



İSTANBUL
METROPOLITAN MUNICIPALITY

İstanbul Air Quality Strategy



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www.universiteliler.com.tr
Tel: +90 232 388 8686
Fax: +90 232 343 5933

foreword

Air pollution is a major environmental problem affecting developed and developing countries around the world. Increasing amounts of various harmful gases and particles are emitted from different pollutant sources into the atmosphere, resulting in damage to human health and the environment. Damage to buildings and structures; agricultural crops, vegetation and forests; reduced visibility; and increasing global warming are additional environmental impacts of air pollution.

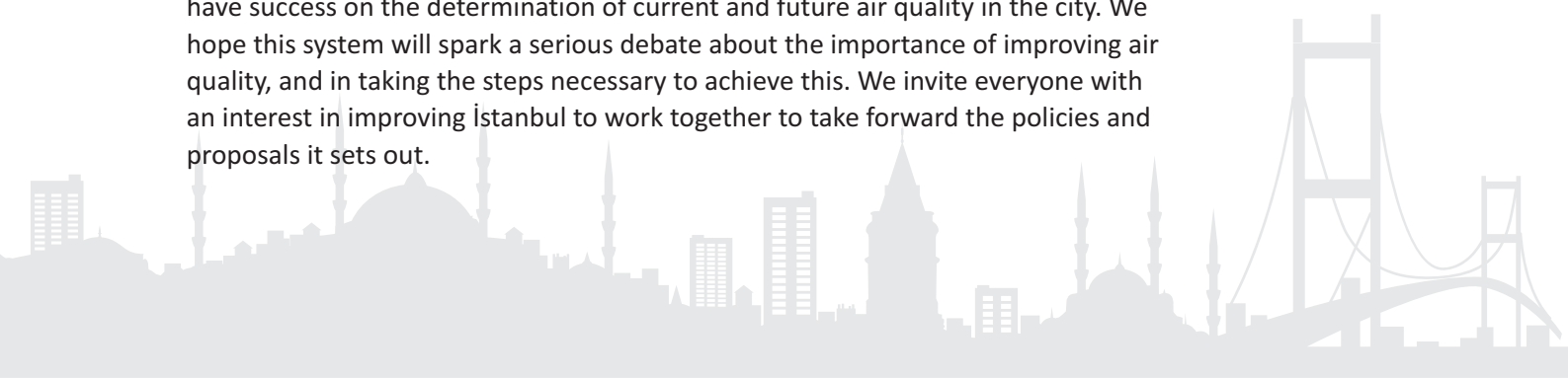
Air quality management is necessary to maintain the quality of air that does not harm human health and welfare in a city. The goal of air quality management recognizes that air quality must be maintained at levels that protect human health, but must also provide protection of animals, plants (crops, forests and natural vegetation), ecosystems, historical places (buildings, statues, monuments, etc.). To achieve this goal, policies and strategies should be developed by global and regional/ local authorities.

Governmental policy is the establishment of an air quality management system. Without an appropriate policy framework and adequate legislation, it is difficult to maintain an active or successful air quality management program. A policy framework should contain the policies in the areas of transport, energy, planning, development and the environment.

During the last two or three decades, air quality management in the cities of developed countries has been broadened in scope. However, the emphasis and success of management activities vary. Although considerable progress to improve air quality has been achieved in some large cities of developing countries, many large cities still face very significant challenges for implementing effective action. Also, it is now recognized that urban air pollution can be transported over long distances, affecting the areas outside the local and national boundaries.

Policy makers require access to available emission data and frequently make use of scenario type manipulations of such data to study possible changes in air quality in the future. In many cases they also want to assess contributions of different sources or source groups to ambient concentrations, both in the present situation and as a consequence of possible future developments as modeled by the scenarios. In cases like this, the availability of a decision support system comprising emission data, scenario manipulations and dispersion modeling is of great help.

A GIS based decision making system has been newly developed for urban air quality management in Istanbul within the scope of a EU LIFE project (LIFE06-TCY/TR/000283). Preparation of a comprehensive emission inventory and air quality modeling are the main themes of this system. This system developed allows us to have success on the determination of current and future air quality in the city. We hope this system will spark a serious debate about the importance of improving air quality, and in taking the steps necessary to achieve this. We invite everyone with an interest in improving Istanbul to work together to take forward the policies and proposals it sets out.



introduction

Located in the center of the Old World, İstanbul is one of the world's great cities famous for its historical monuments and magnificent scenic beauties. It is the only city in the world which spreads over two continents: it lies at a point where Asia and Europe are separated by a narrow strait - the Bosphorus. İstanbul has a history of over 2,500 years, and ever since its establishment on this strategic junction of lands and seas, the city has been a crucial trade center.

İstanbul has been a cultural and economic crossroad between the Black Sea and the Mediterranean and between Europe and Asia, acting as a bridge between the Orient and the trading centers of Europe and the Middle East.

Coming forward with its unique historical accumulation and splendid natural beauties, also successfully undersigning several international events in recent years, İstanbul has been selected as one of the “2010 European Cultural Capitals”.

İstanbul's urban growth has accelerated in relation with changes in national industrial policies from “import substitute” to “export-oriented” and the corresponding liberalization policies and measures put in place in the 1970's, which triggered the industrialization of İstanbul. From then on industry-lead urbanization continuously increased the in-migration and population of İstanbul and expanded its urban areas outward. In the process İstanbul grew from a city of 3.0 million to a mega city of 12,5 million people.



Historical Peninsula and Bosphorus

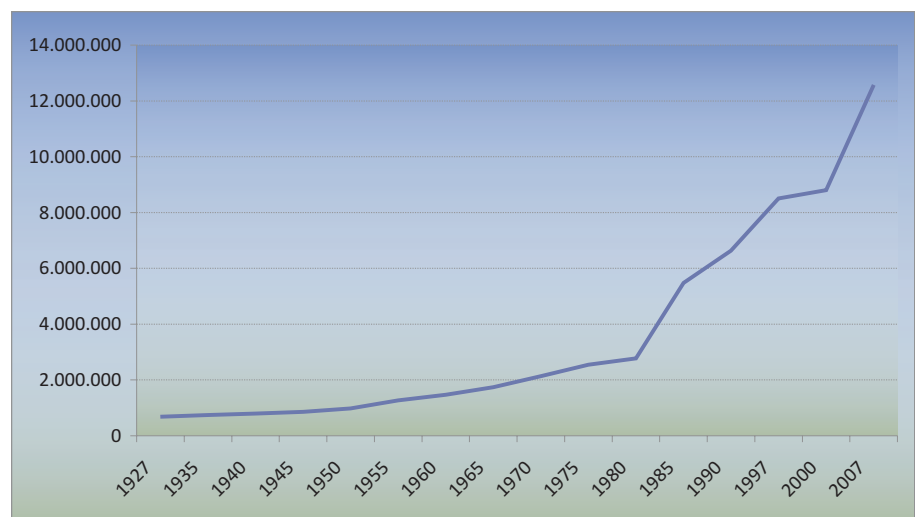


Figure 1 Population growth curve of İstanbul according to years



air quality of İstanbul

Air pollution in İstanbul, one of the most important problems of modern life, became a serious problem in the past, due to rapid population growth, dense immigration, inappropriate place selection for industry, use of poor quality fuel, not giving importance enough to heat isolation, having non-standard burning devices, use of inefficient burning technologies in industry, failing in flue gas treatment, insufficient efforts on reducing traffic emissions, lack of information on environmental issues, in spite of its seriousness, not giving enough importance to the subject.



The air pollution problem experienced in İstanbul has reached to a significant level since 1980's. Similarly, the pollutant concentrations have exceeded the air quality standards for several times.

The air pollution sources can be classified as:

- Residential heating,
- Motor vehicles,
- Industrial plants,
- Others.

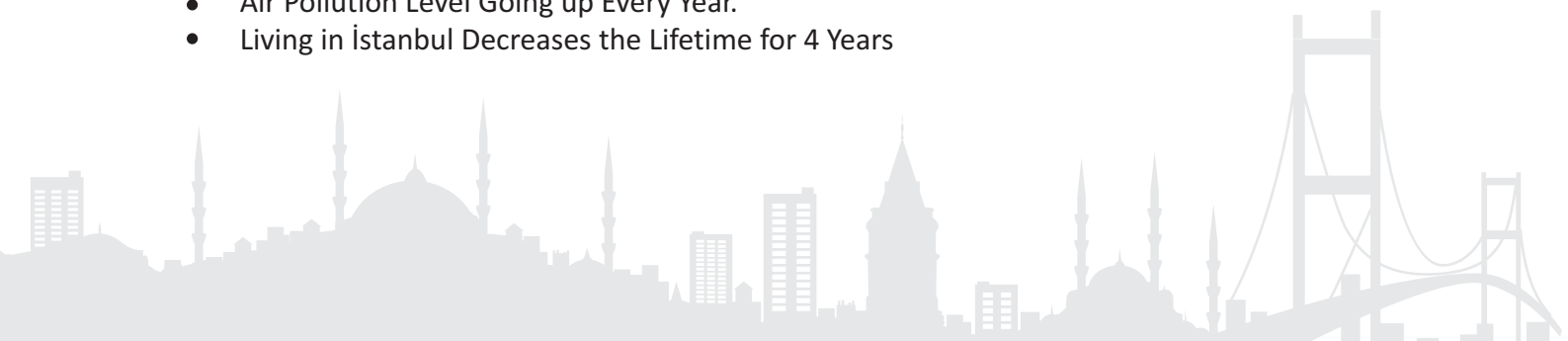
Of these sources, the residential heating contributes to air pollution as a result of the use of poor quality fuels, the buildings without the heat insulation, and due to problems associated with urbanisation.

The great increases in the number of the vehicles has led to the increase in the air pollutants such as CO, HC, NO_x, lead, etc. as well as the traffic congestion problem.

Newspaper headlines in 1990's



- Common Death Risk in İstanbul
- Don't Let Your Kids Go Outside
- Air Pollution Level Going up Every Year.
- Living in İstanbul Decreases the Lifetime for 4 Years



Air pollution has been monitored since 1995 in İstanbul. İstanbul Metropolitan Municipality (İMM) has 11 monitoring stations. It is possible to reach İstanbul's air quality data from our website (<http://www.ibb.gov.tr>).



Figure 2 Air quality monitoring stations in İstanbul

İMM continues its activities briefly for providing high quality fuel (coal, fuel-oil), encouraging the use of natural gas, improvement of burning devices (stoves and furnaces) and systems, implementing heat insulation in buildings, monitoring and controlling of emissions from different sources, improvement of public transportation, using renewable and efficient energy systems, increasing of green spaces, rising the public awareness and by urban planning.

Consequently, as a result of significant efforts of İstanbul Metropolitan Municipality on air pollution, remarkable improvements recorded on city's air quality.



Rate of decrease in SO₂ concentration is shown in Figure 3.

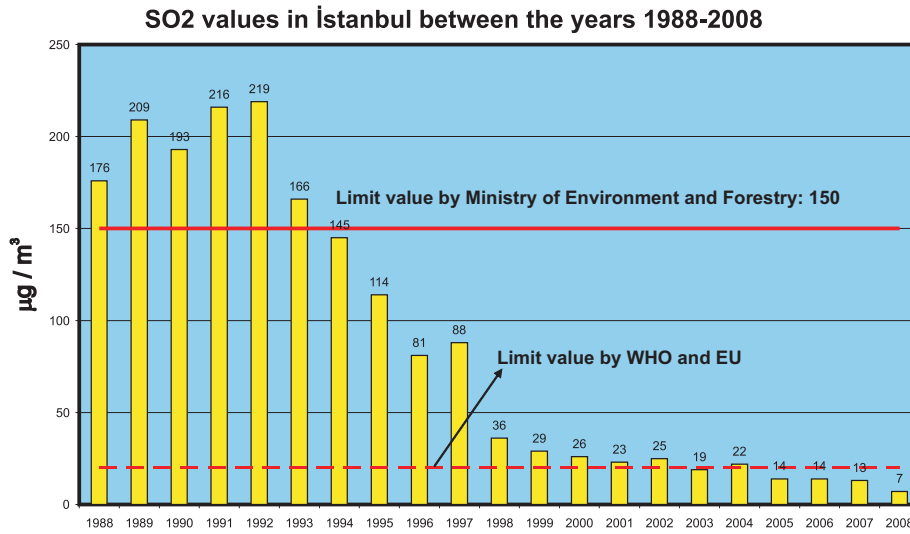


Figure 3 Sulfur dioxide values in İstanbul between the years 1988-2008

Since 2004, sulfur dioxide concentrations have decreased to a requested level; a daily limit value of 125 µg/m³ and the annual limit value of 20 µg/m³ of European Union Frameworks has never been exceeded. Particulate matter concentrations have also decreased to a certain level and have not exceeded the national limit values. However, other parameters also cause air pollution and various projects related to these parameters are already implemented.

2.7 million vehicles are registered in İstanbul currently and everyday 600 more new vehicles are joining to the fleet. Number of motor vehicles has increased by 8.2 times while population has increased 2.5 times in the last three decades.

In the year 2007, İstanbul Metropolitan Municipality performed a project on determination of emissions from traffic with EMBARQ-Istanbul as a partner. That project was carried out by Department of Environmental Protection and Development and the following issues were studied;

The sources and levels of air pollutants related to transportation were determined which is a crucial information in development of İstanbul air quality.



Vehicle Emissions Inventory Campaign





An European Union project has been implemented in a partnership of İstanbul Metropolitan Municipality and Dokuz Eylül University since 2006, called “A GIS Based Decision Support System for Urban Air Quality Management in the City of İstanbul (LIFE06-TCY/TR/000283)” in the scope of European Union LIFE Program. This project aimed to develop a decision support system for urban air quality management for the city of İstanbul. Preparation of emission inventory and air quality modeling are the main components of the system developed. This brochure is created as a result of this project.

To determine the air pollutant emissions from major pollutant sources, a local emission inventory was prepared with 1-hour temporal and 1-km spatial resolution within an area of 170 km by 85 km centered at the metropolitan area of İstanbul. In a systematic way, the emission sources are broadly categorized as point, line and area sources, covering industrial, vehicular and domestic sources respectively. Five major pollutants consisting of particulate matter (PM₁₀), sulfur dioxide (SO₂), carbon monoxide (CO), non-methane volatile organic compounds (NMVOCs) and nitrogen oxides (NO_x) emitted through these sources were identified.

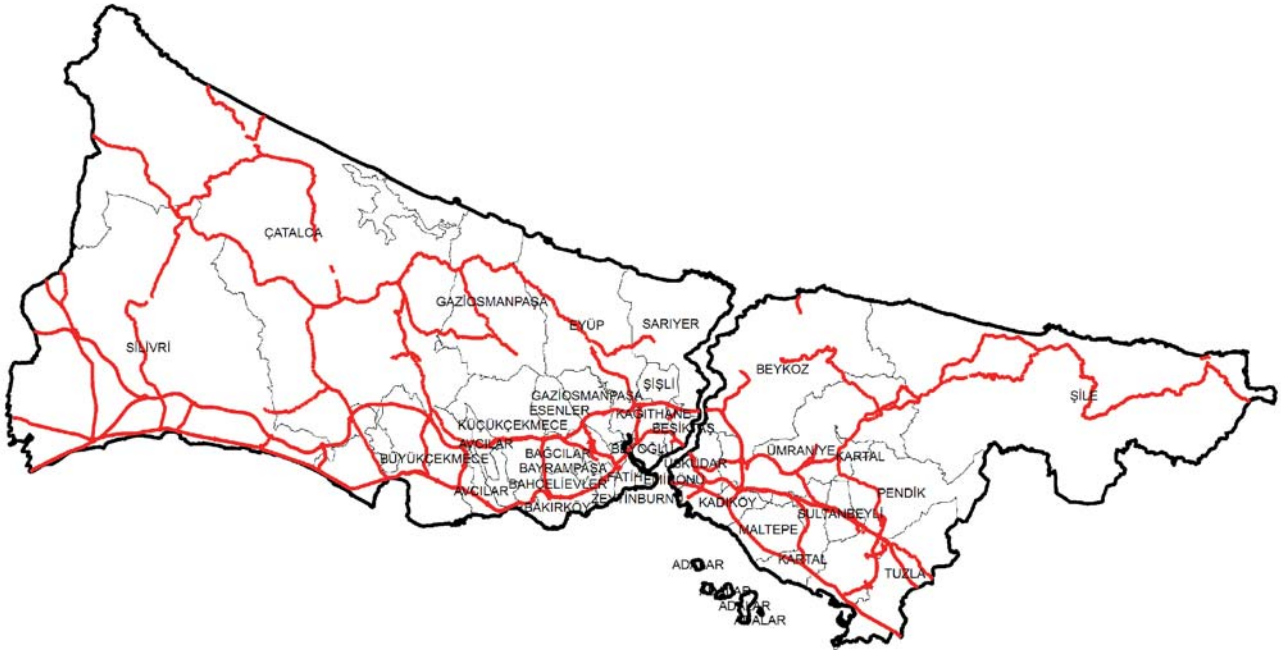


Figure 5 A guide map of İstanbul



Industry is the most polluting sector for SO_2 contributing to about 83% of total emissions while domestic heating is the most polluting sector for PM_{10} contributing to 51% of total emissions. Traffic is also the most polluting sector for NO_x and CO emissions with the contributions of 89% and 68%, respectively, in the study area.

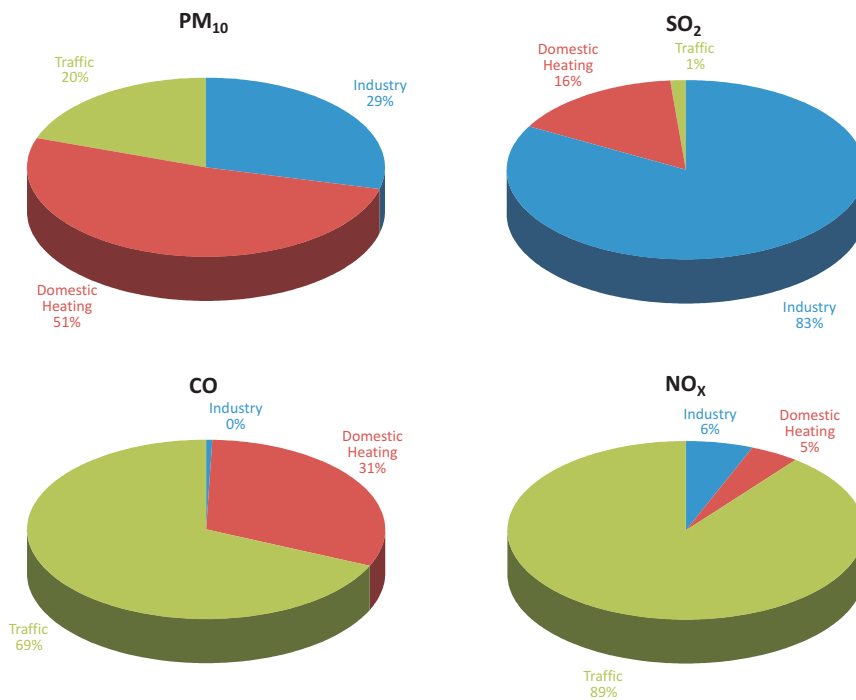


Figure 4 Contribution of each source category to total pollutant emissions

Figures 6-8 illustrate the geographical distribution of total emissions from all source categories together for SO_2 , PM_{10} and NO_x . Figures 9-11 illustrate levels of SO_2 , PM_{10} and NO_x in Istanbul's air in 2007.



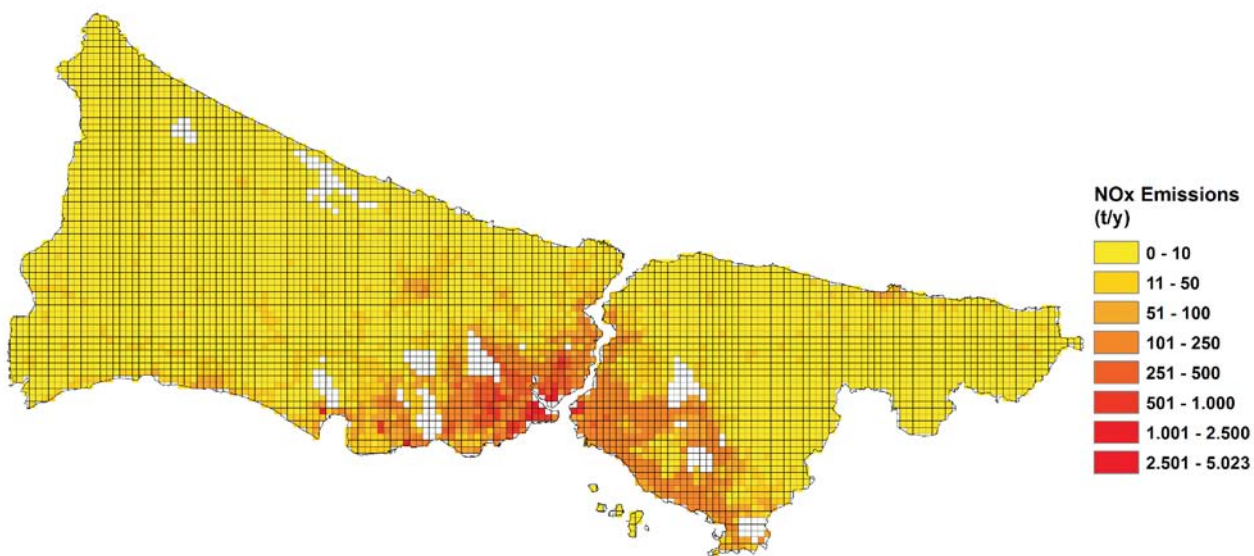


Figure 6 Distribution of annual NO_x emissions from all sources in 2007

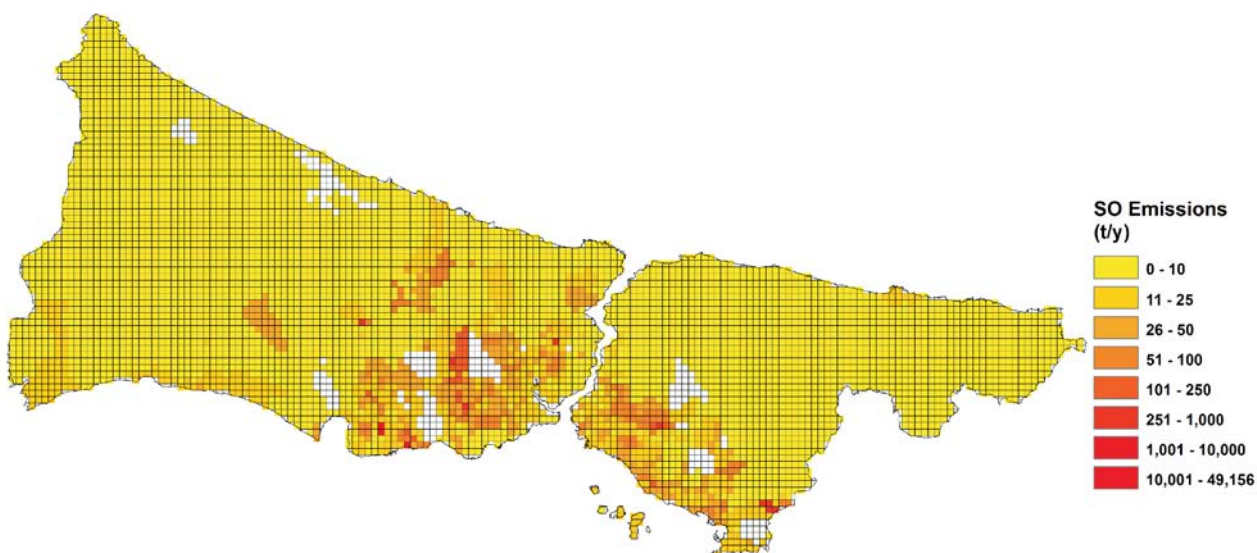


Figure 7 Distribution of annual SO₂ emissions from all sources in 2007

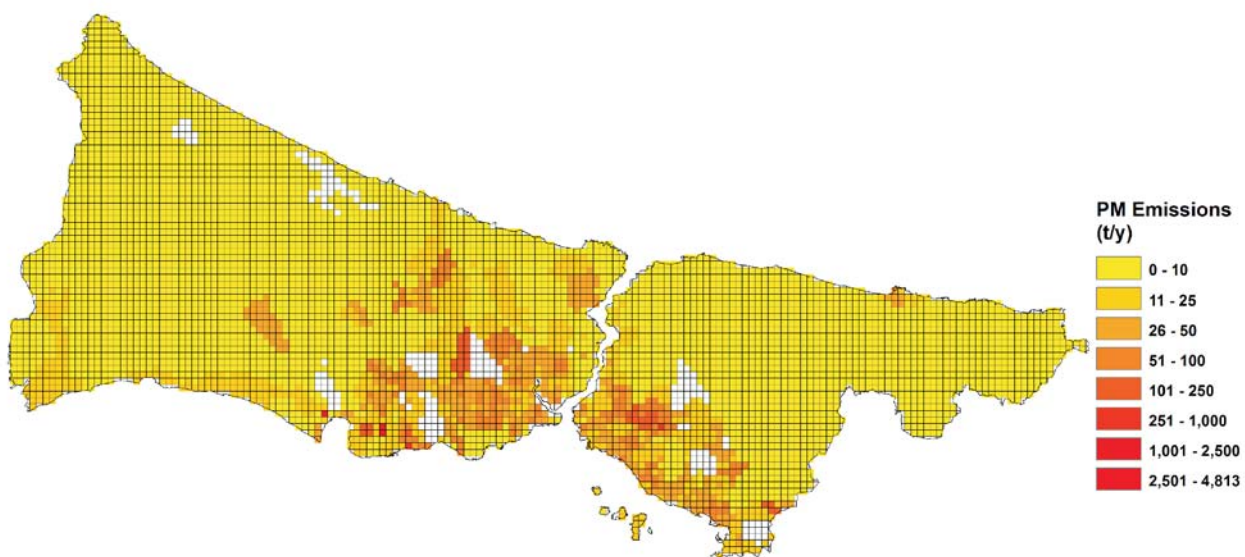


Figure 8 Distribution of annual PM₁₀ emissions from all sources in 2007



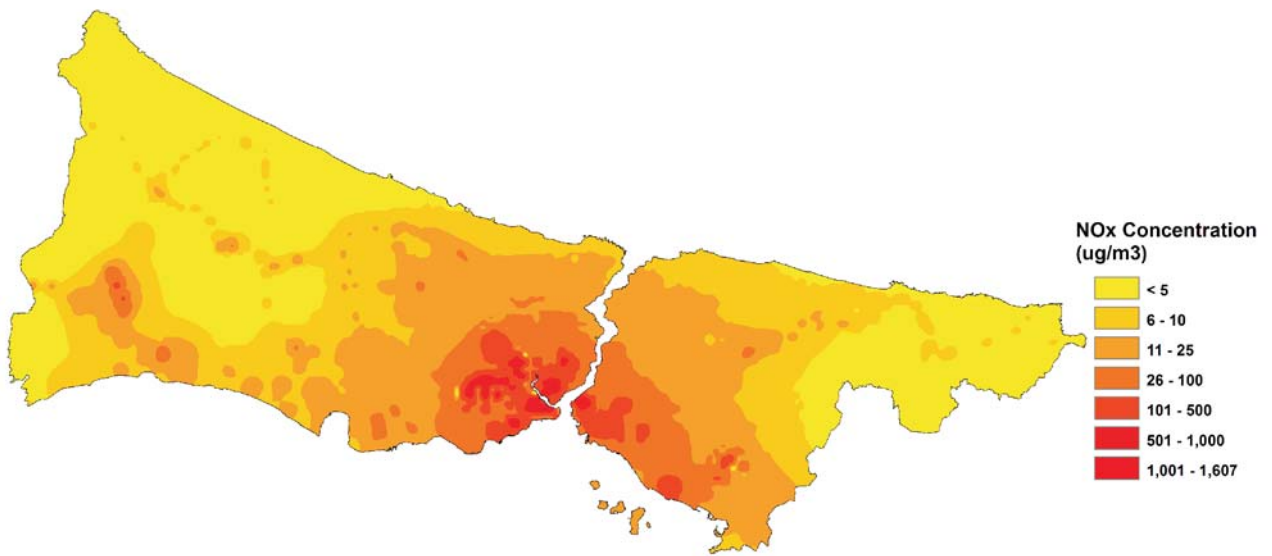


Figure 9 Modelled 2007 annual mean NO_x levels (in µg/m³)

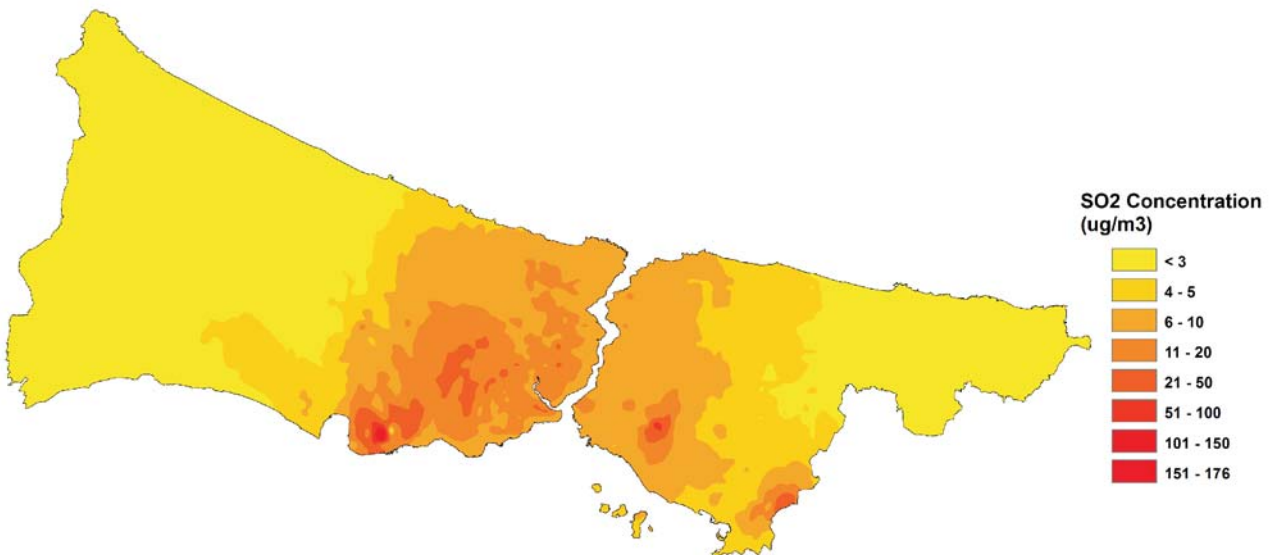


Figure 10 Modelled 2007 annual mean SO₂ levels (in µg/m³)

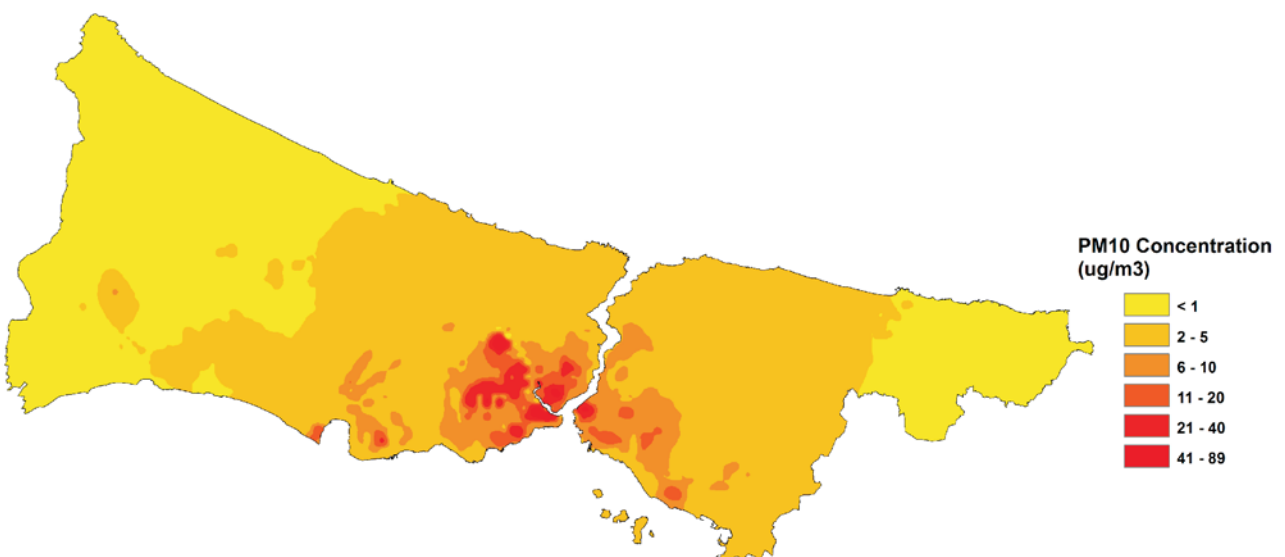


Figure 11 Modelled 2007 annual mean PM₁₀ levels (in µg/m³)



action plans

Vehicle Emission Reduction

- **Raising awareness about the environmentally friendly driving techniques.**

As well as fuel characteristics, exhaust emissions also originated from improper driving techniques. Green driving tips such as; planning and consolidating trips, keeping cars well maintained, avoiding topping-off the gas when refueling, keeping tires properly inflated, repairing air conditioning, accelerating smoothly, avoiding excess idling in non traffic situations and maintaining steady speed will be promoted for emission reduction.

- **Using filter and catalytic converter systems for exhaust emission control on vehicles.**

Convenient filter systems substantially contribute to the reduction of exhaust emissions. Especially for vehicles which are in traffic all day long, (e.g. public transportation busses, taxis) filter appliance is crucial for emission reduction.

- **Reducing pollution through the use of environmentally acceptable vehicles and fuels in public transportation.**

More efficient use of energy, use of less-polluting fossil fuels, increased use of non- fossil energy sources, use of newer and environmentally more benign combustion technologies will led to emission reduction from vehicles and will be promoted especially to achieve national air quality objective for NO₂ .

- **Promoting alternative and more sustainable modes of transport to the cars.**

In heavy traffic areas, rapid bus transit systems (metrobus) which have their own lanes and metro systems should promote in order to attract people's attention. Besides, public transportation systems' quality should be improved by the means of using comfortable and safer vehicles, and ensuring not exceeding passenger capacities.

- **Improving and popularizing the marine transportation.**

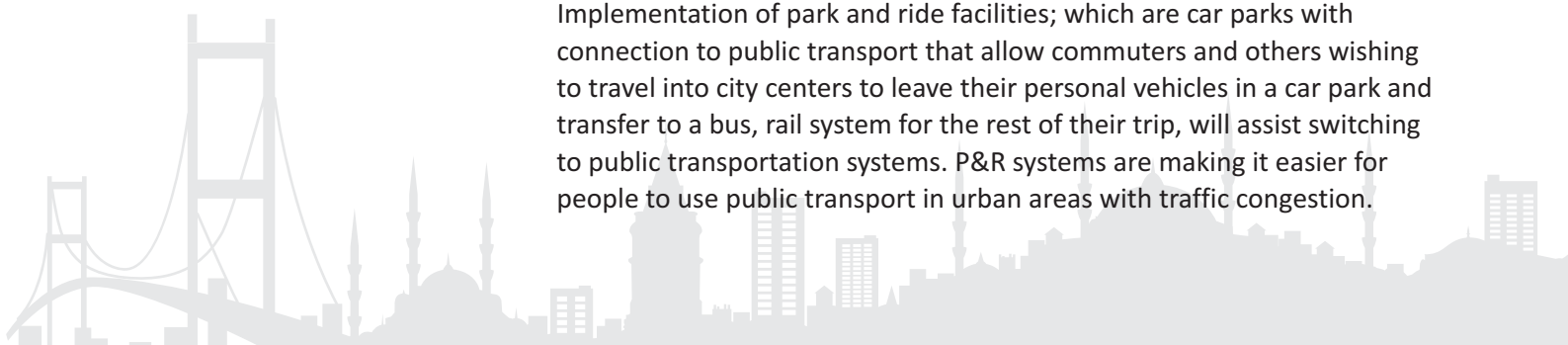
In cities which have a possibility of marine transport like İstanbul, this transportation type must be encouraged. The navigation and seaport numbers of hydrofoils (like IDO-Istanbul Hydrofoils) must be increased and especially alongshore marine transportation must be provided.

- **Promoting the implementation of Park and Ride applications.**

Implementation of park and ride facilities; which are car parks with connection to public transport that allow commuters and others wishing to travel into city centers to leave their personal vehicles in a car park and transfer to a bus, rail system for the rest of their trip, will assist switching to public transportation systems. P&R systems are making it easier for people to use public transport in urban areas with traffic congestion.



Metrobus in İstanbul



- **Application of traffic congestion charge.**
Payoff obligation must be organized for the areas that have heavy traffic for deterrent effect to achieve the reduction in the number of vehicles.
- **Improving the substantial transportation infrastructure.**
Signal optimization studies must be done on intersections, tunnels and bridges for convenience in traffic.



Traffic jam in İstanbul

Industrial Emission Reduction

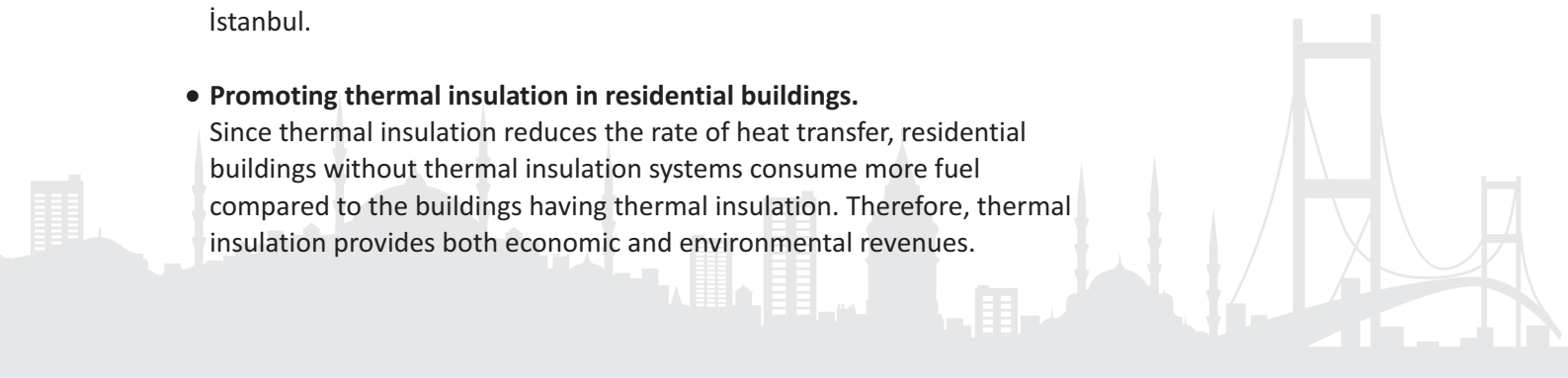
- **Industrial site selection considering wind direction.**
Site selection for industries should be out of residential areas and made by considering the pre dominant wind directions and the location of residential areas.
- **Using environment friendly fuels.**
Maximize the fuel efficiency and the use of eco-friendly fuels to conserve energy and reduce emissions.
- **Industrial source contribution to air quality.**
Contribution of each industrial source to local and regional air quality must be quantified and the required control equipment should be selected.
- **The effects of neighbouring regions on air quality.**
Transport of air pollutants (including air toxics) from neighbouring regions such as Dilovasi and Corlu to İstanbul should be quantified using the required air quality models.
- **Promoting new technologies in industries.**
Although, investment costs of new technologies are higher than the old ones, they are economic and eco-friendly technologies by the means of operation.
- **Online monitoring of emissions from industrial stacks.**
Continuous online monitoring of emissions from large industrial stacks is essential to to ensure compliance with limit values.



Organized Industrial Zones in Tuzla

Household Emission Reduction

- **Encouraging the use of natural gas in all parts of İstanbul.**
Natural gas cause less pollutant emissions than the other fossil fuels. Therefore common use of natural gas will improve the air quality in İstanbul.
- **Promoting thermal insulation in residential buildings.**
Since thermal insulation reduces the rate of heat transfer, residential buildings without thermal insulation systems consume more fuel compared to the buildings having thermal insulation. Therefore, thermal insulation provides both economic and environmental revenues.





The Golden Horn

- **Raising awareness about periodic stack cleaning and efficient combustion.**

Stack cleaning is an essential activity for efficient combustion. Education programs must be organized to emphasize the importance of stack cleaning and the techniques of correct combustion.

Other initiatives

- **Raising public's awareness about air quality.**

Partnership with the government, the counties, industries, other organisations and individuals.

- **Increasing green areas.**

Green areas are generally the breathing spaces of cities. Increasing these areas helps to improve city's air quality.

- **Considering air flow corridors while preparing construction plans.**

The front of air flow corridors shouldn't be closed while new buildings are constructed. Therefore, very high buildings shouldn't be placed especially in coastlines.

- **Using the advanced decision support systems for urban and transport planning.**

- **Development of air monitoring network with the new analysers and parameters.**



İstanbul Metropolitan Municipality
Environmental Protection and Control Department

Kemal Paşa Mah. Atatürk Bulvarı No: 162 Saraçhane Eminönü / İstanbul
Phone: +90 212 455 23 85 - 86
www.ibb.gov.tr/airqualistanbul