LIFEINDEXAIR

Technical report on the development of guidelines for action plans formulation

Deliverable B7.1

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2. EXECUTIVE SUMMARY

The main objective of the Action B7 of the LIFE Index-Air project is to develop concrete guidelines for action plans formulation directly linked to the decrease of PM exposure and, in turn, to the reduction of burden of disease for Lisbon, Oporto, Athens, Kuopio and Treviso.

The Technical Report on the development of guidelines for action plans formulation (Deliverable B7.1), prepared in the scope of Action B7, describes the work developed in:

- Action B7.1 – Review of action plans and measures;
- Action B7.2 - Identification of strategic measures for the studied cities.

3. INTRODUCTION

The Technical Report on the development of guidelines for action plans formulation is a document of the LIFE Index-Air project, delivered in the context of the Action B7 – Development of guidelines for action plans formulation, more specifically in Activity B7.1 and B7.2.

TU-Crete reviewed action plans and measures to improve air quality in terms of PM and strategic measures for Lisbon, Oporto, Athens, Kuopio and Treviso were identified by IST, UAVR, NCSR-D, THL and IST, respectively. Finally, the consortium selected the measured that will be considered by the LIFE Index-Air tool.

This report presents 3 main chapters:

1. Portfolio of best the practices;
2. Strategic measures for the pilot cities;
3. Selection of measures that will be considered in the LIFE Index-Air tool.

4. PORTFOLIO OF BEST THE PRACTICES

Based on the project results, on already established measures in urban areas in Europe and on the consultation process with key stakeholders, a set of control actions has been developed and provided as guidelines for the preparation of an Air Quality Plan. The measures were based on PM concentration and speciation obtained during 2017-2018, and taking into account the most efficient reductions achievable.

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 and their metal content.

According to questionnaire results, the need to establish a closer link between environment and health was identified. It is important to implement measures to reduce emissions from residential combustion. There is also a need of new policies for the protection of air quality: (a) assessment of emissions from sectors with insufficient, disjointed and/or inconclusive information e.g. maritime transport and harbours, (b) development of methodologies that optimize air quality management with the best cost benefit ratio, (c) quantification of the effects of air pollution on human health and (d) assessment of the effects of air pollution on ecosystems. In addition, significant air quality issues are: (a) monitoring of micro-pollutants (mostly organic as benzo(a) pyrene and other IPA, tracers of biomass burning, PCDD-F near specific industrial plants), gas precursors for ozone, UF particles, $PM_{2.5}$ and PM_{10}, (b) determination of compounds in airborne particulate matter (especially for $PM_{2.5}$) (c) odour problems (waste water drains, waste treatment plants etc.) in dwelling areas, (d) air quality impacts of domestic wood combustion, (e) data for population exposure, (f) impact assessment of sources contribution to exceedances and (g) air quality index (AQI) for large cities.

In addition, according to questionnaire results specific measures for the improvement of air quality for the reduction of particulate matter have to target local sources (e.g. wood combustion) and emissions from heating, energy production and fugitive dust emissions, e.g. road dust. These reductions have to be targeted together with reductions in particulate matter metal content.

The chemical composition of PM_{10} depends on emission sources. The metal content of PM_{10} originates from both natural and anthropogenic sources and reduction of their ambient concentrations is also an objective of the LIFE Index-Air project. In particular, important sources of As are coal combustion, pesticides and mining. In addition, the sources for Cd include vehicular traffic, brake and tire wear, volcanic eruptions, forest fires, industrial activities and cigarette smoke. As regards Cr, the sources are vehicular traffic, windblown dust and metallurgical processes. Additionally, the Mn originates from soil and road dust. Regarding Pb, their ambient concentrations originate mainly from vehicular traffic, brake and tire wear, waste incinerator and Pb-acid battery manufacturers. Furthermore, Ni originates mainly from oil combustion, burning of residual and fuel oil, municipal waste incinerator and vehicular traffic. Finally, the major sources of Co are oil and coal combustion. Therefore, specific measures targeted on their emission sources may result to the reduction of their ambient levels. These include mainly vehicular traffic, industrial emissions and cigarette smoking indoors.

The 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…".

The objective is that where the levels of pollutants in ambient air exceed any limit value or target value, Member States shall ensure that air quality plans are established in order to achieve the related limit or target values. When the air quality standards are exceeded, a control strategy will be applied (emission reduction measures). The control strategy has to be based on technical feasibility, resulting costs and environmental and health impacts.

In the long-term, LIFE Index-Air project may improve the effectiveness of National, Regional and Local policies regarding ambient air quality, in accordance with the requirements of Directive 2008/50/EC for air quality plans formulation and reductions of ambient PM concentrations, as well as WHO Guidelines for the protection of human health.

Best practises which were used in the past and applied in number of urban areas include the following:

1. **Road Traffic**

1.1 Low emission zones (LEZ): Expand and prioritize the 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. The environmental zone limits the emissions generated by busses and waste collection vehicles in the city centre. Adherence to tighter emissions restrictions is required in the environmental zone.

1.2 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. Parking pricing can be also raised in the city centre in order to reduce traffic in the inner city, especially during rush hours.

1.3 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. Studies in the effectiveness of street cleaning activities found that mechanical sweeping combined with water flushing achieved reductions of > 90% in deposited dust loads on the road. Therefore washing is an effective mitigation technique of reducing ambient concentrations of PM_{10} (reduction 2 – 15 %).

1.4 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_2 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.

1.5 Expand public transport Network: Continuous expansion of Metro lines. Improvement of Public Bus Network for an efficient, ecologic and faster public transportation (metro, train, and tram). In order to become more environmentally friendly bus fleet can be developed and for instance use of electric busses can be investigated. Diesel buses can be adapted to use renewable waste-based biofuels. Introduction of hybrid and electric buses will also reduce noise.

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

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

1.8 Improving public fleet: Increase the share of natural gas buses. Enforce the measure of withdrawal of old technology urban and regional buses.

1.9 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.

2. **Heavy Oil Combustion / Shipping**

2.1 Combat the illegal trade of adulterated fuel: Incidents of adulterated fuel circulation and use has to be limited. Continuous controls are needed to eliminate this phenomenon.

2.2 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.

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

4. **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.

5. Precursors of Secondary Aerosol

5.1 Reduce precursors of secondary particles, mainly SO_2: Sulphate is produced from SO_2 emitted mainly during energy production processes in the industrial and residential sectors. The introduction of natural gas in the national energy system constitutes a major priority of the national energy policy.

5.2 Reduce trans-boundary pollution due to the use of fossil fuels in large industrial facilities and power plants in European developing countries: EU members comply with EU standards and limit 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 in the overall area of Southeast Europe may be partly due to long range transport of SO_4^{2-} or gaseous precursors (SO_2), and specifically from developing countries present in the region, which are still using high sulphur content fuels. The low oxidation rate of SO_2 to 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.

6. Biomass Burning

6.1 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 in 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.
- Promoting good methods for wood storing Furthermore, fireplaces improvement is foreseen. The improved/certified fireplaces and stoves are designed to reduce PM emissions by burning wood more efficiently and completely. The Ecodesign Regulation for domestic biomass appliances, i.e. for stoves, fireplaces and range cookers was published in April 2015 (EU Regulation 2015/1185).

7. Local Population Bad Practices

7.1 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.

5. STRATEGIC MEASURES FOR THE PILOT CITIES

Guidelines for action plans formulation for the five cities identified (Lisbon, Oporto, Athens, Kuopio and Treviso) have been presented in the current document. These measures are mainly based on local Air Quality Plans. However, alterations of measures and identification of new ones, as well as quantification of the effects of specific measures is expected after the implementation of the Policy Tool which is under development in the LIFE Index-Air project.

CITY OF LISBON, PORTUGAL

In order to comply with the air quality standards set by the current Air Quality Directive (2008/50/EU), in 2005 CCDR-LVT developed an Air Quality Plan (CCDR-LVT, 2006) that was approved by Portaria nº 715/2008. This document was the base for the Execution Program approved by Despacho Conjunto nº 20763, published in 16th of September 2009. In 2017 CCDR-LVT developed a new plan for the reduction of PM10 and NO_2 levels that is now under evaluation.

The following measures may be appropriate to improve Lisbon air quality:

1) Supply and demand of energy

- Increasing the renewable sources of energy;
- Improvement of the energy efficiency in buildings and electric power sector.

2) Mobility and traffic

- Improvement of the public transport network:
  - Expansion of the metro system in Lisbon;
  - Expansion of the buses offer (routes and number);
  - Renovation of the bus fleet;
  - Renovation of the Taxis fleet;
  - Increasing the peripheral car parks near interfaces;
  - Restructuring the tariff and ticketing system.
- In the current Low Emission Zone (LEZ):
  - Reinforcement of the requirements (Zone 1 – at least EURO 4, Zone 2 – at least EURO;
  - Increasing the inspection;
  - Implementation of a circulation charge to Zone 1 on working days and to non-residents.
- Introduction of Mobility Plans for companies that generate travel in the city of Lisbon and, in particular, in the LEZ;
- Definition of mobility plans for the city;
- Expansion the parking paid to the entire city of Lisbon;
- Increasing inspection of paid parking in the city of Lisbon;
- Renovation of the fleet of municipal solid waste collection vehicles;
- Training actions on economic driving to reduce energy intensity;

- Implementation of dedicated routes for cars with more than 2 passengers at peak times;
- Increasing the corridors for buses in structural ways to increase commercial speed;
- Increasing the frequency of street washing;
- Regulation of the circulation of vehicles related to the touristic activity in the city of Lisbon;
- Improvement of the measures to promote the electric mobility, with the introduction of major charging stations in the city;
- Fiscal disincentive to the acquisition of vehicles with high emissions and incentive to the acquisition of electric vehicles.

3) Harbour

- Docking only permitted to vessel with engines operating with low sulphur content;
- Reducing the number of cruises.

4) Industry

- Application of the best available techniques;
- Increasing the supervision of the emissions from the industries.

5) General

- Promotion of the urban planning policies to reduce the daily commuting;
- Promotion of the good practices to reduce the atmospheric emissions of particles resulting from the construction and demolition of buildings and infrastructures;
- Development of an information and communication plan on Air Quality, Environment and Mobility;
- Development of an Emergency Plan for the days in which air pollution episodes are expected.

CITY OF OPORTO, PORTUGAL

The Porto Urban Area had in 2015 around 1 342 000 inhabitant, and is repeatedly affected by high PM concentrations. In order to comply with the air quality standards set by the current Air Quality Directive (2008/50/EU), the Northern Region of Portugal developed Air Quality Plans to reduce PM10 (CCDR-N, 2007) and NO2 (CCDR-N, 2011). The following measures may be appropriate to improve Porto air quality:

1) Supply and demand of energy

- Certification of residential combustion equipment;
- Reduction of the emissions of residential combustion (more efficient equipment).

2) Mobility and traffic

- Creation of High-occupancy vehicle lanes in the main access roads to Porto;
- Encouraging the introduction of particulate filters in heavy goods vehicles;

- Incentives for the renewal of the heavy passenger fleet;
- Improvements in the collective transport network;
- Promoting car sharing;
- Renewal of the fleet of urban solid waste collection vehicles and taxis;
- Decrease the percentage of large goods vehicles in circulation;
- Construction of peripheral car parking and increase the prices of parking within Porto;
- Adopting low speed limits;
- Fiscalization of illegal parking;
- Taxes and limitations to the entry and circulation in cities and busy areas (Low Emission Zones, Congestion Charge Zones, Differentiated Road Tolls and Alternate Circulation System based on car registrations);
- Improve frequency of street cleaning;
- Introduction of public natural gas stations.

3) Industry

- Application of the best available techniques;
- Higher surveillance of industrial sources;
- Substitution/implementation of high efficiency de-dusters at the industrial sources;
- Inventory and improvement of the inspection of industrial areas;
- Creation of emission standards for industrial areas and business activities in urban centres.

3) General

- Conducting awareness-raising activities;
- Reduction of dust during civil constructions activities;
- Modification of the production process of bituminous mixtures.

CITY OF ATHENS, GREECE

The historical data on PM10 concentrations and exceedances of respective limit values in Athens during the last two decades show a clearly decreasing trend. This is directly or indirectly linked to the development by Greek National authorities of measures targeting mainly the mitigation of traffic emissions and the reduction of fossil fuel use due to energy efficiency improvements or interventions in favour of alternative fuels and renewable energy sources in the Athens urban agglomeration.

Source apportionment studies on PM10 and PM2.5 concentrations conducted in Athens during the last years (Amato et al., 2016; Diapouli et al., 2017a) have demonstrated that the main anthropogenic sources currently responsible for the observed PM levels are vehicular traffic (with a significant contribution also from non-exhaust emissions) and biomass burning, while secondary aerosol production (secondary organic carbon and inorganic species) contribute by a large fraction to both PM10 and PM2.5 concentrations as well.

1) Mobility and traffic

Several measures related to traffic management and vehicular emission reductions have been implemented in Athens:

- These include an age limit of 23 years, which has been implemented for all urban, semi-urban and long distance buses.
- Also the limit of 11 years was set as the higher permissible age for buses in public transport.
- Under the provisions of the same law, economic incentives were given in the owners for the replacement of vehicles with new or used vehicles of small age.
- Nevertheless, efforts on the mitigation of traffic emissions must be intensified. Among the measures proposed for the city of Athens are:
    - expansion of low emission zones (LEZ);
    - enhancement of the public transportation network and creation of large parking lots near public transport stations at the outskirts of the city, in order to promote the use of public transportation inside the city centre;
    - increase frequency of street cleaning (especially during the dry season and African dust long-range transport events);
    - promotion of low-carbon and low-NOx new technology vehicles and renewal of the car/taxi/motorcycle fleet,
    - reducing of road transportation for goods; (vi) ensure good vehicle maintenance (effective inspection programmes for public and private vehicles);
    - good road maintenance to reduce the contribution of PM from road surface wear.

2) Biomass burning

- With respect to biomass burning emissions, a significant increase has been observed during the last years in Athens, due to the extended use of wood burning for residential heating (Diapouli et al., 2017b). Efforts regarding the mitigation of this source should focus on communication / education campaigns on the "best practices", including selection of biofuels and biomass burning appliances. In addition, economic incentives should be provided for switching to cleaner and more efficient heating methods, such as natural gas systems. Furthermore, open biomass burning (especially related to agriculture, forestry and construction) should be better regulated.
- Regarding the contribution from secondary aerosol production (mainly sulphate and nitrate), mitigation strategies should focus on:
    - industrial energy production;
    - NOx traffic emissions;
    - NH_3 emissions resulting from agricultural, livestock and waste practices.

3) Energy

- 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. 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. Nevertheless, despite the mitigation efforts related to energy production emissions, the levels of sulphate remain high in Athens and across Greece. This may be attributed to long-range transport of SO_4^{2-} or gaseous precursors (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 SO_2 to SO_4^{2-} further supports this hypothesis. It is evident, thus, that efforts on mitigating transboundary pollution in Europe should be intensified and support and incentives should be provided to developing countries to turn towards cleaner fuels and production processes.

CITY OF KUOPIO, FINLAND

The city of Kuopio does not have yet its own air quality plan and does not identified yet mitigation measures for air quality. Identified measures for the air quality plan for Helsinki for 2017-2024 have been proposed here as possible relevant measures to be adopted also in the city of Kuopio.

Helsinki municipality has an obligation to ensure good air quality for its residents. The City of Helsinki has drawn up an Air Quality Plan for 2017–2024. The objective is for the Plan to help reduce traffic emissions as rapidly as possible so that the nitrogen dioxide limit value is not exceeded. Another aim is to generally improve the air quality in Helsinki, as well as to reduce exposure to impurities in the air and health problems. The themes of the Plan are the factors with a significant impact on Helsinki's air quality: (1) traffic, (2) street dust and (3) small-scale combustion of wood.

1) Traffic

- Implementation of vehicle traffic pricing is being investigated and promoted - Effective way to reduce the amount of traffic and streamlining the remaining traffic. Reducing the amount of vehicle traffic effectively reduces climate emissions as well as noise.
- Developing bus fleet in order to reduce emissions - In order to become more environmentally friendly bus fleet is being developed and for instance use of electric busses is being investigated. Diesel buses are being adapted to use renewable waste-based biofuels. Introduction of hybrid and electric buses will also reduce noise.
- Low-emission zones environmental zones - The environmental zone limits the emissions generated by busses and waste collection vehicles in the city centre. Adherence to tighter emissions restrictions is required in the environmental zone.
- Parking pricing - Parking pricing is raised in order to reduce traffic in the inner city, especially during rush hours.

2) Road dust

- Active dust binding and more effective street cleaning methods
- Targeted gritting and effective sand removals - Gritting will be reduced whilst taking care to ensure that it does not endanger safety. Washed sifted and durable crushed stone will be favored for gritting.
- Dust prevention on large construction sites - The City is working together with construction firms and subcontractors in order to ensure dust prevention on the sites.
- Reduction of dust from railways.

3) Wood combustion

- Communicating ways and impacts of reduction of emissions from wood stoves
- Promoting good methods for wood storing
- Promoting low-emission sauna stoves
- Improving monitoring of smoke and providing advices to reduce the harm

CITY OF TREVISO, ITALY

1) Supply and demand of energy

- Improvement of the energy efficiency in buildings and electric power sector;
- Re-qualification of obsolete and/or abandoned buildings considering energy savings;
- Incentive the use of electrical and thermal co-generation plants in the most energizing buildings: hospitals, shopping centers, etc;
- Adaptation, extension and construction of district heating networks powered by the use of local energy resources;
- Control against max temperatures in public buildings;
- Integration of renewable sources in new buildings and in existing buildings undergoing major renovations;
- Support to private parties for the replacement of boilers fuelled by fossil fuels (diesel oil, fuel oil) to methane boilers;
- Establishment of a regional environmental-energy certification system for public and private buildings.

2) Mobility and traffic

- Reduction of the non-exhaust emissions from traffic:
    - Decrease of the kilometers traveled through measures on local and regional mobility;
    - Promote the technological development of brakes and tires with lower emissions;
    - Continue and promote the study of the effects of street washing;
    - Increase the cleaning of solid deposited on roads and sidewalks, especially after periods of rain or in areas of construction.

- Make the urban freight logistics more efficient;
- Upgrading the public transport with a multimodal approach through the construction and management of parking lots, connected with surface transport systems, in the main entrances of the city;
- Promotion of the teleworking to limit the demand for mobility;
- Improvement of the measures to promote the electric mobility - diffusion of both public and private charging infrastructures, facilitated access to the circulation of electric vehicles in cities (eg. access to restricted traffic areas, reserved parking lots, etc.);
- Promotion of the use of methane and LPG;
- Creation of the regional rail and metro network for passengers with new lines and modernization and upgrading of the existing ones;
- Renovation of the bus fleet;
- Agreement with truck companies to promote the voluntary renovation of the fleet;
- Renovation of the fleet of the local authorities;
- Increase the low emission zones;
- Enhance the "bike sharing" services and create a cycling system at the supra-municipal level;
- Strengthening of the railway line, for the transport of goods, towards the major regional industrial centers.

3) Industry

- Promotion of the use of biomass in industrial plants;
- Application of the best available techniques;
- Higher surveillance of industrial sources.

4) General

- Reduction of the ammonia emissions in the agriculture.

6. SELECTION OF MEASURES THAT WILL BE USED IN THE TOOL

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 LIFE Index-Air project highlights the need to develop targeted control measures in the future in order to achieve further reductions of particulate matter and their metal content concentrations in the air.

The LIFE Index-Air project has identified three general emission sources 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 as described above, a set of control measures has been developed and provided as guidelines for the preparation of a National Air Quality Plan.

In the following we summarize possible general measures which can be applied for the reduction of particulate matter and their metal content in air in European urban areas:

1) Reduction of vehicular traffic emissions for both PM and precursor gasses. Specific reduction targets to defined from local authorities. This can be combined with promotion of public transport, walking and cycling. For example, the LEZ option demands the installation of new signage and the operationalization of surveillance.
2) Reduction of emissions of non-road mobile emission sources (e.g. construction machines, vessel, railway) during pollution episodes.
3) Reduction of road dust using specific measures (e.g. street cleaning).
4) Targeted reductions in industrial emissions in urban agglomerations and bans of high emitters for specific time periods. This can be combined application of best available techniques.
5) Reduction on wood burning emissions. Reconversion of fireplaces and reduction of PM emissions.

A careful analysis of possible measures to be incorporated in the LIFE Index-Air Tool resulted in the following specific measures:

1. Transport

1.1 Change in the % of vehicles considering:

- the fuel

- Diesel
- Gasoline
- Electric

- Vehicle emission standard

- EURO 1
- EURO 2
- EURO 3

- EURO 4
- EURO 5
- EURO 6

1.2 Implementation of road wash

1.3 Change in number of ships that enter in the city

2. Biomass burning

2.1 Change in the % of open fireplaces

3. Industry

3.1 Change in the % of implementation of clean technologies

4. Time activity pattern

4.1 Change in the time activity pattern

5. Infiltration

5.1 Change in the infiltration

The LIFE Index-Air tool will be further used to assess the effectiveness of the proposed measures. This will lead to prioritization of measures in different activity sectors. The use of the Tool is recommended in conjunction with air quality monitoring for the evaluation of the success of the proposed measures and Tool validation proposes.

Public authorities can also promote non-technical measures including technologies (e.g. building thermal insulation coats and behavioral actions (e.g. environmental education). An integrated assessment and cost-benefit analysis has to be applied for achieving the best solution for reduction of PM levels in urban areas. This will include scenario analysis/optimization and cost-effectiveness analysis.

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