventories for air

- enhance the basis for a comprehensive ambient air monitoring system following the provisions of the EU Air Quality Framework Directive 96/62/EC (AQFD) and Daughter Directives

- improve MEPP operation of the national Ambient Air Monitoring Network and include other relevant institutions in this activity

The project purpose for Component 1 was to approximate the national legislation on air quality. The mandatory result was that EU air quality legislation based on the already harmonized air quality framework directive further aligned, draft sub-legislation on air quality completed, and about 50 persons trained and training material and instructions manual prepared. The main activities undertaken were to

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ensure that the framework directive on air quality was fully transposed, and that the new EU legislation based on the CAFÉ process was easy to transpose.

The project purpose for Component 2 was to improve the capacity and tools of BC to carry out regular emission inventory work and to improve the information base for air quality related environmental management. BC did not have a permanent national air emission inventory system (including legislation, data collection, national methodology development, inventory preparation and reporting).

The mandatory results for Component 2 were:

1. Institutional capacity and tools improved for maintaining emission data inventories and improved tools

2. Report on compliance with EU based national emission inventory system and priority list for improvement

3. Improvement of National methodology for air emission inventories for the country

4. Capacities improved and draft training materials prepared on emission inventories and reports

5. Support to EPER/E-PRTR reporting

The goal in the Component 3 was to update the preliminary air quality assessment by introducing new methodologies and better quality data. Based on the improved preliminary assessment the zones used for air quality assessment and management should have been updated.

The mandatory results for Component 3 were:

1. Improvement of methodology for preliminary assessment

2. Revised agglomeration and non-agglomeration zones, established with CARDS 2004 Projects

3. A preliminary assessment of ambient air quality has been worked out and reported to the EEA

4. Awareness raised on the importance of the air quality monitoring system

The purpose of the Component 4 was to enhance the basis for a comprehensive ambient air monitoring system following the provisions of the EU Air Quality Framework Directive and Daughter Directives.

The mandatory results of the component 4 were as follows:

1. Operation of the calibration laboratory improved and the staff is trained

2. Capacity built for operation, maintenance, calibration and repairs of air quality monitoring stations and samplers.

3. A draft QA/QC plan has been worked out

4. Plan for improvement and training for data management has been completed

5. Plan for improvement and training for GCs analysis for air samples has been completed

6. The operation of Mobile Emission Monitoring Laboratory is improved and the staff received proper training for emissions measurements

7. Specifications and priority list for investment (software, laboratory equipment and additional equipment for air quality monitoring stations and mobile emission laboratory

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The purpose of the Component 5 was to take into use totally new air quality assessment in BC, i.e. dispersion modelling.

Mandatory results for the Component 5 were:

1. An air quality model has been supplied and implemented

2. Methods to provide meteorological and emission dataset for dispersion modeling has been established

3. The staff is trained in the use and validation of the model results

4. Real case studies prepared

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3 IMPLEMENTATION PROCESS

 Developments outside the project

Overall policy development

During the implementation period covered by the twining project, several activities related to further development of the legislation through transposition of Directives relevant to air, have been carried out in the Ministry of Environment and Physical Planning.

CARDS 2004 Project –Environmental management

Component M3 - Development of Preliminary Assessment of the Air Quality and establishment of air quality zones and agglomerations on the territory of the Republic of Macedonia. Thus, in accordance with the Framework Air Directive 96/62/EC, draft "Proposed Zones and Agglomerations in the Republic of Macedonia and Minimum Required Measuring Points" has been produced.

Under the same project, in relation to secondary legislation development, the following legal acts have been drafted:

- Rulebook on the introduction of CORINAIR methodology

- Decision on preliminary air quality assessment and establishment of zones and agglomerations in the Republic of Macedonia.

- Rulebook on limit values and allowed levels of emissions and type of pollutants in waste gases and vapours emitted by stationary sources in the air.

- Rulebook on substances and their emission limit values for which IPPC licences B exist

CARDS 2005 Project - "National Strategy for Environmental Approximation"

In the air component, implementation plans and costs analysis were prepared in relation to 96/62/EC and 2001/81/EC Directives, implementation plans for 2002/3/EC and 2001/81/EC Directives.

Tables of concordance have been developed for 96/62/EC, 2002/3/EC, 2001/81/EC and 2003/87/EC Directives, as well as the forms and the findings with regard to the status of transposition and gap analysis on 96/62/EC and 2001/81/EC Directives; lists of actions required for full transposition of 96/62/EC and 2001/81/EC have been developed, too.

Under the project, prioritisation of the directives included in this project was made.

National legislation

The Law on Environment has been amendment and supplementing. In this context, Articles regulating environmental monitoring and data reporting, indicators based on the Report development and State of Environment Report, were amended to be more detailed. The amendments of the law were announced in the Official Gazette 24/2007.

Amendments on Law on air quality were made in order to accomplish full implementation of air quality framework directive. The amendments were adopted and announced in Official Gazette 92/2007.

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The Rulebook for the methodology for the inventarization and determination of the emission levels of the pollutants in the atmosphere in tones per year for all types of duties, as well as other data for delivery of the programme for monitoring of the air in Europe (EMEP) is announced in "Official Gazette of RM" no. 142 dated 26.11.2007.

Sub legislation List on zones and agglomerations was given to the Secretariat for Law and is in legal procedure for adoption.

Project COWI Progress monitoring

The project Progress monitoring that is related to preparation of TOC and implementation tables for the directives (96/62/EC; 99/30/EC; 2002/3/EC; 2001/81/EC; 2000/69/EC; 2004/107/EC) is ongoing. There was a meeting where the representatives of MEPP were informed for the two phases i.e. phase 1 up to the end of February and phase to the end of April. The activities in the phases are review and update of the existing TOC and implementation tables of air quality directives. Within phase 2, during the period covered with the report responsible personnel in MEIC reviewed and updated the existing TOC and implementation tables of mentioned air quality directives. Analysis of TOC and implementation tables in the first and second phase showed improvement of the transposition of air quality directives. Framework directive 96/62/EC is entirely transposed, and the other daughter directives will be entirely transposed in the National legislation till end of 2008.

Cards 2006 project

Cards 2006 project with the following goals:

- Support for remediation of the hot points

- Development of four plans for rehabilitation

The project has started and has been finished during the period covered by the twinning project.

National set of indicators

The proposal for the national set of indicators for environment was adopted by the government. Working groups for harmonization of different types of indicators were formed. These groups held regular working meetings on which they adopted, prepared and approved the proposed list of indicators. The national set of indicators should be accepted by the Government of R. Macedonia till end of August this year.

Governmental issues

The government changed in August 2006.

A new Minister of Environment, Mr. Dzelil Bajrami, took office on February 21 2007, coming from the same party as the previous one Imer Aliu.

A new Minister of Environment, Mr. Xzelil Bajrami had a meeting with MS PL Harri Pietarila and the RTA Tiina Harju on 28 June 2007. It was discussed during the meeting about the twinning project, its human and financial resource needs, importance for MEPP

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NPAA

The activities that are related to the air legislation and are given in NPAA were regularly updated and developed according to the plan. In this period the WEB application was filled in according to the SEP requirements, as new method for updating NPAA.

New projects for air

The project "Participation of the West Balkan Countries in the work of the Community Agencies - EEA (2005-2006); Air emissions" is extended for the period 2007-2008. To the request of the coordinator of the project FEA – Vienna, a report was sent regarding the current situation of the emission inventories and the requests of the future project related to this issue. Until now there is no information for the further development of the project.

Ministry of Environment and Physical Planning received project proposal from UN Economic Commission for Europe UNECE / CLRTAP, for ratification of the following protocols: Heavy Metals Protocol, the Persistent Organic Pollutants Protocol and the Gothenburg Protocol. Mrs Marijonka Vilarova was point out as contact person from the Ministry for this project. Also during this period activates were undertaken for translation of the other six protocols under the convention.

The key developments outside twinning project, Component perspectives

The key development outside the Twinning project in the policy area was that the CARDS 2004 and 2005 projects were running and producing results, which were important also for this twinning project.

The original assumptions of the Component 1 were fulfilled, i.e. there was a good co-operation with and output of the CARDS 2004 and 2005 projects, the relevant legislation and documents were translated to full satisfaction, and co-operation with main stakeholders in MEPP was functional, even if it was less so with other stakeholders, except during the final training session.

The following original assumptions in Component 2 were fulfilled:
- Activity data was available and its quality meets the requirements in some cases but for some sectors there is the need to organise permanent data collection procedures at the required level of detail.

- Software and hardware meets the requirements: A new database built up during the mission will meet the requirements when necessary data will be fed into the system. The international Copert 4 traffic emission calculation model was implemented.

- Skilful personnel available and enough personnel resources: During the project experts in MEPP were appointed to the inventory work. There are skilful national experts also outside MEPP but no funding has been appointed for the actual work. So far these experts have been resourced with the funding from GEF and EU only.

The following original assumption in the Component 2 was not totally fulfilled:

- Stakeholders available and willing to cooperate. Responsibilities in the inventory work have not yet been discussed between the possible stakeholders. It is recommended that MEPP experts organize a meeting with relevant stakeholders to discuss permanent organisation for the inventory work. To ensure good co-operation it is necessary to establish a permanent forum, e.g. an inventory working group, for which this meeting could be a start. Nevertheless it has to be

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pointed out that during the project MS experts together with BC experts had many contacts and negotiations with the stakeholders.

The key development for the Component 3 was the finalisation of the CARDS 2004 project and the preliminary assessment produced by the project. The CARDS 2004 provided all the data used in the preliminary assessment, including also the final report and proposals for zoning. The functional co-operation between the twinning and CARDS 2004 project were established and the data and reports used and produced by the CARDS 2004 were provided to the twinning project. MS expert of twinning project participated and contributed also in the final workshop of the CARDS 2004 project to enable the continuation and sustainability of the work. The change of government and minister delayed the needed decisions for funding of additional measurements and software's needed to improve the data used in the preliminary assessment. It was not possible to conduct additional measurements to support the preliminary assessment and no new software was taken into use for data management and validation to improve the quality of the data.

The following original assumptions in Component 3 were fulfilled:
- Co-operation and outputs of CARDS2004

- Dispersion model and GIS tools existing and meets requirements (dispersion models provided by twinning project and GIS tool existing and needed further training given by twinning project)

- Enough personnel resources available

- Enough resources for producing and distributing promotion materials (brochure printed and distributed by MEPP resources)

The following original assumptions in Component 3 were partly fulfilled:
- Emission data, other activity data and AQ measurement data available and its quality meets requirements (The data and its quality was adequate to produce first draft assessment. Nevertheless there is need for more reliable and detailed emission and other activity data to improve the assessment. Also reliable measurement data was available only for three years for some pollutants and the data was lacking totally for some pollutants covered by EC AQ directives)

In the Component 4 the key outside development was participation and good success of the calibration laboratory at the intercomparison exercise addressed to National Reference Laboratories of MS (NRL). The intercomparison campaign was organized by EC/JRC (Ispra) and by World Health Organization in Essen in October 2007. Much effort was laid down by MS and BC experts for preparation to the intercomparison event and calculation of the results. Participation of such an intercomparison studies with the other NRL of MS shows the readiness of the laboratory for such a demanding task.

The following original assumptions in Component 4 were fulfilled:
- New equipment for PAH analysis in air by GC procured in the Environmental Laboratory. There was no need to procure new detector.

- New equipments and spare parts for mobile emission laboratory procured (new equipments were procured at the ending phase of the project. Still it was possible to take them into use and give relevant training)

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The following original assumptions in Component 4 were partly fulfilled:
- Skilful personnel available (the personnel available were skilful but there was shortage of personnel during the project, and still is because of personnel changes and short time contracts of the well trained personnel)

- Hardware and software requirements met (no funding was allocated during the project for the new data management software)

- Enough resources for new spare parts and/or equipments (There was, and still is shortage of funding for both spare parts and new equipments in MEPP. The funding was delayed at least partly because of change of minister during the project. There is no stock of fundamental spare parts needed)

In the component 5 the key development was that the co-operation between MEPP and HMA was strengthened. This enabled at least the starting of the meteorological data exchange and is crucial for any further air quality modelling related activities. Nevertheless more efforts have to be put to improve the co-operation in the future.

The following original assumptions in Component 5 were fulfilled:
- BC human resources and computer meets requirements

- Resources for model procurements available (The models were given free of charge by MS)

The following original assumptions in Component 5 were partly fulfilled:
- Co-operation with HMA (co-operation started but need to be enhanced and establish in more permanent base in the future)

- GIS, emission and meteorological data available (GIS data available but the coverage and quality of emission and meteorological data needs improvements)

External problems

The main implementation problem was the not sufficient staffing of MEPP and its Environmental Information Centre. This sometimes delayed progress somewhat, and is a threat to the sustainability of the results achieved. The personnel problem was continuously addressed by the RTA and MS PL when they had meetings with top MEPP officials, and by MS experts when meeting with MEIC personnel.

The staffing and finance problems were at least partly caused by the change of government and minister in MEPP. This caused big delays in decisions to finance necessarily needed spare parts, new instruments or even consumables in MEPP. Also decisions to finance new data management software and additional measurement campaigns were not made during the project. Lot of discussions between MS and MEPP were carried out to solve the situation. RTA and MS PL discussed the situation also with the new minister.

The lack of personnel and the short term contracts of the personnel is a serious problem which should be solved. Also the present situation where the personnel of the laboratory are working at the Ministry of Environment and Physical Planning and not at the expertise institute or agency is not recommended. Too much of time is spent on travelling from the ministry to the laboratory and to the measurement

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stations. The task of the laboratories needs experienced and competent personnel who should devote their work completely. A more detailed training of personnel to increase the level of expertise is needed.

The lack of consumable funds to guarantee the proper operation and maintenance of all the equipments at the calibration and chemical laboratories, at the air quality network and at emission measurements is a serious problem to solve urgently. In addition, there is still need for proper tools in the laboratories; The lack of spare parts to the analyzers is a serious threat for continuous operation of the measurements.

Co-operation problems between MEPP and HMA hindered the smooth progress especially in the Component 5. It was not possible to get the needed meteorological data for dispersion modelling from HMS during the project. Lot of efforts were put and negotiations carried out between HMA, MEPP and MS to solve the situation. MS experts provided automatic data transfer scripts for HMA to enable the data transfer without overwhelming labour work. Recommendations for automation and modernization of HMA meteorological measurement network and data management system and also for closer co-operation and common development projects were given to improve the situation in the future.

Project developments

The key development in the project was that several MEIC staff members were dismissed in October 2006, but then some people were re-employed or employed as new members in December 2006. This caused uncertainty and motivation problems in staff, in addition to some delays in performance. The same situation appeared again in December 2007 and in February 2008, some BC expert did not get continuation to their working contracts. But they remained to work in MEPP and for the twinning project as voluntary workers. This situation endangers the sustainability of the twinning project.

In Component 1 a slight reorientation was made in two respects. Firstly in discussion with CARDS project representatives it was agreed that they prepare some tables of concordance which the Twinning project was supposed to do. Consequently Twinning project staff commented on some emission sub-legislation prepared by CARDS, when asked to do so. Another reorientation was the inclusion of considerations what consequences the new CAFÉ directive would have on national legislation, as such planning was needed soon anyway.

National experts outside MEPP could not be used in the inventory work in the Component 2 during the whole project because of the lack of financial resources. This was especially harmful for the traffic emission inventory where special expertise is needed. BC experts are skilful and able to manage tasks related to air emission inventories if given the necessary resources. For instance, by using tools prepared by MS experts, BC could improve and complement their inventory reporting.

During the project it appeared that basic traffic research which is necessary in traffic emission calculations does not exist in the whole country. The importance of research has been clearly presented by MS expert in many negotiations with the authorities and institutes involved. Threats to the Component 2 were related to the fact that many of BC experts were involved in many other activities also during the missions, and this prevented to take full advantage of the project.

In the Component 3 the plan to conduct additional measurements to support the preliminary assessment had to be changed because no finance was available during the project. The plan to carry out these measurement campaigns in the future were made together MS and BC experts instead. Also dispersion modelling component could not produce overall and reliable traffic modelling results for Skopje area because needed traffic fleet data was found to be outdated and thus unreliable. No new traffic fleet measurements could be conducted during the project. Simple data validation tools were introduced by MS experts and training given to enable good quality data for preliminary assessment, because it was not possible to procure new AQ data management software with data validation function. Nevertheless it

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was not any more possible to correct reliably the oldest measurement data because no calibration information was available. Thus the preliminary assessment was based on three years data instead of five years data. Nevertheless the preliminary assessment were successfully finalised to enable to evaluate the air quality management zones on more reliable bases.

In the Component 4 the personnel at the calibration laboratory received training and good progress for preparation of gas mixtures for calibration of the continuous analyzers was achieved. The malfunction of BTEX analyzers were notified during the project and thus extra activity concerning the BTEX training was added to the project. Especial developments on the use of BTEX analyzers in practice were thus achieved. Calculation of the calibration results and correcting the measured values based on the calibration results were made according to EU practises. The traceability chain from the calibration laboratory to the network measurements was finally established and first real field calibrations together with data validations based on calibration results carried out. A successful training on maintenance of analysers and especially electronic compounds of the analysers in the monitoring stations was performed during the study tour to Finland and during MS expert's missions. Many of the broken instruments could be corrected during the training sessions and issues causing the troubles were straighten out. A lot of practical information and guidance was given to BC experts and exchange of ideas of different practises was discussed and evaluated.

The working out of QA/QC Plan has familiarized BC Experts with the requirements and procedures of the quality management system and with planning and documenting. The skills and knowledge learned as well as the written material produced will be beneficial later in the preparation process for the accreditation when the Quality manual for the Calibration laboratory is established according to the requirements of the accreditation standard EN ISO/IEC 17025.

The lack of personnel at the Central Environmental Laboratory during the first missions was a serious problem. The analysis of organic compounds is very demanding task and would have needed experienced and competent key persons from the beginning. The study tour to the FMI air chemistry laboratory was very successful and finally a key person for the PAH analysis was nominated by BC.

In component 5 Air quality models were installed, staff was trained to use them and also evaluate the modelling results. Co-operation with the local meteorological institute for obtaining meteorological data needed for dispersion modelling was initialized and also technical solutions for providing smooth transition of data between institutes were outlined and implemented. Nevertheless more efforts have to put in the future to enable smooth co-operation and data change between MEPP and HMA.

Internal problems

No internal problems arose in Component 1 and component 3. On the contrary, co-operation both between Junior MS and Lead MS experts, and with MEPP staff, was all the time very open and constructive. The working method adopted, with frequent meetings with MEPP staff during missions to discuss progress and crucial issues, functioned very well, and were truly transparent.

The major internal problem in the Component 2 was the limited personnel resources in MEPP. Many of BC experts were involved in many other activities also during the missions, and this prevented to take full advantage of the project.

In the Component 4 the use of static injection system on routine basis was not performed. Since the method is the highest of metrological point of view the staff of the laboratory needs to use the calibration system accurately with good precision and to reach a good expertise on that. The way of thinking the link (traceability) on calibration of the analyzers between the static injection system, transfer calibrator and the site analyzers is important to adapt.

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The BTEX analyzer is quite different analyzer to operate in comparison with the other continuous analyzers and therefore good skill will only be achieved by working continuously with the instrument. The experience for repair and doing the maintenance for the BTEX analyzer is far less than that for the other instruments.

The GC/MS equipment was found to have poor sensitivity possibly due to water and air leaks when running test samples. During the second mission the problems were solved, and the GC/MS was functioning properly. The rotary evaporator was broken and could not be used.

The software for collecting the data from the analyzers to data acquisition system and to MEPP server was old. The data handling between the database and the measurement software needed much of manual work which made the reporting according to the requirement by the EU very time consuming.

In the Component 5 the main problem seems to be the very limited resources available for doing air quality modelling work in the institute. During the project, resources assigned for Component 5 were satisfactory - after the project the situation is very unclear. The problems with the emission and meteorological data availability and reliability have to be also solved.

Project visibility

In the beginning of the twinning project, when Cards projects were still running, Component 1 and 3 staff participated in Cards project meetings, with a greater number of stakeholders present. Otherwise a larger outreach was achieved only at the final Component 1 and 3 workshop in April 2008. EU visibility was increased through introducing the EU Clean Air for Europe (CAFÉ) elements in the work process, and by reporting (by MS Component leader) on a Nordic - EU seminar on Future air pollution and climate policies in Europe, which was held in Spring 2007.

Especially in the Component 2 MS experts together with BC experts had many contacts and negotiations with the authorities and institutes during the project. The project, its objectives and the role of EU were presented in each meeting. The meetings were essential to find out the possible data sources and to promote the co-operation between the authorities.

In the Component 3 a booklet to general public concerning the air quality issues in BC and the importance air quality management to improve air quality was prepared. The booklet was distributed during workshops and seminars. It was also agreed that MEPP will distribute the booklet in the future via internet and in different workshops and seminars. MS PL participated and contributed the CARDS 2004 final seminar introducing there the twinning project and its objectives. Press releases were made together connected to the steering committee meetings, workshops and final seminar. Media appearance was quite good: tv-interviews were given and there were articles in news papers. Also Finnish tv-company made a special programme about the twinning project and air quality in BC. The programme was broadcasted on Finnish television and distributed also through internet.

The participation of the calibration laboratory to the intercomparison exercise in Essen 2007 with the other national reference laboratories in Europe was challenging for the laboratory and revealed the responsibility that the every national reference laboratory needs to participate. The participation and the gained results of the calibration laboratory are now documented at European level. The German expert made practical arrangements for the participation of the laboratory to the event.

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4 ACHIEVEMENT OF MANDATORY RESULTS

The mandatory results and the status of their achievement in the *Component 1* are:

1. ***EU air quality legislation based on the already harmonized air quality framework directive further aligned:*** The agreed Gap Analyses were made, as also the Tables of Concordance (some with Cards assistance). Further also an extra activity concerning legislation needs from the CAFÉ directive was carried out.

2. ***Draft sub-legislation on air quality completed:*** The agreed sub-legislation and guidelines were prepared, and are adopted or in the process of adoption by national authorities.

3. ***About 50 persons trained and training material and instructions manual prepared:*** Training workshop was held in April 2008, with adequate participation from various stakeholders, and relevant material was prepared and distributed. Further also an extra idea was drafted, in the form of an outline for an information campaign on air pollution.

The following mandatory results were achieved as described below in the *Component 2*:

1. ***Institutional capacity and tools improved for maintaining emission data inventories and improved tools:*** New updatable database for emission inventory were created during the project and for the traffic emission inventory the international Copert 4 model was implemented. Relevant training was given for new tools and database. Substantial improvement of capacity of personnel has thus achieved and tools improved. Nevertheless it has to be underlined that there is still great lack of resources in terms of dedicated experts both in MEPP and in other ministries and institutes. Still more development of tools and training is needed for future development.

2. ***Report on compliance with EU based national emission inventory system and priority list for improvement:*** The plan for national inventory system and the priority list for improvement have been prepared. The work for establishing the national system has been partly started, i.e. legislation has been prepared but plans for implementation are pending on the lack of resources.

3. ***Improvement of National methodology for air emission inventories for the country:*** The methodology and inventory results have been improved during the project. This is a good base for needed future development. However, according to the EU CARDS 2003 Regional project on Establishment of a National Methodology for Emission Inventory, it was expected that BC delivers satisfactory inventories for the year 2005 to the UNECE/CLRTAP and the EU NEC, and in addition has set up a working emission inventory system for the following years starting from 2006. In practise, this has not been possible as no resources have been allocated for the work. A basis for the traffic emission inventories was established during the project by the implementation of the Copert 4 model. The contacts and several meetings with the different stakeholders of the transport sector promote the development of the national methodology for the traffic emission calculations.

4. ***Capacities improved and draft training materials prepared on emission inventories and reports:*** Improvements were achieved and draft training materials prepared. However, full advantage of the training programme was limited due to the fact that BC experts had many competing activities during the missions. However, the attendance of the IT experts was excellent. Fruitful discussions were carried out during the missions, with giving information on

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establishing national systems, resource requirements and methodology development. Also an updatable and expandable database was created during the missions and examples were provided on inventory source sectors not yet included in the previously reported data. Based on these, BC was already in 2008 able to report complemented data to the CLRTAP. The experts participating in the preparation of the greenhouse gas inventory to the UNFCCC as part of the National Communication were interviewed during the missions but they were not available for any capacity building activities. For the traffic emission calculations there are international detailed guidebooks and training material available. The manual for using emission data system is prepared. Material to support development of national methodology was provided to BC (both international guidance and other supporting material)

5. ***Support to EPER reporting:*** This was partly started by exploring the requirements, but BC is not ready to prepare an EPER or PRTR report because the secondary legislation to support the collection of data does not yet exist and the data collection procedures have not been developed. The new database created during the missions can later be further developed to support reporting to the European PRTR. Data from the CADASTRE has been fed into this database.

The mandatory results were and the status of their achievement in the ***Component 3*** is:

1. ***Improvement of methodology for preliminary assessment:*** New methods were introduced, trained and taken into use for the preparation of preliminary assessment. Improvements were achieved for example in the following issues: Integration of emission data and dispersion modelling data in the assessment, use of GIS methods, validation of measured data, analysing the results and making overall conclusions. The preliminary assessment was thus substantially improved by the project and also the capacity of MEPP personnel was improved to further develop methods and revise the assessment after more data is available.

2. ***Revised agglomeration and non-agglomeration zones, established with CARDS 2004 Projects:*** The results of CARDS 2004 project and the CARDS 2004 zoning system were evaluated and new zoning was proposed based on the improved preliminary assessment results. Finally the new proposal includes two zones and one agglomeration (Skopje) to be used for air quality management in BC. The new zoning is more cost effective and it takes better into account differences of air quality in different parts of the country than the old zoning system. Also indications and proposals for needed adjustments of air quality monitoring network was made, i.e. needed new monitoring stations and their type, measured pollutants, siting of the stations, etc..

3. ***A preliminary assessment of ambient air quality has been worked out and reported to the EEA:*** The new preliminary assessment report was concluded by the project including all relevant and reliable information in the country. After official processing and acceptance by MEPP it can be delivered to EU. The preliminary assessment was based only on three years monitoring data of basic pollutants instead of five years data which is the directive recommendation, because no reliable data from longer period is available. The preliminary assessment does not cover all pollutants included in AQ daughter directives, because no or very few or very unreliable data is available for some pollutants (for example PAH, BZ, Heavy metals). Thus it was recommended by the project to update the preliminary assessment after few years when five years reliable data is available for basic pollutants, proposed additional measurement campaigns have been carried out, more detailed emission data is available and more comprehensive dispersion modelling has carried out.

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4. ***Awareness raised on the importance of the air quality monitoring system:*** The preliminary assessment results and its indications to air quality, major air quality problems, major emission sources and the role of air quality monitoring system were presented to different stakeholders in workshop organized by the project. Also booklet for general public concerning same issues was prepared and distributed by the project. The air quality issues and importance of air quality monitoring system was also discussed in press releases prepared by the project and during interviews given by MS and BC experts to all media.

The mandatory results were and the status of their achievement in the ***Component 4*** are:

1. ***Operation of the calibration laboratory improved and the staff is trained:*** The operation of calibration laboratory was improved by repairing and taking into use all the basic instrument needed in the laboratory. BC experts were trained to use all the calibration facilities. The traceability chain was established from the primary calibration facility of the laboratory to the field station.

2. ***Capacity built for operation, maintenance, calibration and repairs of air quality monitoring stations and samplers:*** Intensive practical hands on training were given during MS expert's missions and study tour in all above issues. Substantial improvement of personnel capacity was achieved and also demonstrated by improved operations of equipments. Intensive amount of malfunctioning or broken instruments were repaired during the project by BC experts under guidance of MS experts. Also good results BC achieved during international intercomparison measurements in Essen were good demonstrations of capacity of BC staff.

   The operation of the facilities of calibration laboratory was reached to a good level of repeatability for the preparation of calibration gas mixtures by the personnel of the laboratory. However the target for repeatability was set to 1 % based on the experienced users which will be reached after intensive use of the methods. The capacity built for operation, maintenance, calibration and repairs of air quality monitoring stations and samplers was reached to a very confident level. With intensive training the capability of preparing the calibration gas mixtures, calibration and maintenance of the analyzers reached an acceptable level. The way forward to reach the target value set for the repeatability of the primary calibration facility, to get benefit of all the new equipments, to maintain the approved level for running the network and to follow the new QA/QC plan is to work intensively and systematically at the laboratory and at the field stations.

3. ***An draft QA/QC has been worked out:*** A draft plan for QA/QC for air quality monitoring was prepared and relevant training and advices for the future development given.

4. ***Plan for improvement and training for data management has been completed:*** The plan for needed new data management system was made. Also technical specifications for data management system were prepared for the tendering process. Nevertheless tendering process and procurement of new software were delayed and no new software for data management was procured during the twinning project. MS experts provided simple methods for data validation, processing and presentation. Training in the basic data validation methodology and in the use of simple methods was given during MS expert missions and study tour to Finland. At the beginning of 2007, after the new requirement by the EU was official, MS experts made written information to BC experts on how to work out the data.

5. ***Plan for improvement and training for GCs analysis for air samples has been completed:*** The improvement plan for GC analysis was made based on present situation assessment. The technical specifications needed to improve the technical capacity of the laboratory to enable PAH

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analysis were made and equipments procured in the last part of twinning project. Systems were equipped for PAH analysis and tested. Practical hands on training on sample preparation, chemical analysis and data handling was given in fully functional chemical laboratory during study tour to Finland. Practical hands on training were completed after BC laboratory was equipped during MS expert missions. Besides MEPP personnel also persons from HMA and RIHP were involved in training.

The implementation of the standard EN ISO/IEC 17025 in the chemical laboratory was very comprehensive and records and standard operating procedures for the essential parts of the quality management system were prepared. The standard operation procedure for PAH analysis was carried out in detail. The laboratory was provided with quality control charts (X, R and D) as a tool for internal quality control.

The implementation of the standard EN ISO/IEC 17025 was handled in detail and the documentation for the chemical laboratory was prepared. Analyzing PAH compounds in the air is a demanding task and within the current project the basic principals were supervised. However, more training should be provided for personnel responsible for PAH analysis especially in a practise of GC software, preferably by the manufacturer of the instrument. Also the proper maintenance has to be provided for the GC-MS instrument in order to gain good quality data.

6. ***The operation of Mobile Emission Monitoring Laboratory is improved and the staff received proper training for emissions measurements:*** Operation of the Mobile Emission Laboratory is improved substantially. The laboratory has received new emission measurement equipment as planned. The staff received proper training for emission measurements. BC experts have received basic training for the emission measurements both in theory and also in practice in real conditions. Naturally, since the new analyzers had arrived just one week before these missions, it will take time before BC experts are fully aware of all the technical details of these analyzers. This can be achieved only by performing several actual measurements.

7. ***Specifications and priority list for investment (software, laboratory equipment and additional equipment for air quality monitoring stations and mobile emission laboratory):*** Specifications was made based on the evaluation of current situation. The equipments were purchased based on the specifications during the last part of the twinning project and taken into use and relevant training in the use of new equipments was given.

The mandatory results were and the status of their achievement in the ***Component 5*** is:

1. ***An air quality model has been supplied and implemented:*** Two air quality models, CAR-FMI and UDM-FMI have been supplied and taken into use in MEPP.

2. ***Methods to provide meteorological and emission dataset for dispersion modelling has been established:*** 3 years meteorological time-series for Skopje area have been prepared and provided. This is enough for making air quality assessment runs for Skopje area with the models provided. For future purposes and shorter term AQ assessment studies also an agreement with the local meteorological office (HMA) has been signed and an automated method to ensure the continuous flow of meteorological data from HMA to MEPP in the future has been provided. Meteorological pre-processor for producing needed meteorological data for dispersion models has been implemented and ready to use when ever relevant meteorological data is available. Also method for processing emission input data for stationary sources and traffic sources has been implemented and practical training has been given. Emission datasets for all energy

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production sources in Skopje and for traffic sources in selected part of Skopje have been prepared.

3. ***The staff is trained in the use and validation of the model results:*** During every expert visit the reasonable amount of time has been spent to train and advice the staff to utilize the AQ modelling tools. Also training sessions on the use of state-of-art statistical methods for model validation has been organized for the local staff. Practical hands-on training in preparation and evaluation of input data for models, using the models, statistical analysis of the modelling results, visualising the model results by GIS methods, analysing model results, drawing up conclusions and reporting was given during MS expert missions.

4. ***Real case studies prepared:*** During the missions of experts several real case studies for AQ assessment especially in the Skopje area have been prepared both for stationary emission sources and for traffic. Also reports from these studies have been prepared.

Basic modelling tools for estimating the impact of traffic and stationary sources have been provided and the staff has been trained to use the tools, both in theory and practice. The staff has also been trained to use statistical methods for evaluation the model performance against measurements. The work gives a good base for MEPP staff to continue improving their skills in using models for practical air quality assessment.

An overview of the mandatory results achieved is given in Annex 1.

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5 IMPACT

The activities carried out definitely led to the achievement of the results foreseen, as measured by the benchmarks of the Work Plan. The overall objective of the project, to improve air quality in the country, was by these activities easier to achieve, as a new set of sub-regulations and guidelines was prepared, improved and totally new methods for air quality management and assessment taken into use and intensive practical training given. Thus new tools for improving air quality were developed.

The achievement of the results led to fulfilment of the purpose of the project in the component 2 and the overall objective measured against the benchmarks specified in the Work Plan. However, in the future decisions need to be made in BC in order to progress successfully in the emission inventory work according to the prepared plans.

The results of improved preliminary assessment can be further utilised when plans and programmes to improve the air quality in BC are drawn up. The revised zoning system and air quality management is more cost effective and thus more resources can be used in longer run for measures to improve air quality.

The personnel of the calibration laboratory have got an idea on how to improve ones expertise by working according to accepted practise (EN-standards and QA/QC plan) around EU. Also having met colleagues from various calibration or reference laboratories dealing with the same issues and facing and solving same problems can improve the motivation to reach a good quality of work and become an expert on air quality measurements. The progress and improved equipment, practises and human capacity enables more reliable air quality data to be used in air quality assessment and when informing public on air quality.

The personnel of the chemical laboratory now have a picture of good laboratory practise, but it needs further effort and experience to take it into daily use. With the new methods taken into use and trained it is possible to analyse new air pollutants to fulfil better the EU requirements for AQ management.

The ministry people are able to practically use two models for AQ assessment: UDM-FMI and CAR-FMI, and also evaluate the model results against air quality measurements, thus the capabilities of BC in environmental impact assessment and strategic environmental assessment have been significantly improved. The dispersion modeling can be used to produce different scenarios when preparing plans and programmes and evaluating different measures to improve air quality.

The major unexpected result was most likely to show that several Finnish research organisations can work together on a project like this, and thus it was a model also to BC for improving institutional co-operation.

Secondly the work method of several experts working independently on specific but related issues, and reporting frequently on progress and items needing common decisions, to make the whole process democratic and transparent, was most likely revealing to beneficiary country experts.

The concrete unexpected results were the extra activities achieved, i.e. the analysis of what regulatory changes the CAFÉ Directive presupposes, and the draft plan for an information campaign on air pollution. Further MEIC Head was informed about the results of a Nordic – EU seminar on Future air pollution and climate policies in Europe, held in spring 2007.

The working condition (no permanent vacancies) of the personnel and their willingness to work on voluntary bases at MEPP and for project finalisation was not expected. It shows the personnel great devotion to their work.

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6 FOLLOW-UP AND SUSTAINABILITY

The results of the project Component will be issued as new sub-regulations or official guidelines of MEPP. Thus they will be available to all stakeholders in charge of air pollution activities in the country.

More resources should be addressed by government to emission inventory work and permanent structures should be established. Basic research work should be launched to provide basic country base information needed and different organisations having the relevant information and expertise should be involved in the work. The project has given clear and concrete recommendations and plans where to start and how to proceed in the future. Also different stakeholders needed in the work have been identified and contacts established.

The proposed new zoning system should be taken into use for air quality management and the needed modifications in the measurement network carried out accordingly. Also recommendations given to modify the air quality monitoring network should be enforced.

BC administration should reorganize the calibration laboratory and the air quality network into a separate expert institute or agency and to assure permanent employment of the laboratory and field personnel and provide further training for them in order to bring the EU practices in reality.

The new dispersion models taken into use in MEPP should be used in any future AQ assessment work to support the environmental permitting and strategic planning work. Combined with the agreement between MEPP and HMA concerning the meteorological data exchange this will provide a good base for independent future local scale AQ assessment work in BC.

MEPP personnel has prepared a list of still needed sub-regulations and guidelines, which was checked by MS experts, and they aim to work further on that, resources permitting. A special need is to proceed with the national plans and programs, and for this a project plan was prepared by the Component leader. There is a pressing need to ensure adequate personnel resources for drafting further sub-regulations, and to ensure their implementation.

BC uses the proposal for establishing the national system for air emission inventories and the draft priority list prepared by MS experts in implementation of the requirements set for the national system. The new database was built up to support reporting according to all requirements. The traffic emission calculation tool Copert 4 will be used for traffic emission inventory in the future. This presumes that traffic research will be carried out to reveal the national features of the traffic. BC should allocate necessary resources to the work.

The plan for additional measurement campaigns to improve the preliminary assessment and to include new air pollutants in the assessment has been made by the project. BC should allocate the necessary resources to carry out these measurements in the nearest future. The calibrations of measurement instruments and the data validation should be carried out on regular bases. This enables better quality information also for preliminary assessment. The preliminary assessment and possible revision of zones should be carried out after two-three years when at least five years good quality data from automatic monitoring network and more information about pollutants not covered by it is available.

The duties set up by the framework directive (96/62/EC) for the National Reference Laboratory are substantial. To fulfil the requirements for the measurement activities it needs accurate measurements for the atmospheric pollutants and systematic expert work from the personnel. It is vital important that BC provide good working conditions to the employment. In order to keep the air quality network running the funds for the consumables and spare parts for the analyzers should be increased considerably. The

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QA/QC-plan for the measurements and analysis of the samples should take into the practise. The participation in the network of the National Reference Laboratories (NRL) of MS (AQUILA) is important in gaining the latest information about the activities that are planned in the area (intercomparison exercises, workshops, standardization work etc). The AQUILA network is also a forum for sharing information and experience within the task of the NRL.

Although the models itself have been modified to ease up the practical use of the models in BC, there is a continuous work needed in keeping up the emission estimates up-to-date – this is the perquisite for obtaining any practical and useful model results for AQ assessments. Also some plan/co-operation with other institutes for obtaining the regional scale AQ-estimates/forecasts would be needed, this project dealt only with the local/urban scale AQ-assessments. MEPP has prepared a project proposal to improve the quality and availability of meteorological data for air quality modelling and assessment. The project plan includes also improving the emission data for dispersion modelling and regional scale modelling.

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7 CONCLUSIONS

Overall Assessment

Component 1 did progress very well, and achieved all the mandatory, and some extra results. Progress was based on open and continuous co-operation between MS experts and MEPP personnel. The results produced are already or are to be introduced as new sub-regulation, changes to present regulations, or new guidelines. Thus new tools for air quality management were prepared, and this will enable a better air quality in the future.

Good progress in the emission inventory work has been gained by the project: new updatable emission data base has been developed on the basis of the existing one, Copert 4 model for traffic emission calculation taken into use and personnel capacity improved by given relevant training. Concrete step by step plan has been made for the needed future development. At the moment the work on emission inventories is not on permanent basis. It is urgent that BC allocates permanent resources to the work. According to the fact that the National system for air emission inventories has not yet been established, allocation of responsibilities to the national authorities in the different areas of the inventory work has not been started.

The preliminary air quality assessment was substantially improved by taken into use new methodologies and improving the quality of the data used. Based on the improved assessment result it was possible to draw up the air quality management and assessment zones so that air quality situation in different parts of BC is better taken in to account. New zoning system is more cost effective so that the air quality assessment can be carried out with fewer stations and thus less costs than with the existing zoning system. Also the data quality can be improved because more resources can be allocated in longer run into maintaining and quality work instead of new stations. MEPP personnel capacity has improved remarkably during the preparation of preliminary assessment: new methods for processing, analysing and presenting the data have been introduced and relevant hands on training given. One of the most remarkable issues during the preparation of preliminary assessment was the developing and learning the data processing and validation procedures. This enables MEPP to validate the measurement data and thus better quality air quality information is available for analysing, reporting and dissemination. The awareness of BC air quality experts, authorities and general public on importance of air quality and its consequences as well as on the role of air quality monitoring system has risen during the project. The materials and booklet prepared by the project are usable also in future awareness rising campaigns.

The existing practises for obtaining and controlling the air quality and emission measurements, calibration of the analyzers, analysis of the samples at the laboratory and data collection, analysis and reporting have been in routine use at the country. During this project the practises that have been set by the Air Quality Framework Directive 96/62/EC (AQFD), Daughter Directives, and the EN-air quality standards have been trained to the experts at the country. The gaps between the present situation at the country and the practises that are used across the Europe have their differences. To fill the gap, substantial training has been addressed to a great number of items, listed at the work plan of the project, during the one and a half year. Workshops on topics as QA/QC –system for the air quality measurement and workshops on theoretical background for emission measurements were organized.

Study tours to cover laboratory work, air quality monitoring and maintenance of the analyzers were conducted over the course of the project to Finland. To see the EU practices in reality is important as well as to see how colleagues do the same job. To demonstrate the capability of the calibration laboratory it took part on the intercomparison exercises organized by the European Reference

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Laboratory for Air Pollution and by the World Health Organization. A good success of the laboratory during the trial was a proof how BC calibration laboratory had adapted the practises by the EU. Considerable improvements have also met in many other items of activities carried out at the project and the personnel capacity improved considerably. However one should keep in mind that for taking all the training and guidance into the reality there has to work hard and to have resources enough to manage the task. There are also considerable threats to bring the practices in reality: to organize the work and responsibilities of the personnel, to reserve enough human and financial resources and to provide with the personnel a secured working contracts are the most important. To build up the expertise at air quality issues in the country is beneficial for many other area of the society, among others the health issues.

The process on how the country will continue the adaption of the EU practises is on the way but it is foreseen that a great deal of training and hard work is still needed to put the QA/QC plan in reality, to improve the practices and to reach the target. Contacts, visits, co-operation with MS experts and taking part of the work at the network of the national reference laboratories (AQUILA) will be very helpful.

All pre-defined goals dispersion modelling were achieved. The basic tools needed and training for the practical use and evaluation of air quality modelling are provided for BC. Also real case studies utilizing the local emission and meteorological data are performed. The work finalized during the project provides a good base for building up the capabilities of BC for performing, understanding and evaluating the use of air quality models in air quality assessment.

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8 RECOMMENDATIONS: lessons learned

Efforts should be made to convince the responsible persons that the necessary funds to maintain air quality monitoring have to be guaranteed for prolonged periods of time. The major issue is still the personnel resources of MEPP, which need to be ensured in the long run, to ensure sustainability of the results, and their proper implementation. It is crucial that the personnel trained during the Twinning project will remain at MEPP to continue applying the trained skills. Therefore, it is strongly recommended to ensure permanent employment for the air quality staff.

Specific short, medium and long term recommendations given by each Component of the project are:

Component 1

There is still some need to fully approximate EU air quality directives into Macedonian legislation and practice. The most pressing is to assist in the preparation in national plans and programs. There is also a list of still needed legislative actions, which could form the basis of further activities. Because of the amount of expertise required on the one hand, and because air quality problems are similar across various municipalities, it is strongly recommended not to prepare air quality programmes on the level of the municipalities. Instead it is recommended to prepare programmes on the level of zones or to combine adjacent municipalities with similar air quality situation into one programme.

Short term

- All results be fully adopted (process to end)
- National Plans and programs need to be prepared
- List of further legislative work to be used and tasks carried out

Medium term

- Personnel for further legislative work to be ensured (and for implementation)
- Stakeholder events to be held on regular base
- Information campaign (AQ) to be launched

Component 2

At the moment the emission inventory work is not on a permanent basis. There are skilful national experts ready to carry out the work on air emission inventories when funding is available. Using the tools and methods provided by MS experts BC experts have already been able to improve and complement the inventories. The main recommendations for further inventory work are: Establishment of the legal framework; Development of a National System for inventories, i.e. appointment of responsible parties, organization of data collection; Ensuring resources.

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Short term
- Establishment of the legal framework
- Minimum 5 experts at MEPP
- Sharing responsibilities between ministries

Medium term
- Agreements between expert institutes participating the work
- Ensuring resources for all inventory parties (~ 10-15 experts)
- Implementation of data collection and development of national methodologies. This includes finance for national institutes for basic traffic research. Every country's traffic has its special features that should be studied locally

Long term
- National System fully implemented with quality system

Component 3

Short term

- Further improvement of quality of measurement data

    • New software for data validation, management and dissemination

    • Quality Chain in regular bases: calibration laboratory, field calibration, data validation

    • Ensure proper maintenance and funding for spare parts etc.

    • Ensure human resources: calibration laboratory, field work, data management

    • Detailed recommendation given by component 4

- Quality and coverage of emission data should be improved

    • Traffic, small scale wood burning, Industry and energy production

    • GIS information, technical information (stack height, etc.)

    • Time variation

    • Detailed recommendation given by component 2

- Improve reporting and dissemination of AQ data

Medium term

- Extent the use of dispersion modelling

    • Traffic, small scale wood burning

    • Comprehensive city modelling (Skopje)

    • Regional scale modelling

- Additional measurement campaigns should be performed to assess air quality

    • Different environments (i.e. urban background areas near residential areas, rural residential areas, traffic influenced areas outside cities (along motorways), rural background areas)

    • Cities not having fixed stations (Prilep, Ohrid, Kriva Palanka, Stip/Kratovo, Strumica, Berovo/Delcevo)

    • Lead, HMs, PAH, Bz, PM2,5

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- Use of mobile station
- Passive sampling

Long term

- Revise the preliminary assessment after reliable data available for five years period (after 3 – 5 years)

- Modernize the meteorological measurement network and data management system to provide more reliable information for air quality management

- Upgrade the Air Quality Monitoring network

  - At least one urban background and one traffic stations in every zone (2-3 urban background stations need to be established or relocation of existing stations)

  - Check siting criterias of existing and new stations (possible relocation of stations)

  - Upgrade the measurement program per station (ozone measurements in Skopje, PM2,5, etc.)

- Use the Air quality data to initiate the work to prepare plans and programs to improve air quality

Component 4

In this project the EU practices on the air quality and emission measurement, analysis of the samples, information and data management has been brought to knowledge of the country. It is vital important that BC will reserve human and financial resources to increase the expertise of the personnel and to bring the practices in daily routine work. In order to do this short term, middle term and long term recommendations are made:

Short term - Improvement of the organization and expertise of air quality measurement

- BC should evaluate the task and the duties on the different air quality networks and the laboratories.

- MEPP should organize the calibration laboratory into a clear unit with the task according to Framework directive (96/62/EC) with the head of the laboratory and competent technical personnel.

- To found the permanent measurement team for emission measurements

- Provide permanent job vacancies to the key persons (calibration laboratory, maintenance of the instruments and the air quality measurements sites, emission laboratory, chemical laboratory, data management and quality manager).

- BC experts should continue the training process by working hard and consistently in their expertise area: Learning by doing is the key to become an expert.

- To establish the traceability chain from the Calibration laboratory to the field measurements by frequent calibration of the field analyzers: Static injection method → (Dynamic Dilution method →) transfer calibrator → (site calibrator→) site analyzer.

- New software for data acquisition system at the measurement stations and for data analysis, validation and reporting

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Medium term - Further improvement of the expertise of the personnel and the QA/QC-system for air quality measurement

- All the work associated with improving the air quality in the country is an expert work and the country should have expertise to cover all the tasks laid down by the directives. To solve the problem more intensive hands on training should be arranged either at the expert laboratory abroad or by MS-experts at the country.

- The SOPs (Standard Operating Procedures) concerning all the relevant activities of the Calibration laboratory should be in use.

- Adapt the QA/QC plan in full operation. All the actions that are made at the laboratory and at the sites need to be proceeded according to the QA/QC plan (calibration of the instruments, filling the logbooks, calculation of the calibration results, handling and maintaining the analyzers, etc)

- Build up the uncertainty budget for the air quality measurements (ISO-GUM)

- Define the specific responsibility for each of the staff member. The chart of the responsibilities of each of the person should be included at the QA/QC-system.

- Real time publishing of monitoring results in web should be arranged and new kind of statistics should be included into the daily, monthly and annual reports.

- To build up the back up system for all primary and validated air quality monitoring data.

- To study if the files of ISO-7168 could at the beginning be used for the data source of real time data delivery in web. This requires that sufficient filtration rules for invalid values can be defined.

- Put more efforts on PM measurements (continuous analyzers, PM2.5).

- Participate the intercomparison exercises organized by EC/JRC and by WHO (air quality and emission measurements)

Long term recommendation - The air quality measurements are in line with the EU practices

- Prepare the accreditation to the Calibration laboratory. As an accredited laboratory the Calibration laboratory should be a compact unit where the management hierarchy is clear, have competent and large enough personnel for the task and the responsibilities of laboratory personnel are defined.

- Join the work to the Network of the National Reference Laboratories (AQUILA)

- Join the standardization work at CEN

- Backup analyzers should be available for each of the compounds at the laboratory

Component 5

Short term

- Significant resources and strong co-operation with other institutes should be allocated for reliable local/urban air quality assessment

- Ensure that the data flow from HMA to MEPP will be/remain operative

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- Ensure that all data received is stored in such a way that it can be directly utilized in future dispersion modeling activities

- Implementation of a continuous system for transfer of meteorological data from the HMA to MEPP

- Further improvement of the emission data quality and coverage

- Improve and update the traffic input data

- Use the modelling tools to support environmental permitting

Medium term

- Ensure resources for continuous work that is needed to gain a sufficient level of expertise for independent air quality assessments by the tools already provided and also for all the possible additional complementary tools

- Modernise the meteorological observation and data management system with necessary tools to provide good quality meteorological data for air quality assessment in all parts of the country

- Study the possibilities of utilizing meteorological modeling results as a bases for AQ modeling

- Use the modeling tools to support strategic environmental planning

Long term

- Minimum of 3-4 people should be allocated/trained to tasks related to modeling (input data, model runs, evaluation)

- Establish strong and continuous co-operation with other institutes specialized in this area of modelling

- Extend the coverage of modelling tools – especially adding capabilities in regional scale modelling.

- Implement Regional scale modeling with co-operation with relevant institutes

- Use the modeling tools in air quality forecasting

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9 ANNEXES

Annex 1: *Overview mandatory results achieved*

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Overview mandatory results achieved

Component	ACTIVITY	expected MANDATORY RESULTS (Components)	Deadline	Delay +/- [months]	expected BENCHMARKS (Activities)	ASSESSMENT to date	Self-assessment Rate HS (Highly satisfactory), S (Satisfactory), U (Unsatisfactory)
1) Guidelines and secondary legislation							
	1.1.1 Review current secondary legislation, and preparation of Table of concordance for: 99/30/EC, 2004/107/EC and 2000/69/EC -Decree on limit values(50/05), -Rulebook on air quality assessment 1.1.2 Analysis of the needed sub legislation for further implementation of first, second and fourth –Directive 99/30/EC, 2004/107/EC and 2000/69/EC	1. The EU air quality legislation based on the already harmonized air quality framework directive further aligned	11/2006	0	GAP analysis Concordance Tables	Fully achieved, partly with assistance from Cards projects (ToC:s); Cap analysis and Concordance tables prepared.	HS
	1.2.1 Drafting on Monitoring and reporting for ambient air quality under the FWD and the Daughter Directives. 1.2.2 Drafting of sub legislation – 2004/224/EC and 96/62/EC regarding National plans and programs 1.2.3 Review of a rulebook for	2. Draft sub legislations on Air Quality completed	11/2007	0	Draft Sub legislation existing	Fully achieved, draft sub legislation exists. Also extra result, not foreseen in original plan achieved, i.e. CAFÉ Directive impacts on legislation	HS

	zones and agglomerations prepared by CARDS 2004 project						
	1.3.1 Draft Instructions to assist the application of secondary legislation – considering air quality. 1.3.2 Capacity building of stakeholders to use Manual	3. About 50 person trained and training material and instructions manual prepared	12/2007	Partial delay 4 months – accepted by side letter	About 25 pages manual Training for 50 people arranged	Fully achieved. Manuals for air quality monitoring and reporting prepared. Workshop for stakeholders arranged.	HS

2) Emission inventories

	2.1.1 Identify and appoint stakeholders 2.1.2 Support to construct the database and its content for preparation of the reports to relevant international bodies	1. Institutional capacity and tools improved for maintaining emission data inventories and improved tools	11/2007	+/- 0	Capacity of personnel and tools improved	Achieved – stakeholders identified. MS experts together with BC experts had many (over 15) contacts and negotiations with the stakeholders (authorities and institutes) during the project. A new updatable and expandable database was built up by MS expert. Traffic emission model Copert 4 implemented and available data inputted. otherwise implementation by BC still pending Done at the level possible especially in traffic emissions, but no national experts were appointed to the work or available for detailed training. Actions in traffic emissions done, no other actions by BC. BC experts in MEPP trained for the use of Copert 4 model.	S
	2.2.1 Identify data gaps for compliance with EU based national air emission inventory	2. Report on compliance with EU based	3/2007	+3	Priority list	Achieved. Identification and priority list done. But no implementation actions carried out.	S

	system and reporting requirements 2.2.2 Preparing a draft list of priorities for recommended improvements	national emission system and priority list for improvement				
	2.3.1. Support to developing a National Emission Factors and inventory methods 2.3.2. Support to develop collection of activity data 2.3.3. Support to update the National Methodology for air emissions inventories for the country with special attention on subjects that need improvements such as emission from farming, emissions from wood burning, emissions from road traffic, emissions from air traffic and railroad traffic, emissions from off-road machinery	3. Improvement National methodology for air emission inventories for the country.	9/2007	+/-0	Improved methodology and inventories	Mandatory result achieved: methodology and inventory improved. Done at the level possible especially in traffic emissions. There is need to appoint national sector experts to the work or continue detailed training. Visit to the State Statistical Office which is willing to cooperate. Traffic data collection started. However, further actions needed by BC to develop data collection on a permanent basis. Data needs and possible data collection procedures and responsibilities identified, but final Implementation is pending on BC. Road traffic related activity data gathered and inputted to the Copert 4 model. Legal basis developed according to information received from BC experts. A basis for the traffic emission inventories was established during the project by the implementation of the Copert 4 model. Also calculation basics for other transport modes were dealt with. Training the calculation of traffic emissions. Inventories in residential combustion and agriculture have	S

					been completed by inputting new data and thus complementing the inventory for the agriculture and residential combustion sectors. BC was even able to complete their reporting in 2008.	
	2.4.1. Improve capacities to Develop comprehensive training program (supporting training materials) on emission inventories and reports	4. Capacities improved and draft training materials prepared on emission inventories and reports	10/2007	+/- 0	Draft training materials	Achieved; Capacities improved and support given to BC. For the traffic emission calculations international detailed guidebooks and training material available and introduced. The manual for using emission data system is prepared. Material to support development of national methodology was provided.	S
	2.5.1. Support to EPER reporting in general	5. Support to EPER reporting	11/2007	+1	EPER report	Partly achieved: the support was given to fulfil the future reporting obligations. The next reporting will be in 2009 and MS experts gave support to fulfil the future requirements. Implementation is pending: Secondary legislation to support collection of data does not yet exist and the data collection procedures have not been developed.	S
3) Preliminary environmental assessment							
	3.1.1 Analyses and review the outcome of CARDS 2004 Projects 3.1.2. Improvement of methodology for preliminary assessment taking into account CARDS 2004 Projects output.	1. Improvement of methodology for preliminary assessment	6/2007	+6	Improved preliminary air quality assessment	Fully achieved and preliminary assessment substantially improved. Analyses and review of CARDS 2004 results done and taken into account. New methods introduced, trained and used in the new assessment. Emission inventory and dispersion modelling data integrated in the assessment.	S

3.1.3. Integrate emission inventory data and dispersion modelling within preliminary assessment.					Implementation partly delayed because newest data was taken into account.	
3.2.1. Revision of agglomeration and non agglomeration zones	2. Revised agglomeration and non-agglomeration zones, established with CARDS 2004 Projects	10/2007	+5	Zone and agglomeration definition ready	Fully achieved: zones for air quality assessment was revised. New more feasible and cost effective zoning defined and justified. Final implementation to legislation has to be done by BC.	HS
3.3.1. Reporting and visualization of the assessment results	3. A preliminary assessment of ambient air quality has been worked out and reported to the EEA	12/2007	+3	Preliminary Air Quality Assessment reported	Achieved. Preliminary assessment report produced and the results and zoning system visualized. Results visualized also in map with a new GIS method. Final official acceptance of the report and delivery to EU is pending. It is recommended to revise the preliminary assessment after 2-3 year.	S
3.4.1. Perform campaign to promote results for public 3.4.2. Preparation of a brochure covering the air quality situation in BC, (most important pollutants and their health effects, concentration levels and most important emission sources and their contribution to air quality)	4. Awareness raised on the importance of the air quality monitoring system	3/2008	0	Workshop	Fully achieved. The results were promoted in workshops and through media by press realises interviews to news papers and TV. Brochure was prepared and distributed. It is strongly courage to continue promoting the importance to the general public.	HS
4) Air quality measurements and laboratory work						
4.1.1. Review of the present situation at the calibration	1. Operation of the calibration	8/2007	0	Operation of the laboratory	Fully achieved. Based on the results of present situation review a	HS

	laboratory. 4.1.2. Preparing a Plan for Improvement of calibration laboratory 4.1.3. Sharing EU MS country's experience and training on air quality monitoring 4.1.4 Training technical staff on calibration of instruments 4.1.5. Calibrate and check instruments in co-operation with technical staff	laboratory improved and the staff is trained			improved	plan for improvement was made. Though it was difficult to complete without the presence of the personnel in the beginning phase of the project. The Study tour was successful and included lot of practical experience and hands on training. The personnel of the laboratory has a good experience but needs training on using all the calibration facilities. Very good progress has achieved both in technical and human capacity.	
	4.2.1. Training technical staff on repair maintenance 4.2.2. Implement and assist in the preparation of SOP for maintenance and calibration of monitors 4.2.3 Training technical staff on repair and maintenance for BTX analysers 4.2.4. Training on maintenance of electronic compounds of the analysers in the monitoring stations 4.2.5. Training on calibration of the analysers on the monitoring stations	2. Capacity built for operation, maintenance, calibration and repairs of air quality monitoring stations and samplers.			Capacity of people improved	Fully achieved with good results. Remarkable increase in human capacity and technical operation has been achieved. Practical hands-on training was given basically in all crucial operation processes, maintenance, repairing and calibration of different monitoring instruments in field and in laboratory. Draft SOPs were also prepared for operation. Still More experience and training is needed in the future.	
			2/2008	0			S/HS
	4.3.1. Developing draft QA/QC plan	3. An draft QA/QC plan	1/2008	0	Draft QA/QC plan	Fully achieved. A draft QA/QC plan has been prepared and relevant	S

	4.3.2. Training on QA/QC	has been worked out				training has been given both in overall quality work as well as technical training enabling the continuation of the work started during the project. Initiation of different document started.	
	4.4.1. Review of present situation for data management system 4.4.2. Identified needs for furthered development of the software 4.4.3. Plan and specification for procurement of new data management software	4. Plan for improvement and training for data management has been completed 11/2006	0	Improvement plan Staff trained	Achieved. Based on the present situation review a plan and specifications for new data management system with proper tools for data validation, analysis, reporting and dissemination was made. Nevertheless no new software was procured during the project because of finance problems. Thus simple method for data validation was introduced and relevant training given.	S
	4.5.1. Review of present situation in Central Environmental Laboratory on GCs analysis for air samples 4.5.2 Preparing a Plan for improvement of chemical laboratory; assessing the target compounds, laboratory infrastructure and standard operation procedures. 4.5.3. Arrange and perform training courses for staff concerning standard operation procedures of target compounds for GC analysis for air samples (Include staff from HMA and RIHP Institute of Chemistry from the university and other stakeholders in training courses)	5. Plan for improvement and training for GCs analysis for air samples has been completed 11/2007	+3	Improvement plan Staff trained	Fully achieved. Review and plan for improvement prepared. Substantial amount of supporting documents (incl. SOPs) prepared. Training courses concerning sample preparation, chemical analysis, SOP's and data processing given both during Study Tours and MS STE missions. Participants from MEPP, RIHP and HMA included in training. Substantial personnel capacity building achieved and technical operation of laboratory improved.	HS

4.6.1. Check instruments of mobile emission laboratory and prepare plan for improvement and support to repair and renew equipment 4.6.2. Check the results of improvements 4.6.3. Training course (part 1) on emission measurements; basic principles 4.6.4. Training course (part 2) on emission measurements; advanced emission measurements techniques and emission measurement audit on selected industrial source	6. The operation of Mobile Emission Monitoring Laboratory is improved and the staff received proper training for emissions measurements 2/2008		0	Operation improved Staff trained	Fully achieved. Mobile emission laboratory repaired and new equipments taken into use. Emission measurement principles and technical training given for large group of people from MEPP, other institutes and private companies. Hands on training included also measurements carried out in real conditions on selected industrial sources. S
4.7.1. Preparation a draft specification and priority list of investment (software, laboratory equipment and additional equipment for air quality monitoring stations and mobile emission laboratory)	7.Specifications and priority list for investment (software, laboratory equipment and additional equipment for air quality monitoring stations and mobile emission laboratory) 10/2006		0	Specifications and priority list	Fully achieved. Priority list and specifications finalised and support given for tendering process. New equipments taken into use and now in operation. HS

5) Dispersion modelling

5.1.1. Specification and procurement of an appropriate system for AQ modelling on	1. An air quality model has been	12/2006	+3	Operational model for dispersion	Fully achieved. Two local scale dispersion model given by MS free of charge and taken into use in HS

	local scale (Gaussian point source dispersion modelling system)	supplied and implemented			calculations procured and implemented at the MEIC	MEPP: UDM-FMI for stationary sources and CAR-FMI for traffic sources.	
	5.2.1. Investigate available meteorological data from HMA and Skopje airport and develop methods to provide meteorological data for dispersion modelling 5.2.2. Preparation of emission and other input data for dispersion modelling	2. Methods to provide meteorological dataset for dispersion modeling has been established	3/2007	0	Meteorological emission dataset available	Fully achieved. Methods to provide and pre-process both meteorological and emission data implemented in MEPP and partly in HMA. Meteorological data sets for Skopje prepared and emission data sets for Skopje energy production and traffic in a selected are prepared and used in modelling.	HS
	5.3.1. Training course on dispersion modeling and Demonstrate methods for validation of AQ models and for scenario making 5.3.2. Develop training course materials	3. The staff is trained in the use and validation of the model results	4/2007	+3	Staff trained	Fully achieved. Intensive training including scientific background and practical training in using the models, preparing input data, analysing, presenting and validating results has been given. Also training materials prepared and distributed.	S
	5.4.1. Use of dispersion modelling for air quality assessment in couple of real cases	4. Real case studies prepared	6/2007	+7	Real case study	Fully achieved. Both implemented dispersion models has been used in real case studies. UDM-FMI has been used to assess air quality of several point sources and all energy sources in Skopje. CAR-FMI has been used for selected steers in Skopje City centre.	S