

**ACCEPT-AIR**

**LIFE+ 09 ENV/GR/000289**

## **Action 11**

### **Deliverable D30.**

**TITLE:** Mitigation measures and policies for the control of particulate pollution

August 2014

Coordinated by:



**DEMOKRITOS**

NATIONAL CENTER FOR SCIENTIFIC RESEARCH



## **EXECUTIVE SUMMARY**

DIRECTIVE 2008/50/EC “on ambient air quality and cleaner air for Europe” calls for reductions of air pollution levels and development of air quality plans for emissions control. In the framework of LIFE09 ENV/GR/000289 project “Development of A Cost Efficient Policy Tool for reduction of Particulate Matter in AIR (ACEPT-AIR)”, a comprehensive characterization of the air pollution situation with respect to Particulate Matter (PM) has been performed for three urban centers in Greece: Athens Metropolitan Area, Thessaloniki Metropolitan Area and Volos Greater Area. The present report summarized the experience gained from the implementation of ACEPT-AIR and the collaboration with the relevant National, Regional and Local authorities, with respect to the development of cost-effective mitigation strategies.

The interaction with project key stakeholders constituted a significant part of the process leading to the development of control measures for the reduction of PM concentrations. The initial objective was to acquire a clear image of the current environmental policies followed in Greece. Detailed information was provided by the Ministry of Environment, Energy and Climate Change which is responsible for air quality monitoring and management. Following the documentation of current situation, with respect to concentrations, emission sources and control strategies, ACEPT-AIR project results and experience gained were used for the compilation of a set of control measures, to be used as Guidelines for the formulation of Action Plans for the reduction of pollution from particulate matter.

The implementation of general measures for air pollution abatement has already led to decreases in PM concentrations as well. Nevertheless, the need for new emission control strategies is evident, especially since the Greek economy has undergone through a deep recession during the last 5 years resulting to dramatic decreases in the emissions of primary particulate pollutions and gaseous precursors. Recovery of the economy will lead to a rise in concentrations, which is already visible in 2013. The experience gained by ACEPT-AIR project highlights the need to develop targeted control measures in the future in order to achieve further reductions of particulate matter concentrations in the air. Three general emission sources have been identified as the main contributors to increased PM concentrations and exceedances of the EU air quality standards: Road traffic, Biomass burning and Secondary aerosol production by gaseous precursors (nitrogen and sulfur oxides and volatile organic compounds).

Based on the project results and the consultation process with key stakeholders, and mainly the Greek Ministry for the Environment, Energy and Climate Change, a set of control measures has been developed and provided as guidelines for the preparation of a National Air Quality Plan. These measures have been endorsed by the National, Regional and Local authorities of the three cities (Athens, Thessaloniki and Volos).

## ΠΕΡΙΛΗΨΗ

Η Οδηγία 2008/50/ΕΚ «για την ποιότητα του ατμοσφαιρικού αέρα και καθαρότερο αέρα για την Ευρώπη» προτρέπει σε μειώσεις των επιπέδων ατμοσφαιρικής ρύπανσης και στην ανάπτυξη σχεδίων διαχείρισης της ποιότητας της ατμόσφαιρας. Στα πλαίσια του έργου LIFE09 ENV/GR/000289 “Ανάπτυξη ενός Εργαλείου άσκησης αποτελεσματικών πολιτικών για τη μείωση των αιωρούμενων σωματιδίων στον αέρα (ACEPT-AIR)”, πραγματοποιήθηκε ένας ολοκληρωμένος χαρακτηρισμός της σωματιδιακής ατμοσφαιρικής ρύπανσης σε τρία αστικά κέντρα της Ελλάδας: την Αθήνα, τη Θεσσαλονίκη και το Βόλο. Η παρούσα αναφορά παρουσιάζει περιληπτικά την εμπειρία που αποκτήθηκε από την εφαρμογή του έργου και την συνεργασία με τις σχετικές Εθνικές, Περιφερειακές και Τοπικές Αρχές, σε σχέση με τον σχεδιασμό αποτελεσματικών στρατηγικών ελέγχου της ρύπανσης.

Η αλληλεπίδραση με τους κύριους φορείς χρήστες του έργου αποτέλεσε σημαντικό τμήμα της όλης διαδικασίας που οδήγησε στην ανάπτυξη μέτρων ελέγχου για την μείωση των επιπέδων αιωρούμενων σωματιδίων (PM). Αρχικός στόχος ήταν η αναλυτική ενημέρωση των συνεργατών του έργου πάνω στις υπάρχουσες περιβαλλοντικές πολιτικές που εφαρμόζονται στην Ελλάδα από το Υπουργείο Περιβάλλοντος, Ενέργειας και Κλιματικής Αλλαγής, το οποίο είναι υπεύθυνο για την παρακολούθηση και διαχείριση της ποιότητας του αέρα.

Η εφαρμογή γενικών μέτρων καταπολέμησης της ρύπανσης έχει οδηγήσει σε μειώσεις των επιπέδων PM. Παρ’όλα αυτά υπάρχει ανάγκη για εφαρμογή νέων στρατηγικών ελέγχου, ιδιαίτερα δεδομένου ότι η Ελληνική οικονομία περνά μια βαθύτατη κρίση τα τελευταία 5 έτη η οποία έχει οδηγήσει σε δραματική μείωση των εκπομπών πρωτογενών σωματιδίων και αέριων ενώσεων πρόδρομων για τον σχηματισμό δευτερογενών σωματιδίων. Η ανόρθωση της οικονομίας θα οδηγήσει σε αύξηση των συγκεντρώσεων, όπως ήδη καταδεικνύουν τα δεδομένα για το 2013. Τα αποτελέσματα του έργου ACEPT-AIR τονίζουν την ανάγκη ανάπτυξης στο μέλλον στοχευμένων μέτρων ελέγχου ώστε να επιτευχθούν περαιτέρω μειώσεις των συγκεντρώσεων αιωρούμενων σωματιδίων. Τρεις ομάδες πηγών εκπομπής αναγνωρίστηκαν ως οι κύριες συνεισφορές στα αυξημένα επίπεδα PM και στις παρατηρούμενες υπερβάσεις των Ευρωπαϊκών προτύπων ποιότητας του αέρα: Η οδική κυκλοφορία, η Καύση βιομάζας και η Δευτερογενής παραγωγή σωματιδίων από πρόδρομες αέριες ενώσεις. Βάσει των γενικών αποτελεσμάτων του έργου και της αλληλεπίδρασης με κύριους φορείς χρήστες, αναπτύχθηκαν κατάλληλα για τις αστικές περιοχές της Ελλάδας Μέτρα ελέγχου – Οδηγίες για την προετοιμασία Εθνικού Σχεδίου Δράσης για την Ποιότητα της Ατμόσφαιρας. Τα μέτρα αυτά έχουν ήδη γίνει αποδεκτά από τις Εθνικές, Περιφερειακές και Τοπικές Αρχές των τριών πόλεων (Αθήνα, Θεσσαλονίκη και Βόλος).

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## 1. INTRODUCTION

DIRECTIVE 2008/50/EC “on ambient air quality and cleaner air for Europe” is based among other on the need “ to reduce pollution to levels which minimize harmful effects on human health”, “to combat emissions of pollutants at source and to identify and implement the most effective emission reduction measures at local, national and Community level”, “(for Member States) to comply with the limit values and critical levels, and where possible, to attain the target values and long-term objectives” and to develop “air quality plans... for zones and agglomerations within which concentrations of pollutants in ambient air exceed the relevant air quality target values or limit values...”.

In the framework of ACEPT-AIR project a comprehensive characterization of the air pollution situation with respect to Particulate Matter (PM) has been performed for three urban centers in Greece: Athens Metropolitan Area (AMA), Thessaloniki Metropolitan Area (TMA) and Volos Greater Area (VGA). Specifically, through the project realization, the following issues have been addressed:

- The extensive database on PM<sub>2.5</sub> and PM<sub>10</sub> concentration levels as well as chemical speciation provided a detailed description of the ambient air quality in relation to particulate pollution at the three urban areas studied.
- The application of source apportionment techniques provided information on the contribution of natural and anthropogenic sources to the observed PM concentration levels.
- The development of ACEPT-AIR Policy Tool allowed for the estimation of PM concentration changes due to increases or decreases on emission strengths of specific PM sources.
- The application of different emission scenarios provided an initial assessment of the prioritization of control measures as well as the reduction potentials for the Greek cities, based also on the regional background concentration levels and the contribution of natural sources.

The present report summarized the experience gained from the implementation of ACEPT-AIR and the collaboration with the relevant National, Regional and Local authorities, with respect to the development of cost-effective mitigation measures and strategies. This process of integrating the outcome of ACEPT-AIR project into the environmental Directorates followed by Greek authorities has led to the compilation of a set of control measures, to be used as Guidelines for the formulation of a national Action Plan for the reduction of pollution from particulate matter.

## **2. METHODOLOGY**

The distinct steps followed in order to develop the set of mitigation measures to be used as Guidelines for the formulation of a National Air Quality Action Plan included:

1. Comprehensive characterization of the air quality with respect to particulate matter, based on ACEPT-AIR results and historical data. The outcome has been submitted as Deliverable D29 “Characterization of air quality in relation to particulate matter at the three areas studied and contribution of natural sources to exceedance events”.
2. Consultation with the Greek Ministry for the Environment, Energy and Climate Change which is responsible for the planning of the national environmental policies on the current measures implemented.
3. Application of ACEPT-AIR Policy Tool in order to examine different emission scenarios and assess the effect of specific control measures on the ambient PM<sub>10</sub> and PM<sub>2.5</sub> concentrations. A summary of the outcome of this initial application of the Policy Tool has been submitted as Deliverable D19 “PM concentration reductions in relation to the implementation of specific measures / scenarios, apportioned to changes in different source categories”.
4. Provision to the National, Regional and Local authorities of a Report including Deliverables D29 and D19 mentioned above.
5. Extensive discussion with relevant authorities on the proposed by the project mitigation measures.
6. Endorsement of the set of control measures developed in the framework of ACEPT-AIR project by key stakeholders, including: the Greek Ministry of Environment, Energy and Climate Change, the Municipality of Thessaloniki and the Regional Unit of Magnesia and Sporades (former Prefecture of Magnesia).

## **3. DEVELOPMENT OF MITIGATION AND POLICIES**

### ***3.1. Consultation process with the Ministry for the Environment***

The initial aim in the consultation process was to acquire a clear image of the current environmental policies followed in Greece. A meeting with the Directorate of Air Pollution and Noise Control of the Greek Ministry of Environment, Energy and Climate Change was planned specifically for this purpose on 20/2/2013. The coordinating beneficiary, NCSR “Demokritos”, met with representatives of the Ministry and discussed on the project results, in particular the development of ACEPT-AIR Policy Tool, as well as on the current status of air quality management in Greece. The list of participants and minutes of the meeting are provided in Annex I.

Following the meeting, a questionnaire with specific questions on the mitigation measures implemented was sent to Mr. Adamopoulos and Mrs. Tsilibari, from the Directorate of Air Pollution and Noise Control. The questionnaire and answers provided by the Ministry are included in Annex II.

### **3.2. *Mitigation measures for Action Plan formulation***

The historical data of exceedances of PM<sub>10</sub> (and NO<sub>2</sub>) limit values during the last decade shows in general a downward trend, followed as well by PM<sub>10</sub> and PM<sub>2.5</sub> concentrations at all three cities. This is directly or indirectly linked to the development by Greek National authorities of measures targeting mainly the reduction of traffic emissions, reduction in fossil fuel use due to energy efficiency improvements or interventions in favour of alternative fuels and renewable energy sources in urban areas. Nevertheless, this positive result should not lead to complacency towards future effective mitigation measures. The comprehensive characterization of air pollution with respect to PM provided by ACEPT-AIR project has made evident the need for new emission control strategies, especially since the Greek economy has undergone through a deep recession during the last 5 years resulting to dramatic decreases in the emissions of primary particulate pollutions and gaseous precursors. Recovery of the economy will lead to a rise in concentrations, which is already visible in 2013.

The Mediterranean region is known to have high natural background PM concentrations, due to its climate and topography. The implementation of general measures for air pollution abatement has already led to decreases in PM concentrations as well. The experience gained by ACEPT-AIR project highlights the need to develop targeted control measures in the future in order to achieve further reductions of particulate matter concentrations in the air. Three general emission sources have been identified as the main contributors to increased PM concentrations and exceedances of the EU air quality standards: Road traffic, Biomass burning and Secondary aerosol production by gaseous precursors (nitrogen and sulfur oxides and volatile organic compounds). Based on the project results and the consultation process with key stakeholders, and mainly the Greek Ministry for the Environment, Energy and Climate Change, a set of control measures has been developed and provided as guidelines for the preparation of a National Air Quality Plan. The measures were based on PM speciation and source apportionment obtained during 2011-2012, taking into account the most efficient reductions achievable as assessed by ACEPT-AIR Policy Tool. Details on the implementation of proposed measures are also included, such as: (i) feasibility (in terms of degree of priority and effectiveness, ranging from 1 - 3, with 1 corresponding to the highest degree); (ii) minimum time required for implementation; (iii) costs; (iv) responsible party; (v) means of implementation.

## **ROAD TRAFFIC**

**Low emission zones (LEZ)**: Expand and prioritize the recently (2012) implemented free access for Euro 5 or newer technology vehicles emitting less than 140 g/km or hybrids in the “green ring”. In this area all other vehicles enter every second day according to an odd/even system with respect to their number plate last digit; finally vehicles larger than 2.2 tn are banned.

**Priority: 1 / Effectiveness: 2**

### **Actions proposed:**

- Traffic study to examine the expansion of the green ring area (12 months; 100.000 €)
- Environmental Impact Study (10 months; 80.000 €)
- Common ministerial decision (3 months)
- Inspection and monitoring of the implementation of green ring (360.000 €/year)

### **Implementation agencies**

Ministry of Infrastructure, Transport and Networks

Ministry of Environment Energy and Climate Change

**Parking**: Creation of large parking lots at main transport interfaces (train and metro stations) at the outskirts of the city (park and ride system) with incentives (low fares) in order to promote the combined use of car and public transport.

**Priority: 1 / Effectiveness: 1**

### **Actions proposed:**

- Feasibility study (12 months; 200.000 €)
- Environmental Impact Study (8 months; 150.000 €)
- Studies and construction of parking lots (24 months; 1.500.000 €)

### **Implementation agencies**

Ministry of Infrastructure, Transport and Networks

Ministry of Environment Energy and Climate Change

**Street cleaning**: Tandem use of sweeping and, more importantly, water washing, especially during dry periods of the year. It is evident that non-exhaust traffic emissions lead to a major part of the coarse fraction of road dust that can be removed by street cleaning.

**Priority: 3 / Effectiveness: 3**

### **Actions proposed:**

- Provision of the infrastructure required (15 months; 600.000 €)



- Implementation of the measure 600.000 €/year (pilot application in the Athens Metropolitan Area - AMA).

**Implementation agencies**

Ministry of Infrastructure, Transport and Networks

Ministry of Environment Energy and Climate Change

Decentralised Administration Authorities

**Promoting low-carbon and low-NOx vehicles and new technology vehicles:**

Implement further Reductions in Road Tax and Import Tax for low emission vehicles (for NO<sub>2</sub> and PM); Incentives to withdraw aged private vehicles and replacement with modern (E5/E6) vehicles; Incentives for installation of particle filters in heavy duty commercial vehicles.

**Priority: 1 / Effectiveness: 1**

**Actions proposed:**

- Techno economic study for: i) the determination of the reduced Road Taxes and Registration Taxes and ii) the estimation of the expected public revenues in relation to the current revenues (15 months; 120.000 €)
- Environmental Impact Study (11 months; 90.000 €)
- Common ministerial decision (3 months)

This measure should be self-financed, the final cost, if any will be determined from the above study.

**Implementation agencies**

Ministry of Finance

Ministry of Environment Energy and Climate Change

**Expand public transport Network:** Continuous expansion of Metro lines in Athens (currently only 3) and completion of the Metro in Thessaloniki. Improvement of Public Bus Network for an efficient, ecologic and faster public transportation (metro, train, and tram)

**Priority: 1 / Effectiveness: 1**

**Actions proposed:**

- Implementation of the scheduled construction of additional metro lines in Athens (construction times and costs according to existing estimations)
- Completion of the Thessaloniki metro (8 years; costs according to existing estimations)
- Origin-Destination Traffic Study (15 months; 500.000 € for AMA)
- Techno-economic Study (10 months; 150.000 € for AMA)

- Improvement of Public Bus network according the conclusions of the Origin-Destination Study (AMA) (10 months; costs determined by techno-economic study)

**Implementation agencies**

Ministry of Infrastructure, Transport and Networks

Ministry of Environment Energy and Climate Change

**Reducing road transportation for goods:** Creating a terminal outside the Athens Metropolitan Area serviced by rail line to the Piraeus harbour. Currently trucks travel for 50 km within the central axis of the Athens Metropolitan Area.

**Priority: 3 / Effectiveness: 2**

**Actions proposed:**

- Feasibility Study for the expansion of the railway network and the construction of the terminal (8 months; 80.000 €)
- Environmental Impact Study (12 months; 120.000 €)
- Technical studies and Construction works (24 months; cost determined from the studies required).

**Implementation agencies**

Ministry of Infrastructure, Transport and Networks

Ministry of Environment Energy and Climate Change

**Renewal of car/taxi fleet:** Subsidies for increasing the share of hybrid, natural gas and new technology private vehicles and taxis.

**Priority: 2 / Effectiveness: 2**

**Actions proposed:**

- Techno-economic Study for: i) the determination of subsidies and ii) the estimation of the expected public revenues in relation to the current revenues (9 months; 60.000 €)
- Environmental Impact Study (8 months; 50.000 €)

This measure should be self-financed, the final cost, if any will be determined from the techno-economic study.

**Implementation agencies**

Ministry of Finance

Ministry of Environment Energy and Climate Change

**Reduced fares of public transport:** Reduced fares for public transport during intensive Sahara dust intrusions or forecasted intense pollution episodes.

**Priority: 2 / Effectiveness: 2**

**Actions proposed:**

- Common ministerial decision (3 months)

**Implementation agencies**

Ministry of Finance

Ministry of Environment Energy and Climate Change

**Improving public fleet:** Increase the share of natural gas buses (currently at 35%). Enforce the measure of withdrawal of old technology urban and regional buses.

**Priority: 2 / Effectiveness: 2**

**Actions proposed:**

- Common ministerial decision for withdrawal of old technology urban and regional buses (3 months)
- Techno-economic Study for: i) the determination of subsidies and ii) the estimation of the expected public revenues in relation to the current revenues (9 months; 60.000 €)
- Environmental Impact Study (8 months; 50.000 €)

This measure especially for regional buses should be self-financed; the final cost, if any, will be determined from the techno-economic study.

**Implementation agencies**

Ministry of Finance

Ministry of Environment Energy and Climate Change

**Vehicle and road maintenance:** Increase the frequency of inspection programmes to public vehicles to ensure that in-use engines continue to have functional controls and proper maintenance. Maintaining roads in good repair to reduce the contribution of PM from road surface wear.

**Priority: 1 / Effectiveness: 1**

**Actions proposed:**

- Common ministerial decision for the implementation of inspection programmes (3 months)
- Enhanced programme of maintenance of road network (10.000.000 €/year)

### **Implementation agencies**

Ministry of Infrastructure, Transport and Networks

Ministry of Environment Energy and Climate Change

Decentralised and Local Administration Authorities

### **HEAVY OIL COMBUSTION / SHIPPING**

**Combat the illegal trade of adulterated fuel:** Incidents of adulterated fuel circulation and use are still common in Greece. Continuous controls are needed to eliminate this phenomenon.

**Priority: 1 / Effectiveness: 1**

#### **Actions proposed:**

- Application of inflow-outflow fuel control system in all gas stations (6 months)
- Inspection and control of the inflow-outflow fuel control system in gas stations (150.000 €/year)

### **Implementation agencies**

Ministry of Finance

**Stricter legislation for industrial heavy fuel oil users:** Monitor with inspection checks the fuel efficiency of burners, boilers and power generators of small and medium scale industries operating machinery using heavy fuel oil.

**Priority: 2 / Effectiveness: 2**

#### **Actions proposed:**

- Inspection and control of boilers and burners (100.000 €/year)

### **Implementation agencies**

Ministry of Environment Energy and Climate Change

Decentralised Administration Authorities

**Industrial facilities:** Impose high standards for fuels and increase inspections to facilities.

**Priority: 2 / Effectiveness: 2**

#### **Actions proposed:**

- Inspection and control of industrial facilities (150.000 €/year)
- Common Ministerial Decision (for setting fuel quality standards) (3 months)

### **Implementation agencies**

Ministry of Environment Energy and Climate Change

Decentralised Administration Authorities

Ministry of Infrastructure, Transport and Networks

**Stricter legislation for harbour:** Docking at the large commercial harbours is only permitted to vessel with engines operating with low sulphur content. These rules need to be enforced and monitored.

**Priority: 1 / Effectiveness: 1**

### **Actions proposed:**

- Inspection and control of ships fuels (150.000 €/year)
- Common Ministerial Decision (for setting fuel quality standards) (3 months)

### **Implementation agencies**

Ministry of Environment Energy and Climate Change

Ministry of Infrastructure, Transport and Networks

Port Authorities

## **PRECURSORS OF SECONDARY AEROSOL**

**Reduce precursors of secondary particles, mainly SO<sub>2</sub>:** Very high levels of SO<sub>4</sub><sup>2-</sup> are observed across Athens and in the whole of the country. Sulphate is produced from SO<sub>2</sub> emitted mainly during energy production processes in the industrial and residential sectors. The introduction of natural gas in the national energy system is one of the largest investments ever carried out in Greece and it constitutes a major priority of the national energy policy. An important part of the infrastructure, mainly the high pressure transmission system and the medium pressure network, which is necessary for the transport of natural gas to the main regions of consumption, has been completed. Expansion projects of Greek natural gas system are under way in order to link more cities and industries to the system (e.g. Aliveri, Megalopolis, etc). Moreover, in the areas connected to the natural gas network, natural gas stations for feeding CNG (Compressed Natural Gas) vehicles have been created.

**Priority: 1 / Effectiveness: 1**

### **Actions proposed:**

- Expansion of natural gas system (12 months; costs according to existing estimations regarding natural gas system expansion)

### **Implementation agencies**

Ministry of Environment Energy and Climate Change

Ministry of Infrastructure, Transport and Networks

### **Reduce trans-boundary pollution due to the use of fossil fuels in large industrial facilities and power plants in European developing countries:**

Greece complies with EU standards and limits set for large industrial facilities. Moreover, the penetration of natural gas has further reduced the amount of air pollutants emitted. The high levels of sulphate observed across Greece and in the overall area of Southeast Europe Athens may be partly due to long range transport of  $\text{SO}_4^{2-}$  or gaseous precursors ( $\text{SO}_2$ ) from outside Greece, and specifically from developing countries present in the region, which are still using high sulphur content fuels. The low oxidation rate of  $\text{SO}_2$  to  $\text{SO}_4^{2-}$  further supports this hypothesis. This is an area where policy makers must intensify efforts for resolving problems of trans-boundary pollution in Europe, by providing support and incentives to developing countries to turn towards cleaner fuels and production processes.

**Priority: 1 / Effectiveness: 1**

### **Actions proposed:**

- Techno-Economic Study for the reduction of air pollution from large industrial facilities and power plants in European developing countries (15 months; 120.000 €)
- Installation of anti-pollution systems to reduce industrial air pollution in developing countries in Europe (10 months; the cost will be specified from the techno-economic study)

### **Implementation agencies**

European Commission

## **BIOMASS BURNING**

**Reduction of low efficiency wood burning for residential heating:** High price of diesel for residential heating during the economic crisis resulted in the use of wood in a large scale in the densely populated areas of Greek urban centres, leading to high pollution episodes during stagnation periods in winter. Measures to discourage citizens from this inefficient form of energy are needed:

- Introduction of natural gas and renewable energy sources
- Improvement of the thermal behaviour of residential buildings
- Promotion of energy efficiency appliances and heating equipment

- News bulletins advising for reduction in wood burning during forecasted atmospheric stagnation periods
- Information material and training of citizens regarding the negative health impact of uncontrolled biomass burning.

**Priority: 1 / Effectiveness: 1**

**Actions proposed:**

- Information campaigns in order to avoid biomass burning and to promote the use of high energy efficient appliances (50.000 €/year)
- Common Ministerial Decision for giving citizens subsidies in order to be connected to the natural gas network (3 months)
- Subsidies for further penetration of natural gas for house holdings (2.000.000 €/year)
- News bulletin advising the reduction of biomass burning during atmospheric stagnation episodes.

**Implementation agencies**

Ministry of Environment Energy and Climate Change

Ministry of Finance

**LOCAL POPULATION BAD PRACTICES**

**Environmental education and awareness raising:** Communication campaigns through the media and dissemination of "best practices" should be favoured in order to sensitize population on the opportunity of the previous measures.

**Priority: 1 / Effectiveness: 1**

**Actions proposed:**

- Information and awareness campaigns in order to promote the measures described above (80.000 €/year)

**Implementation agencies**

Ministry of Environment Energy and Climate Change

Ministry of Infrastructure, Transport and Networks

Ministry of Health

**3.3. *Endorsement of measures by key stakeholders***

The final set of measures prepared in the framework of ACEPT-AIR project have been submitted to the National, Regional and Local authorities of the three cities

(Athens, Thessaloniki and Volos) in order to serve as guidelines for the formulation of Air Quality Action Plans. Very positive feedback was obtained by the Ministry of Environment, Energy and Climate Change, the Municipality of Thessaloniki and the Regional Unit of Magnesia and Sporades (former Prefecture of Magnesia). All three stakeholders and relevant authorities in the studied areas have endorsed the proposed set of measures as documented in the letter submitted to the coordinating beneficiary after the end of the project. In addition, the Association of Motor Vehicles Importers Representatives has submitted to the coordinating beneficiary a letter expressing their interest regarding the objectives and outcome of the project. All four letters are included in Annex III.



## **ANNEX I: Meeting with representatives of the Ministry for the Environment, Energy and Climate Change**

**MEETING with the  
MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE  
for the project  
ACCEPT-AIR LIFE09 ENV/GR/000289**

**MINUTES OF THE MEETING**

**Direction of Air Pollution and Noise Control, MEECC**

**Athens, 20/2/2013**

The main objective of the meeting was to inform the Ministry of Environment, Energy & Climate Change (MEECC) on the progress of ACCEPT-AIR project and in particular the development of ACCEPT-AIR Policy Tool.

Initially, Dr. Th. Maggos provided to Mrs. E. Tsilimpari and Mr. A. Adamopoulos an update on the work progress regarding the development of standard methods for PM measurements by the Technical Committee CEN/TC 264, in which he is participating. He provided them as well with draft versions of the documents: “Ambient air - Standard gravimetric measurement method for the determination of the PM<sub>10</sub> or PM<sub>2.5</sub> mass concentration of suspended particulate matter” (prEN 12341) and “Ambient air - Automated continuous systems for the measurement of the concentration of particulate matter (PM<sub>10</sub>; PM<sub>2.5</sub>)” (FprCEN/TS 16450). The documents are expected to be finalized in 5 years. Mrs. Tsilimpari and Mr. Adamopoulos expressed their interest, especially in view of the planned purchase of new optical instruments by the Ministry. Dr. K. Eleftheriadis commented on the pros and cons of optical instruments, mainly their ability to monitor efficiently short-term variations and the need to calibrate the measured concentrations by gravimetric measurements.

Mrs. Tsilimpari and Mr. Adamopoulos discussed on problems regarding instruments' maintenance and the operation of regional stations. Dr. Eleftheriadis mentioned a measurements campaign conducted some years ago in Megalopoli, where a number of metal constituents were also quantified. Mrs. Tsilimpari expressed the Ministry's interest in acquiring this data, especially regarding the metals included in the Directive (Ni, As, Pb and Cd). Dr. Eleftheriadis agreed to provide the available data.

Dr. Eleftheriadis presented to Mrs. Tsilimpari and Mr. Adamopoulos with a small questionnaire regarding the present control measures implemented by the government, the methods for assessing their effects, if any, as well as some suggestions for future mitigation measures. In addition, he requested some information on industrial emissions. The MEECC representatives agreed to provide all available information. Practices involving the reduction of dust resuspension, adopted in Spain, Austria and Italy, were discussed (street cleaning, application of liquid Calcium-Magnesium-Acetate as dust-binder). Mr. Adamopoulos asked what percent of PM may be attributed to soil / road dust and whether these measures are really effective. Dr. Eleftheriadis replied that in Athens 20 – 30 % of PM may correspond to this source. Mrs. Tsilimpari enquired after the contribution of sea salt and Dr. Eleftheriadis replied that this source is also not negligible in Athens.

Regarding control measures, Mrs Tsilimpari commented that the adopted measures are usually not planned specifically for the reduction of concentration levels of one or more pollutants. They form part of a general planning based on a number of parameters. More information on this subject will be provided through the questionnaire.

Mrs. Tsilimpari also commented on the need to follow the specific instructions on measurements included in the relevant Directives, so that the data submitted by the Ministry are accepted by E.C.

Dr. Eleftheriadis presented the draft version of the ACEPT-AIR Policy Tool. He commented on the need to enhance the calculation algorithms used to assess the effectiveness of different control scenarios. Mr. Adamopoulos enquired after the necessity of including PM concentration data-series in the tool's database. Dr. Eleftheriadis replied that this is important so that the end-user may have a clear picture of the current situation in the different areas, as well as the general trend of concentration levels over the years. Mr. Adamopoulos commented on the graphs presenting the concentration time-series, where missing data are not clearly shown. Dr. Eleftheriadis agreed to make the respective corrections.

Regarding source apportionment results, Dr Eleftheriadis commented that an effort has been made to match the sources provided by source apportionment with the sources included in the emission inventories. He added as well that it is important to see the source contributions' evolution over the years.

Regarding the “built-up scenario” section, Dr. Diapouli enquired after the relevance of the parameters used to build the control scenarios. Mr. Adamopoulos replied that the main parameters are indeed included. He also suggested considering the effect of vehicles’ speed on traffic emissions. A number of countries have adopted lower speed limits in highways close to residential areas, in order to decrease air pollution levels. Dr. Eleftheriadis commented that this could relate to decrease of both dust resuspension and fuel consumption. Fuel consumption increases after 80 – 90 km/hr. Mr. Adamopoulos and Mrs Tsilimpari agreed and added that this measure has been adopted in France and Belgium both for PM and O3.

Regarding residential emissions, Dr. Eleftheriadis commented on the increase in PM levels due to biomass burning for residential heating. This phenomenon has been documented last year as well during ACEPT-AIR winter campaign. More information will be available once the results from source apportionment are available. Mrs. Tsilimpari added that this year there has been an increasing number of complaints by civilians regarding combustion emissions at their neighborhoods.

Mr. Adamopoulos enquired after the methodology used to calculate the concentrations corresponding to specific emission scenarios and how the different parameters (meteorology, emission sources etc) are included. Dr. Eleftheriadis replied that only a yearly mean value is calculated, so the effect of meteorology is not significant on average. Mr. Adamopoulos commented that another major issue is the prediction of daily exceedances.





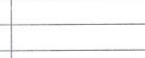

Mr. Adamopoulos asked if biomass burning is included in residential emissions and if so by which means. Mrs. Tsilimpari commented on the difficulty to calculate emissions from residential fireplaces. Dr. Eleftheriadis replied that he will transfer the question to Dr. Progiou who is responsible for the compilation of emission inventories for anthropogenic sources.

The meeting closed with Dr. Eleftheriadis thanking the Ministry’s representatives for their support and assistance.

Meeting with Ministry of Environment, Energy & Climate Change  
 ACCEPT-AIR LIFE09 ENV/GR/000289  
 Direction of Air Pollution and Noise Control

Athens, 20/2/2013

**List of participants:**

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The Coordinator,



K. Eleftheriadis  
 N.C.S.R. "Demokritos"

## **ANNEX II: Questionnaire on current control measures**

### **1. Which measures for the improvement of air quality and especially for the reduction of particulate pollution are currently being used?**

A number of mitigation measures have been adopted for the long-term abatement of air pollution, targeting at all air pollutant emission sources. Their implementation is the responsibility of the Ministry for the Environment, as well as other Ministries and agencies. The most important measures are presented below:

- Implementation of Best Available Techniques (BAT) in industrial activities
- Reduction of emissions of volatile organic compounds (VOCs) emissions from small and large scale industrial facilities that use organic solvents
- Operation of the Environmental Inspectors Office, for control of compliance with environmental terms
- Promotion of the use of natural gas in the residential, industrial and tertiary sector
- Use of more environment-friendly fuels by vehicles, such as the use of natural gas in buses
- Promotion of the use of new technology vehicles (such as hybrid vehicles)
- Renewal of public transportation fleet (buses and taxis), management of vehicles at the end of life cycle
- Withdrawal of old technology two-wheel vehicles (classed before 1995)
- Emission control from vehicles and combustion installations
- Adoption of the Emission Control Card (promotion of its implementation through the establishment of private Centers for the Technical Control of Vehicles)
- Measures aiming at the reduction of private cars' use and the improvement of vehicular traffic
  - Improvement of the design of the public transportation itineraries
  - Construction of the Metro system in Athens and extension of its lines, construction of suburban railway systems in Athens and Thessaloniki
  - Adoption of special traffic lanes for public transportation vehicles
- Control measures for VOC emission during all stages of storage and transport of fuels, through the implementation of vapor recovery system
- Measures for the improvement of fuel quality
- Implementation of the Emission Control Card regulation for two-wheel vehicles

### **2. How and how frequent do you evaluate their effect?**

There is no evaluation procedure / system for each control measure. The general evaluation is performed through assessment of air quality on a yearly basis.

**3. Should further mitigation measures be considered?**

Definitely, since compliance with limit values is not attained.

**4. Which measures are you willing to test and apply? e.g**

- **street washing**
- **application of dust suppressants**

Both measures could be applied, with a simultaneous cost-effect analysis. Their effectiveness could be limited (e.g. for Athens) if we consider the great contribution of resuspended dust from the surrounding land which is stripped from vegetation, as well as the transport of dust from arid areas of the country.

**ANNEX III: Letters of endorsement of control measures  
for Action Plan formulation by ACEPT-AIR key  
stakeholders**



MINISTRY OF ENVIRONMENT, ENERGY AND CLIMATE CHANGE  
OFFICE OF THE DIRECTOR GENERAL FOR ENVIRONMENTAL POLICY

Athens, 30.12.2014

Our Ref.: 1338

Dear ACEPT-AIR Co-ordinator,

We would like to re-iterate our interest in the results of the ACEPT-AIR project and the useful application of the ACEPT-AIR Policy making tool in our work as a supplementary instrument. Having followed the assessment of the status of the Air Quality from our monitoring data, other studies and the additional data provided by the ACEPT-AIR project for the period 2011-2012 we can verify our endorsement of several measures proposed at the ACEPT-AIR Action Plan.

These are in line or supplement many Policy directions we have initiated and are currently in progress for implementation by the Ministry of Environment, Energy and Climate Change.

More specifically and in agreement with the ACEPT-AIR Action Plan we have proposed several measures of Nation Wide significance, which can be summarized in the following three categories:

1. The reductions in gaseous emissions with application of Best Available Practices from industry and the transport sector for reducing the precursors for secondary aerosol production
2. The promotion of Natural gas in all sectors including residential heating for the reduction of the burden from Biomass Burning, a burden specifically highlighted by the results of ACEPT-AIR project
3. Reduction of traffic emissions by improvements on Public transport services, traffic management schemes, enforcement of fuel quality regulation and promotion of introduction of new technology vehicles.

We can therefore summarize that we have undertaken our role as a major stakeholder of the ACEPT-AIR project with great interest and look forward to the follow-up of this and other LIFE+ projects providing results for the improvement of Air Quality in Greece.



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MUNICIPALITY OF THESSALONIKI  
Directorate for the Management of the Urban Environment  
Department of Environment  
Kleanthus 18,  
GR-54642 Thessaloniki, Greece

Thessaloniki, 15 October 2014

Dear ACCEPT-AIR Co-ordinator,

We would like to thank you for the submitted Action Plan of measures and guidelines for the reduction of Airborne Particulate matter as a result of our collaboration in the ACCEPT-AIR project. We are also glad to inform you that our situation is improved after the useful application of the ACCEPT-AIR Policy making tool in our premises as a useful instrument for selecting the most efficient mitigation measures in our area.

After the assessment of the status of the Air Quality from our monitoring data and the data provided by the ACCEPT-AIR project for the period 2011-2012 we can reflect of the long term measures required and agree with the endorsement of several measures proposed at the ACCEPT-AIR Action Plan among other actions for the city of Thessaloniki. General and specific Policy directions followed at the local level are in agreement or can be further improved after the proposed implementation by the Local and Regional government.

In accordance to the ACCEPT-AIR Action Plan several measures have been proposed and can be generalized as follows:

- reduction of Biomass Burning emissions due to residential heating is needed and can be achieved by promotion of Natural gas in all sectors including residential heating. This need has been shown by the ACCEPT-AIR source apportionment
- reduction of traffic emissions by intensifying efforts to improve Public transport services (in the case of Thessaloniki the METRO), traffic management schemes, improvement of fuel quality and reducing adulterated fuel and promoting new technology vehicles.
- reductions in gaseous emissions by applying Best Available Practices in industry and the transport sector are important for reducing the precursors for secondary aerosol production and are a significant benefit

It has been a long term effort to follow as a major stakeholder the ACCEPT-AIR project and it has been of great interest to provide the necessary feedback to the project team. We would be interested in continuing the collaboration through the After LIFE communication plan providing results for the status of Air Quality and targeted tools and mitigation strategies in Greece and Europe as a whole.

The Director

Dr. Maximos Petrakakis





**REGION OF THESSALY – REGIONAL UNITS OF MAGNESIA AND SPORADES**  
**DEPARTMENT OF ENVIRONMENT AND HYDROECONOMY**

Volos 30-12-2014

Dear K. Eleftheriadis,  
(ACEPT-AIR Co-ordinator)

The Regional Units of Magnesia and Sporades would like to confirm the continued implementation of ACEPT AIR Tool and Action Plan guidelines for designing measures for the reduction of Airborne Particulate matter as a result of our collaboration in the ACEPT-AIR project.

After the assessment of the status of the Air Quality in Volos city provided by the ACEPT-AIR project for the period 2011-2012 we have taken extra care of the results both with respect to the general conclusions for urban areas in Greece as well as the problems specific for our area highlighted during the ACEPT AIR project and analysed by means of the ACEPT Air Policy Tool. Despite the recent reduction of fossil fuel combustion emissions and industrial emissions further improvements can be achieved following the guidelines based on the results of the project.

Mitigation actions undertaken by our Office in conjunction with the ACEPT-AIR Action Plan include several sectors of activities related to atmospheric pollution emissions.

Following the results identifying the industrial emissions in our area we intensified inspections and enforcement of Environmental Regulation on emission levels by each industry.

Following the increase of emissions arising for fuel combustion and increased dust we have started collaboration by the Port authorities and investigated a number of mitigation measures to reduce suspension of bulk materials during loading and delivery of cargo.

Informative campaigns targeted to the public for reducing the use of firewood for residential heating are currently implemented in order to reduce the detrimental health effects from biomass burning emissions.

The submitted ACTION PLAN by the ACEPT-AIR project and team remains an important set of long term guidelines for our Regional Authority and has been of great interest to provide the necessary feedback to the project team as well as keep active the long term collaboration with the ACEPT AIR group. Continuing the collaboration through the After LIFE communication has been set as a long term strategy from our side and has been confirmed by your side so that we all benefit from improved Air Quality in our area



The Head Officer

Mahgos



Athens, September 14<sup>th</sup> 2015

Ref. No.: 20951

Dear ACEPT-AIR Co-ordinator,

We would like to communicate our interest regarding the general and specific outcomes of ACEPT-AIR project on the assessment of air quality in Greek urban centers and the major emission sources responsible for the observed air pollution levels. The development of ACEPT-AIR Policy Tool for the control of particulate matter (PM) concentrations in the ambient atmosphere, and the demonstration of its functionality and capabilities in the framework of the project, have provided significant insight into the impact of the different anthropogenic and natural PM sources.

The project indicated that vehicular traffic emissions remain a constant source of PM10 and PM2.5 with equal share in the coarse and fine fraction, with contributions to PM levels reaching up to around 20% for urban background areas and more than 40% for traffic impacted sites. Of special interest was the high share of non-exhaust emissions, whose significance increases as exhaust emissions decrease in new technology engines. Several control measures proposed by ACEPT-AIR project in the framework of the formulation of guidelines for effective development of Action Plans are in line with our general strategies, such as:

- Promotion of low-carbon and low-NOx vehicles and new technology vehicles;
- Renewal of car/taxi/motorcycle fleet;
- Improvement of public fleet and enforcement of the withdrawal of old technology mass transport vehicles;
- Enforcement of appropriate vehicles' maintenance.
- Education and mobilization of the general public towards the adoption of "best practices" in their everyday life, including the selection and use of private vehicles.

In summary, we would like to re-iterate our interest in the aims and outcome of ACEPT-AIR project and our intentions to continue following any new data and information provided by the project partners in the after-LIFE period.

Yours sincerely,

Dim. Patsios  
Director



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ASSOCIATION OF MOTOR VEHICLE IMPORTERS REPRESENTATIVES