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„Joint Risk Monitoring during Emergencies in the Danube Area Border“

ROMANIA
BULGARIA

AIR QUALITY IN THE DANUBE BORDER AREA

Summary

ROMANIA - BULGARIA
Cross Border Cooperation Programme

Common borders. Common solutions.

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AIR QUALITY IN THE DANUBE BORDER AREA

CONTENTS

LIST OF ABBREVIATIONS

AIRNET	Thematic Network on Air Pollution and Health
NEPA	National Environmental Protection Agency
APHEIS	Air Pollution and Health: a European Information System
AQ	Air Quality
AQD	Air Quality Directive
AQG	Air Quality Guidelines
BAT	Best available technology/techniques
BDSit	Database of sites
BREF	Reference documents on best available techniques
CAFE	Clean Air For Europe
CBC	Cross Border Cooperation
CCE	Co-ordination Centre for Effects
CDM	Clean Development Mechanism
CE	Council of Europe
CECA	Air Quality Evaluation Center – Romania
CER	Certified Emission Reduction unit
CLRTAP	Convention on Long Range Transboundary Air Pollution
CM	Council of Ministers – Bulgaria
CMA	Maximum allowable concentration
COMEAP	Committee on the Medical Effects of Air Pollutants, UK
COP	Conference of the Parties
CORINAIR	CORe INventory AIR emissions European Union (EU) emission inventory programme
CRF	Common Reporting Format
DCA	Air Quality Division
ECAIP	Environmental Cost Assessment and Investment Plan Development
ECCP	European Climate Change Programme
EEA	European Environment Agency
EEC	European Economic Community
EIA	Environmental Impact Assessment

Eionet	European Environment Information and Observation Network
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
EPER	The European Pollutant Emission Register
E-PRTR	European Pollutant Release and Transfer Register
ESD	Education for Sustainable Development
ExEA	Environmental Executive Agency in Bulgaria
EU	European Union
EUA	Allowance Unit of one tonne of CO_2
EU-ETS	European Union Emissions Trading Scheme
GEF	Global Environmental Facility
Gg	Gigagram
GHG	Greenhouse Gas
GIS	Green Investment Scheme
GMES	Global Monitoring for Environment and Security
GNM	National Environmental Guard
IET	International Emissions Trading
IMCCC	Inter-Ministerial Committee on Climate Change
IMPEL	European Network for the Implementation and Enforcement of Environmental Law
IPCC	Inter-governmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
IT	Information Threshold
JI	Joint Implementation projects
LDE	Derived Emission Limits
LULUFC	Land Use/Land Use Change and Forestry
MMP	Ministry of Environment and Forests - Romania
MoEW	Ministry of Environment and Water – Bulgaria
MS	Member States
NAARE	The National Alert / Alarm for radioactivity environment
NAMSIQA	National Assessment and Management System Integrated Quality Air
NAPCC	National Action Plan on Climate Change
NAPEP	National Action Plan for Environmental Protection

NAQM	The National Air Quality Monitoring
NIEAP	National Inventory of emissions of air pollutants)
NIR	National Inventory Report
NNMAQ	National Network for Monitoring Air Quality
ODS	Substances that Deplete the Ozone
PEC	Primary Energy Consumption
PEP	The Pan-European transport, environment and health
IT	Information Threshold
POPs	Persistent Organic Pollutants
RIEW	Regional Inspectorates of Environment and Water
SEA	Strategic environmental assessment
SEIS	Shared Environmental Information System
SNAP	Selected Nomenclature for sources of Air Pollution
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organisation

POLLUTANTS

Greenhouse Gases

CH4 - Methane

CO2 - Carbon dioxide

HFC_S - Hydrofluorocarbons

N_2O - Nitrous oxide

PFC_S - Perfluorocarbons

SF_6 - Sulfur hexafluoride

Other Gases

CO - Carbon monoxide

NH3 - Ammonia

NMVOC - Non-methane volatile organic compounds

NO_X - Oxides of nitrogen

SO_X - Oxides of sulfur

PM10 - particulate matter with aerodynamic diameter of 10 mm, passing through a hole the size selective, with a separation efficiency of 50%;

PM2,5 - particulate matter with aerodynamic diameter of 2.5 mm, passing through a hole the size selective, with a separation efficiency of 50%;

GLOSSARY OF TERMS IN AIR QUALITY FIELD

A

Aarhus convention- UNECE convention on access to information, public participation in decisions-making and access to justice in environmental matters, signed by European Community on 25 June 1998;

agglomeration – area with a population which exceeds 250,000 inhabitants or area in which the population is equal to or lower than 250,000 inhabitants, but in which the population density per km^2 justifies the necessity of assessing and managing the environmental air quality;

air quality modeling – use of mathematical representations of physical and chemical processes in atmosphere with a view to estimating quantitatively the atmospheric pollutant dispersion and impact;

alert threshold – level above which there is a risk for human health as a result of a short time exposure, and against which immediate measures should be taken, according to the laws in force;

area – part of the national territory delimited for assessing and managing the air quality, approved by Government;

assessment – any method used for measuring, calculating, by mathematical modeling inclusively, forecasting or estimating the level of a pollutant in environmental air;

atmosphere – mass of air which surrounds the Earth surface, including the protective layer of ozone;

available technique – that technique developed at a scale which allows its implementation in the important industrial sector, under economically and technically viable conditions, taking into account the costs and advantages, no matter if the technique is used or produced in Romania or not , as long as the technique is reasonably accessible to the user;

B

BREF – reference document regarding the best available techniques: documents adopted by European Commission which describe the best available techniques (BAT) for certain industrial sector or many sectors. The competent authorities take these documents in consideration when establishing the operating conditions in the integrated environmental authorizations for the installations to which the Directive 2008/1/CE (IPPC) applies;

best – the most efficient in reaching a high general environmental level;

best available techniques – the most advanced and efficient stage of development recorded in developing an activity and modes of exploitation, which demonstrates the practical possibility of constituting the reference for setting the emission limit values for preventing the pollution, and if this is not possible, for reducing the overall emissions and their impact on the environment as a whole;

biomass – biodegradable part of the products, waste and residues from agriculture, including vegetal and animal substances, forestry and related industries, also the biodegradable part of industrial and urban waste.
Within the energy context, biomass is a compound partially or entirely composed of an agricultural or forestry vegetable matter, usable as fuel for recovering the energy content, also the following waste used as fuel: vegetable, agricultural or forestry waste, vegetable waste from the industrial sector of food processing, if the thermal energy resulted from the burning process is harnessed, fibrous vegetable waste from the production of natural cellulose paste and from the production of paper manufactured from cellulose paste, if these are incinerated at the manufacturing place and if the energy produced by the incineration plant is harnessed, cork waste, wood waste, excepting those which could contain halogenated organic compounds or heavy metals;

by-product – a substance or object which results from a production process which is not the main objective;

C

CAS number – a serial number from the international standard of registration and identification for chemical elements, bio-sequences, alloys or polymers developed by Chemical Abstracts Service (CAS) register, for clearly identifying a chemical or molecular structure when there are many possible generic names. The second column from the Annex II to E-PRTR Regulation indicates CAS number for each pollutant, if available;

capacity threshold or capacity limit – limits established in Annex I, applied on the nominal capacity of the installations which perform activities within some activity categories from E-PRTR Regulation. The exceedance of this threshold is the first condition which favors the possible registration in E-PRTR Register;

certificate of greenhouse gas emissions – title which confers the right to emit a ton of carbon dioxide equivalent in a defined period;

climatic changes – long-term changes of temperature, precipitations, wind and other aspects of Earth's climate. The Convention on Climate Changes at UN level defines "Climate changes which are attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"

competent authority – national authority or authorities or any other competent body or bodies designated by the Member States;

critical load – maximum exposure of ecosystems to one or many pollutants without any significant harmful effect;

D

data capture – ratio between the time period when the monitoring tool produces valid data and the time period for which the statistical parameter or the aggregate value is calculated;

data quality objectives – criteria for establishing the accuracy of measurements and assessment method, developed for getting a proper assessment of air quality;

diffuse sources – many small or dispersed sources from which pollutants may be emitted in air, water or soil, whose combined impact on these environmental components could be significant, and for which it is inefficient to collect reports from each individual source. (Regulation no. 166/2006)

E

ecosystem – unit for ecosphere operation and organization, made of biotope and biocoenosis, capable of biological productivity. The ecosystem contains also the relations between biotope and biocoenosis;

EEA – abbreviated name for European Environmental Agency. This is an agency of the European Union. Its main task is to provide independent and reliable environmental information. The agency is the major information source for those ones involved in developing, adopting, implementing and assessing the environmental strategy, also for public. At present, EEA contains 32 Member States. The Regulation establishing EEA was adopted by European Union in 1990. It was implemented at the end of 1993, soon after being decided the establishment of EEA headquarters at Copenhagen. The activity actually began in 1994. The Regulation organized also the European Environment Information and Observation Network (Eionet).
The main clients are the European Union institutions, European Commission, European Parliament, European Council and Member States. Besides this central group of European political actors, we offer services to other EU institutions, like the Economic and Social Committee and Committee of the Regions;

emission – introduction of environment pollutants as a result of any human activity, deliberately or accidentally, under usual or unusual conditions, including the overflow, emission, discharge, injection, removal or evacuation by means of the sewerage systems without the final treatment of wastewater;

emission factor – average estimated amount of a pollutant released from a given source related to an activity. Emission factors are used for calculating the amounts of pollutants emitted in E-PRTR, when the measurement methods were not implemented. More details may be found in the E-PRTR Guide Document;

emission limit values – concentration or mass of the pollutant substances in the emissions coming from sources along a specified period, whose exceedance is not allowed;

environmental air – troposphere air, excluding that one from the working places;

EPER – abbreviated name of the European Pollutant Emission Register. It is the first European Register for the public, containing industrial emissions in air and water. At present, it is replaced by the new register E-PRTR. The public may visit EPER at the address http://eper.ec.europa.eu

F

fossil fuels - hydrocarbons, coal, oil or gas, formed of the fossilized remains of dead animals and plants;

fugitive emissions - unguided emissions, released in environment by windows, doors and other openings, ventilation or opening systems, which normally do not belong to the category of the guided pollution sources;

G

greenhouse effect –process of heating a planet due to the radiation reflected by it which, if some greenhouse gas is present in atmosphere, will have a significant part reflected back to the surface;

greenhouse gases (GHG) – gaseous constituents of the atmosphere, both natural and anthropogenic, which absorb and emit infrared radiation and are responsible for the phenomenon called “climatic changes” ;

H

hazardous waste - any substance or object as it is defined in Art. 1(4) of the Directive 91/689/CEE ;

I

incineration plant – any fixed or mobile technical installation and the equipment intended for thermal treatment of waste, with or without the recovery of the resulting combustion heat. It includes incineration by waste oxidation, also pyrolysis, gasification or other thermal treatment processes, like plasma processes, as far as the products resulting after treatment are incinerated subsequently. This term has a juridical definition in Directive 2000/76/CE on waste incineration.

indicative measurements- measurements performed by means of some alternative methods which complete the information got from measurements in fixed points;

industrial complex – one or many installations on the same location, which are operated by the same person or entity;

information threshold – level beyond which there is a risk for human health after a short time exposure of some sensitive segments of population, so as when reaching it the communication of updated information is necessary;

installation – defined according to E-PRTR Regulation, as a technical stationary unit in which one or many activities listed in Annex I are performed, also any other directly associated activities having a technical connection with the activities performed in that location and which could have an effect on emission and pollution;

IPPC – abbreviation of the expression „ integrated pollution prevention and control”, used with reference to Directive 2008/1/CE on integrated pollution prevention and control. Some of the activities performed on E-PRTR location are found in the Annex to this Directive, the connection between them being done by the IPPC code;

L

level – concentration of a pollutant in environmental air or its deposit on surfaces for a given period;

limit value – level fixed on the basis of scientific knowledge, for avoiding, preventing or reducing the harmful effects on human health or environment, reached in a given period and which must not be exceeded after reaching it;

location – geographical place of the industrial complex;

long-term objective – ozone concentration in atmosphere up to which, according to the present scientific knowledge, the direct adverse effects on human health and/or environment in general are unlikely and which shall be reached, as far as possible, on long term, for assuring the effective protection of human health and environment;

lower assessment threshold – level up to which the assessment can be exclusively based on modeling and other estimation methods;

M

margin of tolerance – percentage of the limit value by which it may be exceeded, under the conditions specified by the laws in force;

measurements in fixed points – measurements performed in accordance with the provisions contained in Chapter III, Section 1 of the *Normative on establishing the limit values, threshold values, criteria and assessment methods for sulphur dioxide, nitrogen dioxide and nitrogen oxides, particulate matter (PM10 and PM2.5), lead, benzene, carbon monoxide and ozone from environmental air;*

minimum covered time – percentage of the period taken into account for establishing the threshold value for which the concentration of pollutant in environmental air is measured;

mobile sources of pollution – road, railway, shipment and air transportation means, non road mobile equipment fitted out with internal combustion engines;

modeling techniques – different mathematical approaches for representing the physical and chemical processes in atmosphere and the procedures for applying these formulations, together with the necessary input data, in performing the air quality modeling;

municipal waste – waste coming from households, also other waste similar to household waste;

N

NACE code – standard system for economic activity classification, consisting in a 4-digit code;

nitrogen oxides – means the sum of the nitrogen oxide and nitrogen dioxide concentrations, measured in parts per billion (ppb), expressed as nitrogen dioxide per cubic meter;

non methane volatile organic compounds (NMVOC) – all organic compounds, other than methane, coming from anthropogenic and biotic sources, which may produce photochemical oxidants by a reaction with nitrogen oxides, under the presence of sunlight;

NOSE-P code – standard nomenclature for the sources used in the old European Pollutant Emission Register (EPER).

O

objective estimation – it means estimation on the basis of some well defined methods, with a known uncertainty level;

operator – any person or entity which operates or has the control of the industrial complex, as it is provided in national laws, or which has been invested with economic power decisive on the technical operation of the industrial complex;

ozone precursor substances – substances contributing, in the presence of sunlight, to the formation of ground level ozone;

P

pollutant – substance or group of substances which could be dangerous for environment of human health, due to its properties and its introduction in environment;

PRTR protocol – abbreviated name for the Protocol on Pollutant Release and Transfer Register, adopted at Kiev on 21 May 2003 and signed by Romania at Kiev on 21 May 2003, at the Convention on access to information, public participation in decisions-making and access to justice in environmental matters, signed at Aarhus on 25 June 1998, ratified by Lay no. 86/2000, published in Official Gazette of Romania, Part I, no. 224 from 22 May 2000. According to Art. 1 "The objective of this Protocol is to enhance public access to information through the establishment of coherent, integrated, nationwide pollutant release and transfer registers (PRTRs) in accordance with the provisions of this Protocol, which could facilitate public participation in environmental decision-making as well as contribute to the prevention and reduction of pollution of the environment";

PM10 – suspended particulate matter with aerodynamic diameter of 10 µm, which passes through an aperture with selection according to dimensions, with a separation efficiency of 50%;

PM2.5 - suspended particulate matter with aerodynamic diameter of 2.5 µm, which passes through an aperture with selection according to dimensions, with a separation efficiency of 50%;

public – one or more persons or entities and, in accordance with the national laws or practice, the associations, organizations or groups of them;

R

reporting year – calendar year for which the data on pollutant emissions and transfers outside the location shall be collected;

S

spatial resolution – geographical distribution and density of information and/or data;

substance – any chemical element and its compounds, excepting the radioactive substances;

T

target value – level of ozone concentration in environmental air, fixed for avoiding on long term the harmful effects on human health and/or environment in general, which shall be reached, as far as possible, in a certain time period;

techniques – include both the used technology and the way in which the installation is designed, built, maintained, operated or decommissioned;

threshold for emissions – quantitative limit set for each pollutant which could be found in each of the three environments: air, water, soil. This limit is expressed in kg/year. If the total annual amount of a pollutant produced on a location and released from all sources in any of the 2 environments – air or water- exceeded the corresponding limit established in Annex II of the Regulation no.166/2006 , then that industrial complex will be registered in the E-PRTR Register with that emission;

threshold values – values being the alert threshold levels which, once exceeded, determine the competent authorities to take measures, according to the laws in force;

U

upper assessment threshold – in the assessment procedure, the level up to which measurements and models can be used in combination, and beyond which the measurements in fixed points are compulsory;

W

waste –any substance or object as it is defined in Art.1(a) of the Council Directive 75/442/CEE from 15 July1975 regarding waste ;

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CHAPTER 1

ENVIRONMENTAL POLICY

1.1. EU environmental policy

EU environmental policy appeared as a separate field of the community concern in **1972**, fostered by a conference of United Nations on the environment, held the same year in Stockholm.

In **1981**, within the European Community, the Directorate-General for the Environment was set up, unit responsible for preparing and assuring the implementation of environmental policies and, at the same time, initiator of the legislative acts in the field. So, the environmental policy became more and more complex and closely related to other community policies.

The Single European Act was adopted in **1986** (ratified in 1997) and is a document through which the environment protection got a legal basis within the European Community Treaty (Treaty of Rome, 1957).

In **1997**, the environmental policy became the horizontal policy of the European Union (through Amsterdam Treaty), i.e. the environmental aspects will be necessarily taken into consideration within the sectoral policies.

The first *Environmental Action Programme – EAP* (1973-1977) appeared in **1973,** being followed by the development of other 5 environmental action programmes: EAP 2 (1978-1982), EAP 3(1982 -1986), EAP 4 (1987-1992), EAP 5 (1993 – 1999) and EAP 6 (2001-2010)

1.1.1. Legal basis of EU environmental policy

The legal basis of European Union (EU) environmental policy is formed by the articles 174 - 176 of European Community (EC) Treaty, to which the articles 6 and 95 are added. The objectives of the environmental policy are treated in article 174 which contain its **aim** – ***assurance of a high level of environmental protection taking into account the diversity of situations in the various regions of the Community***. Article 175 identifies the legislative procedures for reaching this aim and establishes the way of making decisions in the field of environmental policy, and Article 176 allows the Member States to adopt more stringent standards. Article 95 has in view the harmonization of the legislation referring to health, environmental protection and consumer protection in Member States and a derogation clause allows them to adopt national legislative provisions for a better environmental protection. Operating in other direction, Article 6 promotes the *sustainable development as transversal policy* of European Union and thus emphasizes the need to integrate the requirements for environmental protection in defining and implementing the sectoral European policies. To these, more than 2000 directives, adopted regulations and decisions which constitute the horizontal legislation and the sectoral legislation in the field of environmental protection are added.

Horizontal legislation contains the regulations on the information transparence and circulation, facilitation of the process of decision making, development of the civil society activity and implication in environmental protection a.s.o. (e.g.: Directive 90/313/EEC on the freedom of access to information on the environment, Regulation 1210/90/CEE on the establishment of the European Environment Agency, etc.).

Sectoral (or vertical) ***legislation*** refers to the sectors which are ***the objectives of environmental policy***, which are: waste management, noise pollution, water pollution, air pollution, nature (natural biodiversity) conservation, soil protection and civil protection (which are found in the plans of actions and in the developed strategies).

1.1.2. Institutional framework of environmental policy

European Union environmental policy is supported by an institutional framework involved in its preparation, definition and implementation, which is in permanent consultation with the governments of the Member States (MS), with different industrial organization, non-governmental organization and reflection groups. By the diverse attributions it has, it contributes to the synergetic character of the environmental policy and assures the achievement of its objectives, both at legislative level and at implementation level.

<u>The main institutional actors</u> are:

- European Commission, Directorate-General for the Environment. The Directorate-General (DG) for the Environment was founded in 1981 and is directly responsible for developing the environmental policy and for assuring its implementation. Its role is to initiate and finalize new legislative acts in the field and to assure that the measures adopted in this way will be implemented by the Member States;

- Council of Environment Ministers is a part of the European Union Council and meets several times a year, in order to coordinate the environmental policies of MS;

- European Parliament, Committee on the Environment, Public Health and Consumer Protection.

Involvement of European Parliament in the environmental policy of European Union occurs by its cooperation with the other institutions and by its involvement in the process of co-decision. In 1973, the Parliament set up an Environment Committee, composed of specialists and responsible for the legislative initiatives on environment protection and consumer protection.

- Economic and Social Committee has a consultative role oin the decision-making process and illustrates the generality of the environmental protection policy;

- Committee of the Regions has also a consultative role and assures the involvement of regional and local authorities in the process of decision making at the community level. The environmental aspects are the responsibility of Commission 4, together with the spatial planning and matters related to urban and energy policy.

- European Environment Agency is based in Copenhagen (Denmark) and is mainly aimed at the collection, processing and delivery of information on environment to the decision makers and public. This is achieved by permanent activities of environment monitoring and by signaling in time the emerging issues. Although is not directly involved in the decision making process, its communications and reports on the environment situation have an essential role in adopting new strategies and environmental protection measures at the community level, and substantiate most of the Commission decisions in this direction. At the same time with the European Environment Agency, the European Environment Information and Observation Network (EIONET), which connects the national information networks of MS, was also set up.

The decisions of the institutional framework involved in the environmental protection policy are taken in accordance with the following principles set by the Article 175 of EC Treaty:

- as a general rule, the decisions are taken by the qualified majority voting and by cooperation with European Parliament (EP);

- for the action programmes, the decision of the quality majority in Council, in co-decision with EP, is observed;

- decisions are unanimously taken in Council and when consulting with EP for the fiscal aspects and measures regarding the territorial planning, soil use and water resource management, also measures affecting the energy policy.

1.1.3. Objectives

The objectives which are the basis of European Union environmental policy are stipulated in Article 174 of EC Treaty. These are:

- environment conservation, protection and quality increase;
- human health protection;
- prudent and rational use of natural resources;
- promotion of measures at international level with view to treating the environmental regional issues and not only.

1.1.4. Principles

EU environmental policy has crystallized by adopting some minimal measures for environment protection, which had in view the pollution mitigation, following that in '90s to pass through a process of horizontalization and to be focused on the identification of their causes, also on the obvious need to take attitude for setting the financial responsibility for the damages caused to the environment. This evolution leads to the delimitation of the following action principles:

- **„The polluter pays" principle**: has in view that the polluter should bear the costs related to the measures for combating the pollution, established by public authorities – in other words, the cost of these measures will be reflected by the production cost for the goods and services which generate the pollution;

- **Preventive action principle**: is based on the general rule that „ it is better to prevent than to combat";

- **Precaution principle**: provides taking precaution measures when an activity threatens to affect the environment or human health, even if a cause-effect relation is not entirely proved scientifically;

- **High environmental protection principle**: provides that EU environmental policy follows to reach a high protection degree;

- Integration principle: provides that the environment protection requirements are present in defining and implementing other community policies;

- Proximity principle: is aimed at encouraging the local communities in assuming responsibilities for waste and produced pollution.

1.1.5. Action programmes

The documents which are the basis of EU environmental policy are the Environmental Action Programmes (EAP), the first being adopted by the European Council in 1972, followed by other five ones.

The sixth Environmental Action Programme (2001-2010), also called „Our choice, our future" is the consequence of the process of global assessment of results in 2000 and establishes the environmental priorities during the present decade. *Four priority areas defining the action directions of environmental policy* were identified as follows:

- Climatic change and global warming – has as objective the reduction of the greenhouse gases by 8% against the level of 1990 (according to Kyoto protocol);

- Nature and biodiversity protection – has as objective the removal of the threats addressed to endangered species and to their life environment in Europe;

- Health against Environment– has as objective to assure an environment which does not have significant impacts on, or risks to, human health;

- Natural resources conservation and waste management – has as objective the increase of waste recycling degree and the prevention of waste production.

EAP 6 provides also the development of 7 thematic strategies corresponding to certain important aspects of environmental protection, like: soil protection, protection and conservation of marine environment, use of pesticides within the context of sustainable development, air pollution, urban environment, waste recycling, resource management and use in prospect of sustainable development. The approach of these strategies is a gradual one, being structured in two phases: the first one, of describing the actual state and identifying the problems; the second one, of presenting the measures proposed for solving these problems. The 7 thematic strategies are:

- Air quality – strategy initiated by the programme „Clean air for Europe" (CAFE), launched in 2001, which is aimed at the development of a set of strategic and integrated recommendations, for combating the adverse effects of air pollution on environment and human health;

- Soil protection – the first step in this direction was made in April 2002, by the publication of a communication of European Commission entitled "Towards a thematic strategy for soil protection"; in this communication, the soil protection problem is for the first time independently treated and the existent problems, also the distinctive functions and features of an environmental policy in this direction, are presented.

- Use of pesticides within the context of sustainable development – strategy which started in June 2002, by the Commission communication: „ Towards a thematic strategy for using the pesticides in the context of sustainable development".

- Protection and conservation of marine environment: this strategy is initiated by the homonymous communication of the Commission (October 2002), aimed at promoting the use of seas within the context of sustainability and the conservation of marine ecosystems, the ocean floor, estuaries and coastal areas inclusively, special attention being given to areas with high degree of biodiversity.

- Waste recycling and prevention – launched in May 2003, this strategy represents the first separate treatment of the aspects of waste recycling and production prevention, and by the related communication the manners of promoting the product recycling (when case may be) are investigated and the most adequate options in terms of cost-efficiency relation are analyzed.

- Urban environment – this strategy has already identified four priority themes in terms of sustainable development, through their influence on the environment evolution in urban space; urban transport, sustainable urban management, field of constructions and urbanism/urban architecture.

- Environment and health (SCALE) – this strategy is the latest strategy in the field and is aimed at the complex and directly causal relation existing between pollution, change of environmental characteristics and human health.

1.1.6. Tools for applying the environmental policy

The evolution of environmental policy and the changes recorded by this in time are reflected not only by its objective and priorities, but also by the number – increasing continuously – of its tools for implementation. Thus, one can speak about the development of three types of tools: legislative, technical and economic-financial, to which a set of “helping tools” responding rather to the new trends and strategies for environment protection are added:

A. ***Legislative tools*** create the legal frame of the community policy for environmental protection and are represented by the legislation existing in this field, i.e. the more than 200 normative acts (directives, regulations and decisions) adopted starting from 1970 (they form the so called community acquis).

B. ***Technical instruments*** assure observing the quality standards on the environment and using the best available technologies. In the category of technical tools the following could be included:

- Standards and limits for emissions etc.;
- Best available technologies (BAT);
- „Eco” denomination (eco-labeling);
- Criteria applicable to environmental inspection in MS.

An important role in implementing the EU environmental policy is played by the *Eco-Management and Audit Scheme –EMAS,* created for improving the environmental performance of European organizations and for supplying information to the public and interested parties. Adhering of organizations to this system is a voluntary one, based on fulfilling some specific criteria; once accepted, these organizations may use EMAS logo in public statements, in the header and in the advertising of their products, services or activities (but they may not apply it on the products or product packaging and may not use it for comparison with other products).

C. ***Financial tools*** *of the environmental policy*

The main tools are represented by the LIFE programme and Cohesion Fund.

LIFE programme was launched in 1992 with the purpose of co-funding the environmental protection projects in EU countries, also in the acceding countries. LIFE is structured in three thematic components: *LIFE - Nature*, *LIFE – Environment* and *LIFE –Third countries,* all the three being aimed at improving the environmental situation, but each of them having specific budget and priorities. The component *Accompanying measures* operates as a sub-category of them and has the role of assisting by materials, studies and information the implementation of the three thematic components, also of funding the dissemination actions and exchange of good practices. All components are subjected to the condition of co-funding by the eligible countries, excepting the component *Accompanying measures* – which benefit from 100% funding from EU.

2. Cohesion Fund

The foundation of the Cohesion Fund was decided by the Maastricht Treaty, this becoming operational in 1994. This fund has the following characteristics:

1. **Limited sphere of action**, from this fund the financial support is going to be only given to the Member States that have a GDP/capita lower than 90% of the community average. It means the support is directed to less prosperous countries taken entirely (Spain, Portugal, Greece and Ireland only);

2. **Financial support is limited** to co-funding the projects in the field of **environmental protection** and development of trans-European transport networks;

3. **Financial support** is given to those **countries that have developed programs** through which the conditions referring to the budget deficit limits are accepted, because it is taken in consideration the connection between this fund and the objective of achieving the economic and monetary union.

1.1.7. Strategies of environmental policy

The strategies for achieving the environmental policy strengthen the subsidiarity principle (i.e. delegation of responsibilities to MS, while EU only draws the general framework, the pursued objectives) and try to replace the traditional vertical approach , of control and command type, by promoting an alternative model for reaching the EU environmental objectives. These strategies are a kind of “helping tools”, coming to complete the standard tools and acting as incentives with a view to adopting measured for environmental protection or emphasizing the trend towards an approach based on the principle of volunteering. So, there are:

- Sustainable development,
- Program of promoting the active NGOs in the field of environmental protection,
- Integrated Product Policy (IPP),
- Voluntary agreements for environmental protection and pollution reduction,
- Environmental taxes and duties within the Single Market,
- European strategy for environment and health.

1.2. Romanian environmental policy

In Romania, the environmental protection appeared as a stand alone field of national policies in **1990**, when the former *Ministry of Environment* was set up for the first time; in **1992**, the first official document that established the national objectives in the field – *„National Strategy for Environmental Protection"* was developed, and then it was updated in **1996** and **2002**. The strategy is structured in two sections:

1. Review of the main natural resources, elements regarding the economic status and the quality of environmental factors,

2. The actual strategy, i.e. the general principles of environmental protection, the priorities and long, medium and short term objectives.

Since **1996,** an adequacy of the national strategy with the community one, as regards the principles, priorities and objectives could be noticed. So, the pursued principles are:

- conservation and improvement of people health conditions;
- sustainable development;
- pollution prevention;
- biodiversity conservation;
- conservation of cultural and historical heritage,
- „the polluter pays" principle;
- stimulation of the activity of environment recovery (by granting subsidies, low interest loans etc.).

As regards the established objectives, they are divided into short (until 2000), medium (until 2005) and long (until 2020) term objectives.

1.2.1. Accession negotiations

Since **2000** and at the same with the beginning of the accession negotiations, the environmental policy has developed according to the strategy developed by the European Commission for the candidate countries within **Agenda 2000**. In **2002,** the accession negotiations for Chapter 22 – *Environmental protection* were opened. Also in **2002**, European Commission developed a special document for supporting Romania and Bulgaria in their efforts for EU accession in 2007 and for supplementing the given financial assistance, i.e. "*Roadmap for Romania and Bulgaria*". The *Roadmap for Romania and Bulgaria* is focused on the administrative and juridical aspects, economic reform and adaptation of some chapter from the community acquis that are based on „*Yearly report on the progress recorded by Romania for acceding to European Union -2002*.

The environmental aspects mentioned in the *Roadmap* have in view the development of the capacities for implementing the adopted environmental legislation, also the inter-ministerial coordination in environmental issues, with the purpose of promoting the sustainable development and transforming the environmental policy into transversal policy.

Legislative basis of the environmental policy in Romania is mainly formed by the implementation of the environmental acquis, i.e. of the horizontal and sectoral legislation that regulates the European Union environmental policy. The environmental sectoral acquis is structured on the following fields: air quality, waste management, water quality, nature protection, control of industrial pollution and risk management, chemicals and genetically modified organisms, noise pollution, civil protection and nuclear safety. A particular aspect of transposing the sectoral legislation is Romania's request for 11 transition periods, with durations between 3 and 15 years and necessary as a result of the assessment of high costs it implies, as follows: one transition period in the field of air quality, 3 transition periods referring to waste management, 4 transition periods regarding water quality and 3 transition periods in the field of industrial pollution and risk management.

1.2.2. Institutional frame

The main institutional actors of the environmental policy in Romania are: *Ministry of Environment and Forests (MEF)*, *Ministry of European Integration* (MEI) and *Romanian Parliament*. MEF is directly responsible for initiating the national environmental strategies and for creating the framework for their implementation, and acts for protecting the environment and natural resources, for guaranteeing to present and future generations a clean environment, in harmony with the economic development and social progress.

The National Agency for Environment Protection (NAEP) is under MEF subordination: the Regional Agencies for Environment Protection and County Agencies for Environment Protection, which report the local needs, facilitate and monitor the policy implementation at this level, are also under MEF subordination.

Coordinated by MEF and supplying a lot of data and analyses necessary to adopt new measures, there are four research institutes: *National Research and Development Institute for Environment Protection, National Institute for Marine Research and Development*, *"Danube Delta" National Institute for Research and Development and National Institute of Meteorology and Hydrology* . MEI has an important role in directing the legislative process, by its responsibility within the process of negotiation, which is concretized by the operation of the *Romania-EU Association Subcommittee No. 6 „Transports, Trans-European Networks, Energy and Environment"*, which analyzes and assesses the recorded progresses. Other ministries involved in environmental policy are *Ministry of Transport and Infrastructure, Ministry of Agriculture and Rural Development*, *Ministry of Regional Development and Housing, Ministry of Economy, Trade and Business Environment*, *Ministry of Public Finance*, which support the consultation process of interested parties, in order to adopt new legislative measures. The legislative proposals initiated in this way are submitted to Romanian Parliament, where they are the object of a debate in diverse specialized commissions.

1.2.3. Support programmes of national environment policy

The strategies for developing the national environmental policy are outlined depending on the priorities of EU accession and national needs, corroborated with national priorities. So, one can talk about extensions of community programmes, also about national initiatives and initiatives complying with the international strategies for environmental protection. The community initiatives active in the field of national environmental policy are represented by the pre-accession tools Phare, ISPA and LIFE; the compliance with the international strategies is given by *Agenda 21* and *Global Environment Facility* (GEF), and the compliance with the national ones by the Programme „Health for Romania".

Phare Programme, by its two components, the institutional development and the investment support, represents the main tool for technical and financial assistance for the acceding countries and contributes to the implementation of community acquis and to the mobilization of investment in the environmental field (besides other fields). In Romania, Phare programme has been active since 1998.

ISPA Programme: ISPA is a structural instrument for pre-accession, set up in 1999 and functional since 2000, forerunner to the *Cohesion Fund* and focused on funding the infrastructure projects in environment and transport fields.

LIFE Programme: The two components of LIFE programme for candidate countries, *LIFE – Environment* and *LIFE - Nature*, have been functional in Romania since 1999 and they finance projects treating specific, local problems on quality improvement, protection and conservation of environment (LIFE Environment) and biodiversity (LIFE Nature).

Agenda 21: „Agenda 21" is a global action strategy of *United Nations* (UN), adopted in 1992 for mitigating the effects of human impact on environment and for implementing the principles of sustainable development at local level, signed by 178 countries, including Romania.

GEF (Global Environment Facility): The international character of national environmental policy is reflected also by Romania accession to *Global Environment Facility* in 1994.

„Clean Romania" Programme: This programme was launched in April 2002 by Romanian Government and emphasizes the efforts made for improving the environment situation and the national level integration of the principles of environmental community policy. It is important to note that "Clean Romania" programme represents a national strategy and initiative, which is aimed not only at assuring the environment protection and conservation of natural resources, but also at "the increase of education and awareness level regarding the achievement of these objectives".

The conclusion which is drawn after reviewing the Romanian environmental policy is that at the level of 2003, the transposition of the community acquis into our legislation has been mostly achieved. Referring to its implementation and to the foundation of the institutional framework and human resources corresponding to reaching this objective, one could notice the intention to answer to EU critics, but the progress in this direction can be achieved only by implying some high financial costs. The fact that Romania, along with Bulgaria, has detached from the other candidate countries from Central and Easter Europe may be considered as a positive aspect from the point of view of developing the structures adequate to the implementation of the environmental policy and environmental structure, by supplementing EU financial assistance from the pre-accession funds Phare, ISPA and LIFE.

1.3. Environmental policy in Bulgaria

The basic principle of Bulgarian environmental policy are established by the Constitution of the Republic of Bulgaria, which stipulates that the Republic of Bulgaria should assure environmental protection and reproduction, maintenance and diversity of the wild fauna, also the rational use of mineral resources and of the other resources of the country.

Following the above general rule, the Environmental Protection Act (EPA), which represents the main law in the environmental protection field, establishes the principles that underlie the environmentalal protection, such as: sustainable development, prevention and reduction of risk for human health; “the polluter pays” principle , etc.

The state policy regarding the environmental protection is to be integrated in the related sectoral policies – transport, industry, agriculture, tourism, constructions and others, also in the regional policies for economic and social development and is going to be applied by the competent bodies of the executive power.

EPA regulates the structure and competences of the authorities which administrate and apply the environmental legislation – the main body is the Ministry of Environment and Water Management and the Agencies within its structure, like: Executive Agency for Environmental Protection and Regional Inspectorates for Environmental Protection and Water Management, basin departments (responsible for Water Management), national parks department (responsible for natural parks) and also sector governors and Municipal Authorities.

CHAPTER 2

INSTITUTIONAL AND LEGAL FRAMEWORK FOR AIR QUALITY

2.1. Institutional and legal framework in air quality field at international and European level

2.1.1. Institutional framework

I. UNEP – UNITED NATIONS ENVIRONMENT PROGRAMME, based in Nairobi, is the designated authority of the United Nations system in environmental issues at the global and regional level. Its mandate is to coordinate the development of environmental policy consensus by keeping the global environment under review and bringing emerging issues to the attention of governments and the international community for action.

The Governing Council was established in accordance with General Assembly resolution 2997 (XXVII) (Institutional and financial arrangements for international environmental co-operation) of 15 December 1972. 58 members of the Council are elected by the General Assembly, for four-year terms, taking into account the principle of equitable regional representation.

Romania was reelected for a four years mandate, starting from 1 January 2010, as a member of the Board of United Nations Environment Programme (UNEP), decision taken in the elections held in November, in UN National assembly, at New York.

In previous years, Romania held simultaneously three functions/positions within UNEP, namely: member in UNEP Board during 2006-2009, vice-president of UNEP Board Office between 2005 and 2007 and president of the Committee of Permanent Representatives accredited to UNEP between 2005 and 2006.

II. CLIMATE CHANGE SECRETARIAT

The United Nations Framework Convention on Climate Change and the Kyoto Protocol are serviced by the secretariat, also known as the **Climate Change Secretariat**.

The secretariat is institutionally linked to the United Nations without being integrated in any programme, and administered under United Nations Rules and Regulations. Its head, the Executive Secretary, is appointed by the Secretary-General of the United Nations in consultation with the COP through its Bureau, and currently holds the rank of Assistant-Secretary-General. The Executive Secretary reports to the Secretary-General through the Under-Secretary-General heading the Department of Management on administrative and financial matters, and through the Under-Secretary-

Since August 1996, the secretariat has been located in Bonn, Germany. It moved from its previous location in Geneva, Switzerland, following an offer from Germany to host the secretariat, an offer accepted by COP 1.

Every two years, the Executive Secretary proposes a programme budget, setting out the main tasks to be performed by the secretariat in the coming biennium and the funding needed to carry out this work. This proposal is considered in the Subsidiary Body for Implementation (SBI), which then recommends a programme budget for approval by the COP. The secretariat's structure is kept under review to ensure that it responds to the changing needs of the climate change process.

III. UNECE - UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

The broad aim of UNECE’s environment activities is to safeguard the environment and human health, and to promote sustainable development in its member countries.

The practical aim is to reduce pollution so as to minimize environmental damage and avoid compromising environmental conditions for future generations. To this end, UNECE has adopted a four-pronged approach:

1. Its Committee on Environmental Policy brings together governments to formulate environmental policy and support its implementation by organizing seminars, workshops and advisory missions and providing a forum for sharing experiences and good practices.

2. UNECE also takes a very active role in certain regional and cross-sectoral processes, especially:

- „Environment for Europe” Ministerial process
- Environment, transport and health

- Education for Sustainable Development

3. Through its environmental performance reviews, UNECE assesses individual countries' efforts to bring down pollution levels and manage their natural resources, and makes recommendations to improve their environmental performance.

4. UNECE has negotiated five environmental treaties, all of which are now in force:

- Convention on Long-range Transboundary Air Pollution;
- Convention on Environmental Impact Assessment in a Transboundary Context;
- Convention on the Protection and Use of Transboundary Watercourses and International Lakes;
- Convention on the Transboundary Effects of Industrial Accidents; and
- Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.

Their governing bodies are serviced by the UNECE secretariat, which also helps them to monitor the implementation of the treaties.

III.1. „Environment for Europe"

The ***"Environment for Europe"*** process is a unique partnership of member States within the UNECE region, organizations of the United Nations system represented in the region, other intergovernmental organizations, regional environmental centres, non-governmental organizations, the private sector and other major groups.

III.2. Environment, transport and health

THE PEP - the Transport, Health and Environment Pan-European Programme – connects the Transport, Health and Environment.

THE PEP, established in 2002, by integrating transport, health and environment policies, contributes to a greener economy, safeguarding health and the environment.

The 4 goals to be reached by 2014 are:

No. 1: To contribute to sustainable economic development and stimulate job creation through investment in environment- and health-friendly transport.

No. 2: To manage sustainable mobility and promote a more efficient transport system.

No. 3: To reduce emissions of transport-related greenhouse gases, air pollutants and noise and

No. 4: To promote policies and actions conducive to healthy and safe modes of transport.

THE PEP is serviced by the joint secretariat of the UNECE and WHO/Europe, working hand in hand to promote sustainable transport choices for our health, environment and prosperity.

III.3. Education for Sustainable Development (ESD)

Education for Sustainable Development (ESD) promotes sustainable thinking and acting. It enables children and adults to make decisions and at the same time understand how those decisions affect future generations and the life of others.

IV. EUROPEAN ENVIRONMENT AGENCY (EEA)

The European Environment Agency (EEA) is an agency of the European Union. Our task is to provide sound, independent information on the environment. EEA are a major information source for those involved in developing, adopting, implementing and evaluating environmental policy, and also the general public. Currently, the EEA has 32 member countries.

The regulation establishing the EEA was adopted by the European Union in 1990. It came into force in late 1993 immediately after the decision was taken to locate the EEA in Copenhagen. Work started in earnest in 1994. The regulation also established the ***European environment information and observation network (Eionet).***

EEA's mandate is:

- To help the Community and member countries make informed decisions about improving the environment, integrating environmental considerations into economic policies and moving towards sustainability
- To coordinate the European environment information and observation network (Eionet)

V. Eionet: EUROPEAN ENVIRONMENT INFORMATION AND OBSERVATION NETWORK

Eionet is a partnership network of the European Environment Agency (EEA) and its member and cooperating countries. It consists of the EEA itself, six European Topic Centres (ETCs) and a network of around 1000 experts from 39 countries in over 350 national environment agencies and other bodies dealing with environmental information.

Through Eionet, the EEA coordinates the delivery of timely, nationally validated, high-quality environmental data from individual countries. This forms the basis of integrated environmental assessments and knowledge that is disseminated and made accessible through the EEA website. This information serves to support environmental management processes, environmental policy making and assessment, and public participation at national, European and global levels.

VI. EMEP - Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe

It is a programme for international cooperation for settling the transboundary issues of air pollution, being conducted under the Convention on Long-Range Transboundary Air Pollution

The main objective of the EMEP programme is to regularly provide governments and subsidiary bodies under the LRTAP Convention with qualified scientific information to support the development and further evaluation of the international protocols on emission reductions negotiated within the Convention.

VII. EPER - THE EUROPEAN POLLUTANT EMISSION REGISTER

It offers access to information on the annual emissions of the industrial plants in European Union (EU) Member States, also in Norway.

EPER collects the data on the emissions from 12,000 plants from the 25 EU Member States. Data are available depending on the country, pollutant, activity field (sector), air and water (directly or by means of a sewerage system).

VIII. E-PRTR - THE EUROPEAN POLLUTANT RELEASE AND TRANSFER REGISTER

The European Pollutant Release and Transfer Register (E-PRTR) is the new Europe-wide register that provides easily accessible key environmental data from industrial facilities in European Union Member States and in Iceland, Liechtenstein, Norway, Serbia and Switzerland. It replaces and improves upon the previous European Pollutant Emission Register (EPER). It implements for the European Community the UNECE (United Nations Economic Commission for Europe) PRTR Protocol to the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.

IX. SHARED ENVIRONMENTAL INFORMATION SYSTEM – SEIS

SEIS is an information system based on the latest information and communication technology (ICT) which will provide real time data on the environment to decision makers at all levels (from the local one to the European one) , thus allowing them to make immediate decisions and life-saving.

2.1.2. Legal framework

- **Convention on Long-Range Transboundary Air Pollution**, **from 1978**. It vas adopted at Geneva within the first European Conference on Environment.

At the same time, the convention defined the **Short-Range Transboundary Air Pollution** as the pollution whose physical source is entirely or partially within the jurisdiction limits of a state, the effects being produced in an area subjected to the jurisdiction of another state, at a distance to which is generally impossible to establish the contribution of the source or emission source groups.

The Convention on Long-range Transboundary Air Pollution entered into force in 1983. It has been extended by eight specific protocols:

1. The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone

2. The 1998 Aarhus Protocol on Persistent Organic Pollutants (POPs)

3. The 1998 Aarhus Protocol on Heavy Metals

4. The 1994 Oslo Protocol on Further Reduction of Sulphur Emissions

5. The 1991 Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes

6. The 1988 Sofia Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes

7. The 1985 Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent

8. The 1984 Geneva Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)

The Convention, which now has 51 Parties identifies the Executive Secretary of UNECE as its secretariat.

- **Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991)**

Espoo Convention is key step for bringing together all the interested parties in order to prevent environment deterioration before this happens.

The Convention entered into force on 10 September 1977 and has two specific protocols

***1**. Protocol on Strategic Environmental Assessment* (Kiev, 2003), entered into force on 11 July 2010.

***2**. SEA (Strategic environmental assessment)* protocol follows the Espoo convention by guaranteeing the fact that individual parties integrate the environmental assessment into their plans and programmes since their first stages.

- **The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention)**

The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) is intended to strengthen national measures for the protection and ecologically sound management of transboundary surface waters and groundwaters. The Convention has two specific protocols:

***1**. Protocol on Water and Health*, London, 17 June 1999, is aimed at protecting the human health and welfare by a better water management, protection of water ecosystems inclusively, and by preventing, controlling and reducing the water-related diseases.

2. Protocol on Civil Liability, Kiev, 21 May 2003, provides a comprehensive system of civil liability and of adequate and prompt compensations for the damages caused by the transboundary effects of industrial accidents on transboundary waters.

- **Convention on the Transboundary Effects of Industrial Accidents**

The Convention on transboundary effects of industrial accidents was founded for protecting people and environment against industrial accidents. Its aim is to prevent the accidents that may occur or to reduce their frequency and severity, also to attenuate their effects, if necessary.

The Convention was adopted at Helsinki on 17 March 1992 and entered into force on 19 April 2000. *Conference of the Parties (COP)* was constituted as the governing body of the Convention at its first meeting, at Brussels, 24 November 2000.

1. Protocol on civil liability and compensation for damage caused by the transboundary effects of industrial accidents on transboundary waters was adopted at Kiev on 21 May 2003. The protocol is a common tool of the Convention on the transboundary effects of industrial accidents and of the Convention on the protection and use of transboundary watercourses and international lakes.

- **Aarhus Convention** – **Convention on access to information, public participation in decision-making and access to justice in environmental matters**

UNECE Convention on access to information, public participation in decision-making and access to justice in environmental matters was adopted on 25 June 1998 in the Danish city Aarhus (Århus) at the fourth Ministerial Conference, as a part of the process "Environment for Europe". It entered into force on 30 October 2001.

Aarhus Convention establishes a series of rights of the public (individuals and their associations) related to the environment. The parties participating in this Convention adopts the provisions necessary so as the public authorities (at national, regional or local level) contribute to these rights for making them efficient.

➢ **United Nations Framework Convention on Climatic Change** *(*UNFCCC)

On 5 June 1992, the United Nations Framework Convention on Climatic Change (UNFCCC) was signed at Rio de Janeiro.

United Nations Framework Convention on Climatic Change (UNFCCC) and the related Kyoto Protocol provides an international framework for approaching the climate changes, defining the objectives and shows the way of reaching them.

Under UNFCCC, the signatories establish national programmes for mitigating the emissions of greenhouse gases and submit periodical reports.

- **Kyoto Protocol, 1997**

Kyoto Protocol establishes compulsory limits regarding the emissions of greenhouse gases for the industrialized countries. The protocol also introduced innovative mechanisms based on exchange theory – the so called flexible mechanisms provided by Kyoto Protocol – for keeping the costs related to emission reduction as low as possible.

Kyoto Protocol entered into force in February 2005. In the beginning of 2009, 183 states and European Union had ratified the protocol. It means that 37 developed countries, plus EU -15 (the 15 EU Member States at the date of protocol signing) undertook to achieve the Kyoto objectives. Only one large country, which initially had signed the protocol, did not ratify it: USA.

- **Concerns after Kyoto**

In December 2007, at the **United Nations Conference on climatic change from Bali**, all the large countries agreed to start negotiations at international level for approaching the problem of climate change after 2012, when expires the Kyoto protocol. The progress continues in the next year at Poznan, in Poland, the purpose of the continuous negotiations being to provide an agreement until the end of 2009, at the **United Nations Conference on climatic change from Copenhagen.**

EU

- **In air quality field**

- **Directive 2008/50/EC** on ambient air quality and cleaner air for Europe;
- **Directive 1999/30/CE** relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air (First Daughter Directive)

- **Directive 2000/69/EC** relating to limit values for benzene and carbon monoxide in ambient air (Second Daughter Directive).
- **Directive 2002/3/EC** relating to ozone in ambient air (Third Daughter Directive)
- **Directive 2004/107/EC** relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (Fourth Daughter Directive)
- Council Directive 80/779/EEC on air quality limit values and guide values for sulphur dioxide and suspended particulates, as last amended by Directive 89/427/EEC
- **Council Decision 81/462/EEC** on the conclusion of the Convention on long-range transboundary air pollution (CLRTAP)
- **Council Directive 85/203/EEC** on air quality standards for nitrogen dioxide, as last amended by Council Directive 85/580/EEC
- **Directive 1996/62/EC** on ambient air quality assessment and management (Framework Directive]
- **Council Decision 97/101/EC** establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States
- **Commission Decision 2001/752/EC** amending the Annexes to Council Decision 97/101/EC establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States (Text with EEA relevance)
- **Commission Decision 2004/461/EC** laying down a questionnaire for annual reporting on ambient air quality assessment under Council Directives 96/62/EC and 1999/30/EC and under Directives 2000/69/EC and 2002/3/EC of the European Parliament and of the Council
- Commission Decision 2004/279/EC concerning guidance for implementation of Directive 2002/3/EC of the European Parliament and of the Council relating to ozone in ambient air (Text with EEA relevance)
- Commission Decision 2004/224/EC laying down arrangements for the submission of information on plans or programmes required under Council

Directive 96/62/EC in relation to limit values for certain pollutants in ambient air

- **Commission Decision 2004/470/CE** concerning guidance on a provisional reference method for the sampling and measurement of PM2,5

- **In the field of stationary source emissions**

Integrated pollution prevention and control

Council Directive 2008/1/EC concerning integrated pollution prevention and control

Large Combustion Plants

- **Council Directive 94/66/EC** amending Directive 88/609/EEC on the limitation of emissions of certain pollutants into the air from large combustion plants.
- **Directive 2001/80/EC** on the limitation of emissions of certain pollutants into the air from Large Combustion Plants.

Waste Incineration Plants

- **Directive 2000/76/EC** of the European Parliament and of the Council of 4th December 2000 on the incineration of waste.

Volatile Organic Compounds (VOCs)

- **Directive 94/63/EC** on the control of VOC emissions resulting from the storage of petrol and its distribution from terminals to service stations;
- **Council Directive 1999/13/EC** on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations.

Sulphur content of liquid fuels

Council Directive 1999/32/EC relating to a reduction in the sulphur content of certain liquid fuels.

- **National emission ceilings**

Establishment of national emission ceilings for acidification and eutrophication

- **Directive 2001/81/EC** on national emissions ceilings for certain atmospheric pollutants
- **Directive 2001/81/EC** on national emissions ceilings for certain atmospheric pollutants. Consolidated text

- **In transport and environment field**
- **Transport and Environment - Road vehicles - Automotive fuel quality Proposal** to amend Directive 98/70

- **Directive 98/70/EC** of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC.
- **Commission Directive 2000/71/EC** of 7 November 2000 to adapt the measuring methods as laid down in Annexes I, II, III and IV of Directive 98/70/EC of the European Parliament and of the Council to technical progress as foreseen in Article 10 of that Directive.
- **Directive 2003/17/EC** of the European Parliament and of the Council of 3 March 2003 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels (Text with EEA relevance)

2.2. Institutional and legal framework in air quality field in Romania

2.2.1. Institutional framework

The responsibility for monitoring the ambient air quality in Romania belongs to the authorities for environment protection, according to the provisions of the Law no.104/2011 related to ambient air quality.

National Agency for Environment Protection (NAEP) is the specialized institution of the central public administration, under the subordination of the **Ministry of Environment and Forests**, with competences in implementing the policies and legislation in the field of environment protection assigned on the basis of the

Government Decision no. 918/30.08.2010 regarding the re-organization and operation of the National Agency for Environment Protection and of the public institutions which under its subordination.

NAEP is designed to act for assuring a healthy environment to the population, harmonized with the economic development and social progress of Romania. The mission of the national agency, like that of the 8 regional agencies and the 34 county agencies which are under its direct subordination, is to assure a better environment in Romania for the present and future generations, and the achievement of some major and continuous improvements of air, sol and water quality.

The National System for Assessment and Integrated Management of Air Quality (NSAIMAQ) under the NAEP coordination, provides the organizational, institutional and legal framework of cooperation between the public authorities and institutions, with competences in the field, for unitarily assessing and managing the ambient air quality on the whole territory of Romania, also for informing the population and European and international bodies on the ambient air quality.

The National System for Assessment and Integrated Management of Air Quality includes:

- **National System for Monitoring the Air Quality (NSMAQ)**
- **National System for the Inventory of Atmospheric Pollutant Emissions (NSIAPE).**

The information supplied by the two subsystems NSMAQ and NSIAPE are integrated by the **Center for Assessing the Air Quality) (CAAQ)** in accordance with the national and international requirements in the field of assessing and managing the air quality.

NSMAQ assures the monitoring of the ambient air quality by the National Network for Monitoring the Air Quality (NNMAQ), objective of national public interest, under the administration of the **Central Public Authority for Environment Protection.**

The monitored pollutants, measurement methods, limit values, alert and informing thresholds and criteria for locating the monitoring points are set by the national legislation on atmosphere protection and are in accordance with the requirements provided the European regulations.

The monitoring system allows the local authorities for environment protection to:

- assess, know and inform permanently the public, other interested authorities and institutions on the air quality level;
- take in time prompt measures for mitigating and/or removing the pollution episodes, or measures in case of emergencies;
- prevent accidental pollutions;
- warn and protect population in case of emergencies.

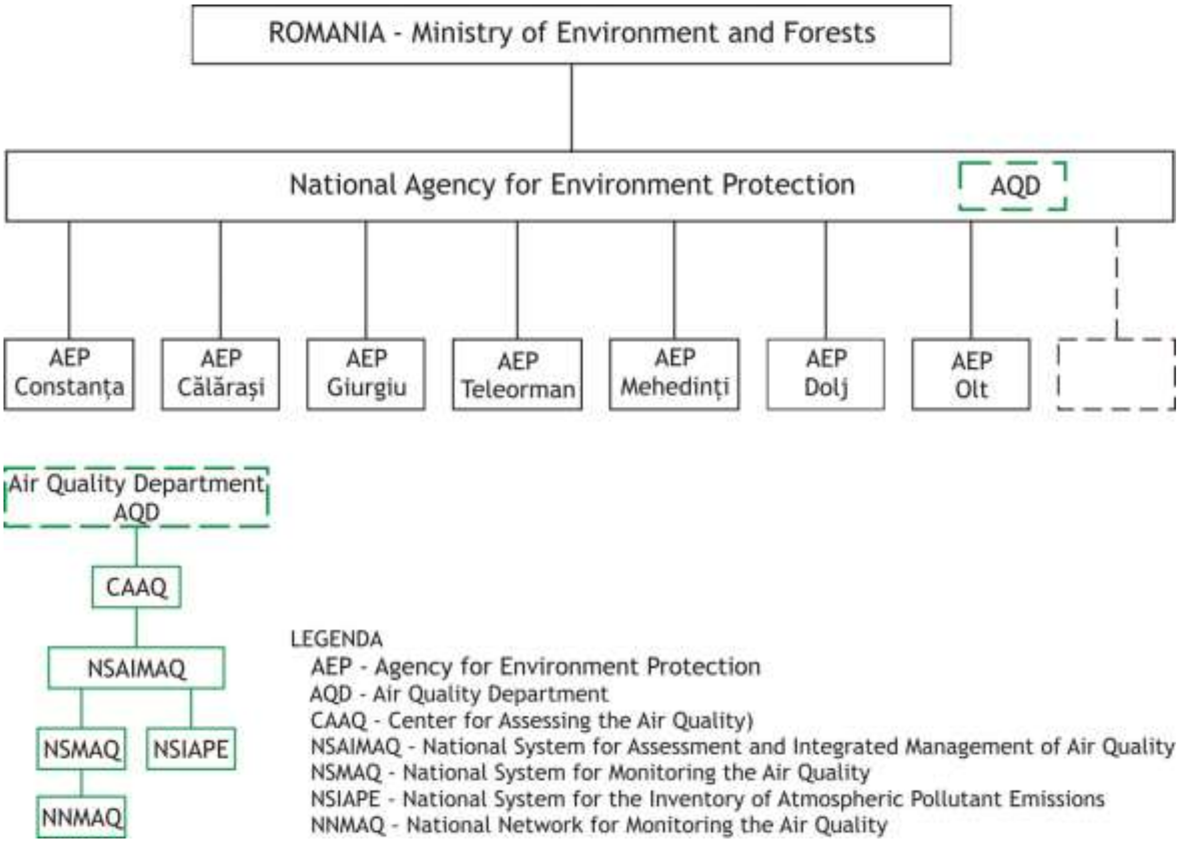


Figure 1 - Institutional framework in air quality field in Romania

2.2.2. Legal framework

- **International conventions and protocols and the law of ratification from Romania**

In 1991, Romania ratified the **Convention on Long-range Transboundary Air Pollution** – through the Law no. 8/1991.

- In 1992, Romania signed the **United Nations Framework Convention on Climatic**

Change (UNFCCC), ratified by the **Law no. 24/1994** , undertaking to act for stabilizing the concentrations of greenhouse gas in atmosphere, at a level that prevents the anthropogenic disturbance of climate system.

Staring from 2002, Romania has transmitted annually to UNFCCC secretariat, the **National Inventory of greenhouse gases**, achieved according to IPCC methodology, using the reporting format common to all countries (CRF Reporter). Romania also signed the **Kyoto Protocol** in 1999 and ratified it by the **Law no.3/2011.**

Romania ratified the **Aarchus Convention** - Convention on access to information, public participation in decision-making and access to justice in environmental matters by the **Law no. 86/2000**, and **Aarchus Protocol on Heavy Metals, Aarchus Protocol on Persistent Organic Pollutants and Gothenburg Protocol to Abate Acidification, Euthophication and Ground-level Ozone** by the **Law no. 271/2003**.

Law no. 652/2002 for Romania's accession to the Protocol of the Convention from 1979 on long range transboundary air pollution regarding the long-term Cooperation programme for monitoring and evaluation of the long range transmission of the air pollutants in Europe (EMEP), adopted at Geneva on 24 September 1984.

- **National laws in air quality field**

Law no. 104/2011 on environmental air quality**;**

The Law on ambient air quality transposes into the national laws the provisions of the **Directive 2008/50/EC** of European Parliament and Council from 21 May 2008 on ambient air quality and cleaner air for Europe and of the **Directive 2004/107/EC** of European Parliament and Council from 15 December2004 regarding arsenic, cadmium, mercury, nickel, polycyclic aromatic hydrocarbons in ambient air.

Law no. 97/1992 for ratifying the Convention between the Romanian Government and the Bulgarian Government regarding the cooperation in the field of the environmental protection;

Law no. 655//2001 – for approving *O.U.G no. 243/2000* on atmosphere protection, published in Official Gazette no. 773 from 04.12.2001;

Law no. 24//2007 – regarding the regulation and management of green spaces in urban areas, published in Official Gazette no. 36 from 18.01.2007;

Decision no. 543//2004 – regarding the development and implementation of the plan and programmes for air quality management, published in Official Gazette no. 393 from 04.05.2004, and completed by Decision no. 210/2007;

Decision no. 586//2004 – regarding the setting up and organization of the National System for integrated management and assessment of air quality, published in Official Gazette no. 389 from 03.05.2004;

Decision no. 731//2004 – for approving the National strategy for atmosphere protection, published in Official Gazette no. 496 from 02.06.2004;

Decision no. 738//2004 – for approving the national action plan in the field of atmosphere protection, published in Official Gazette no. 476 from 27.05.2004;

Emergency Ordinance no. 243//2000 – regarding atmospheric protection, published in Official Gazette no. 633 from 06.12.2000, approved with amendments by the Law no. 655/2001, amended by Emergency Ordinance no. 12/2007;

MAPM Order no. 745//2002 – regarding the establishment of agglomerations and classification of agglomerations and areas for assessing the air quality in Romania, published in Official Gazette no. 739 from 09.10.2002, amended by Order no. 27/2007;

MAPM Order no. 592/2002 – for approving the Normative for establishing the limit values, threshold values, criteria and methods for assessing sulphur dioxide, nitrogen dioxide and nitrogen oxides, particulate matter (PM10 and PM2.5), lead, benzene, carbon monoxide, ozone in ambient air(Official Gazette no. 765/0ctober 2002);

MMGA order no. 35//2007 – regarding the approval of the Methodology for developing and implementing the plans and programmes for air quality management, published in Official Gazette no. 56 from 24.01.2007;

MMGA order no. 349//2007 - regarding the approval of the classification of the localities from Region 4 in lists according to the provisions of MAPM order no. 745/2002 – regarding the establishment of agglomerations and classification of agglomerations and areas for assessing the air quality in Romania, published in Official Gazette no. 316 from 11.05.2007;

MMGA order no. 448//2007 – for approving the Normative for assessment for arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air, published in Official Gazette no. 226 from 03.04.2007;

MMDD order no. 1095//2007 – for approving the Normative for establishing the air quality indicators in order to facilitate the public information, published in Official Gazette no. 513 from 31.07.2007;

Emergency Ordinance no. 12//2007 – for the amendments of some normative acts that transpose the community acquis in the field of environmental protection, published in Official Gazette no. 153 from 02.03.2007, approved by Law no. 161/2007 (published in Official Gazette no. 395 from 12.06.2007);

2.3. Institutional and legal framework in air quality field in Bulgaria

2.3.1. Institutional framework

Under the direct coordination of the **Ministry of Environment and Water** from Bulgaria the **Executive Agency for Environment** from Sofia operates, agency which has as main functions the management, coordination and information on the environment protection in Bulgaria.

The agency is the National Reference Center within the European Environment Agency and at the same time it is a member of the European Network of the Heads of Environment Protection Agencies (EPA Network). The European Network of the Heads of Environment Protection Agencies brings together the leaders of the environment protection agencies and of the similar bodies from Europe and, essentially, represents a working group which exchanges information regarding the points of view and experiences in problems of common interest related to implementing the environmental policies in the everyday life.

The Executive Agency for Environment establishes the architecture and coordinates the National System for Environmental Monitoring, with a view to getting information and monitoring all the factors which influence the environment throughout Bulgaria.

The **National System for Environment Monitoring** from Bulgaria is founded and operates in accordance with Article 1, point 7 of the Law regarding Environment Protection. The system offers reliable and in time information regarding the quality of air and influence factors. On the basis of this information, analyses, evaluations and prognoses are achieved; these are the starting point for the activities of preserving and protecting the environment against harmful factors.

The Ministry of Environment and Water in Bulgaria manages the National System for Environment Monitoring, by mean of the Executive Agency for Environment. Everything that means assurance and management of material and technical resources, methodologies and software, necessary to the operation and development of the national system for environment monitoring are responsibilities of the Executive Agency for Environment. All the measurements on environment quality, also the findings got after the measurements analysis, are performed by the structures of the Executive Agency for Environment. The unitary methods used for preparing, sampling and analyzing the samples are in accordance with the procedures, assuring the quality of data and measurements. All the laboratories within the Agency are accredited according to EN ISO/IEC 17025:2005- General requirements for the competences of the testing and calibration laboratories.

The databases at regional and national level are structured per components depending on the field they are referring to, using a common terminology.

The assessments of the environment components and the data reporting at national level are the Agency’s responsibilities, while the assessments at regional level are achieved by the **Regional Inspectorates for Environment and Water Management**.

A distinct field is the assessment and reporting of the data referring to the water resources at the level of the hydrographic basins, field which is under the jurisdiction of the 4 Directorates for hydrographic basins.

The Regional Inspectorates for Environment and Water Management and the Directorates for hydrographic basins are structures subordinated to the Ministry of Environment and Water.

The Regional Inspectorates for Environment and Water Management have been established as authorities that represent the Ministry of Environment and Water at regional level and they are the role to lead the policy for environment protection in the districts found under their jurisdiction. At the same time, they cooperate with the municipalities in developing the action plans for implementing the environment policies.

The **National system for Environment Monitoring** is organized in accordance with chapter 8 from the Law on Environment Protection and includes the national monitoring networks for:

-air;

-water;

-lands and soil;

-forests and protected areas;

-biodiversity;

-noise and radioactivity

The information and control systems related to the emissions of hazardous substances in air, water contamination, waste and protection of natural deposits are also included in the National System for Environment Monitoring.

An important part of the National System for Environment Monitoring from Bulgaria is the **National System for Monitoring the Air Quality** which, at present, is composed of a network of 53 fixed stations.

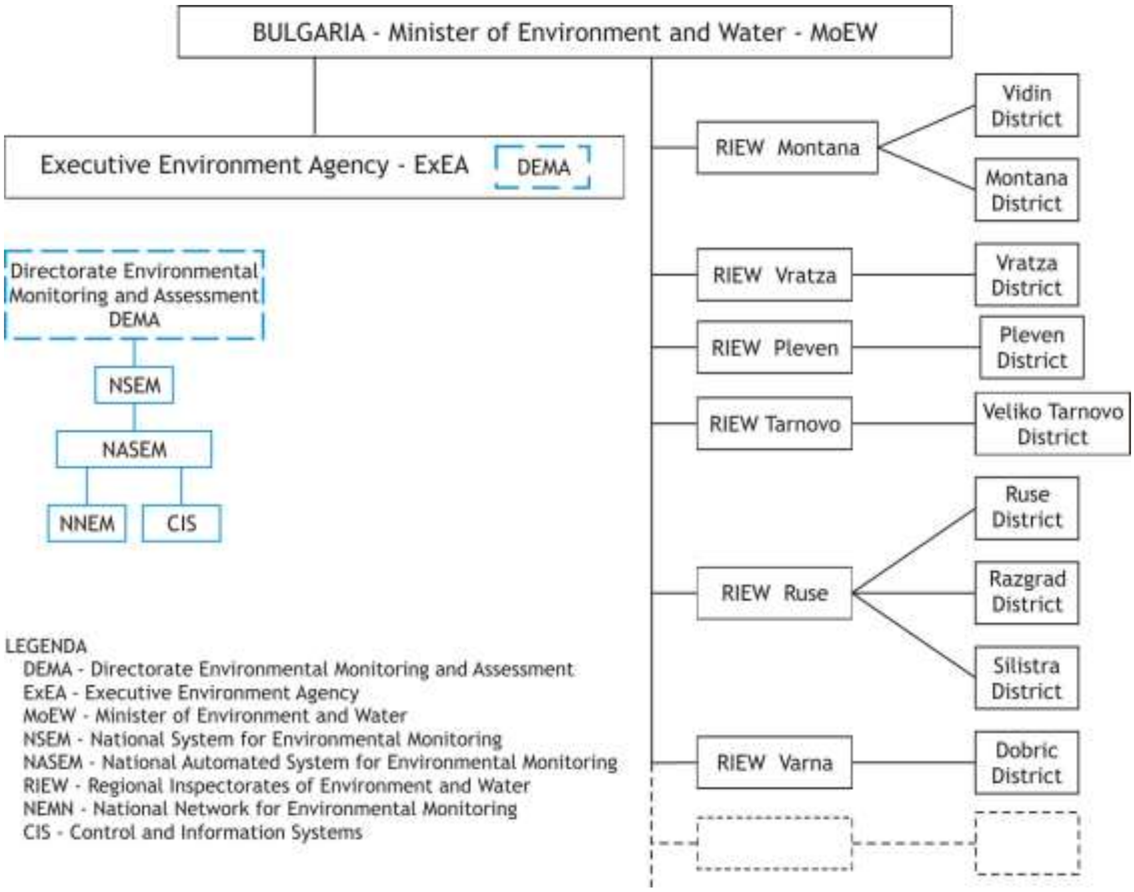


Figure 2 - Institutional framework in air quality field in Bulgaria

2.3.2. Legal framework

- **International conventions and protocols and laws of their ratification in Bulgaria**

Decree of the State Council no. 332/19.02.1981 on the ratification of the Convention on the long-range transboundary air pollution (Bulgarian Official Gazette no. 16/24.02.1981)

Decree of the State Council no. 332/19.02.1981 on the ratification of the Protocol of the Convention of long-range transboundary air pollution regarding the reduction of nitrogen oxides in transboundary fluxes (Bulgarian Official Gazette no.12/1989)

Decree of the Council of Ministers no. 129/1986 for the Protocol of the Convention of long-range transboundary air pollution regarding the long-term financing of the cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe, adopted at Geneva Geneva (EMEP);

Bulgaria ratified:

- **Aarchus Protocol on Persistent Organic Pollutants** in 2001 (Official Gazette no. 42/27 April 2001)
- **Aarchus Protocol on Heavy Metals** in 2003 (Official Gazette no. 88/07.10.2003)
- **Gothenburg Protocol to Abate Acidification, Euthophication and Ground-level Ozone** in 2005 (Official Gazette no. 38/03.05.2005)

- **National laws in air quality field in Bulgaria**

Clean Air Law is the transposition of the Directive 2008/50/EC into the national laws;

Regulation no. 6/1999 regarding the measurement methods and procedures for the emissions of harmful substances from point sources in atmosphere;

Regulation no. 7/1999 regarding the assessment and management of ambient air quality

Regulation no. 10/2003 regarding the limit values of the emissions for sulphur dioxide, nitrogen oxides and dust released in atmosphere by the large combustion plants;

Regulation no. 12/2010 regarding the limit values for sulphur dioxide, nitrogen dioxide, particulate matter, benzene, carbon monoxide and ozone in ambient air.

CHAPTER 3

THE REQUIREMENTS OF DIRECTIVE NO. 50/2008/CE

3.1. The List of monitored pollutants

Sulfur Dioxide

The Sulfur Dioxide is a colorless, bitter, non-flammable gas with a pungent odor that irritates eyes and respiratory.

Measuring Methods

The reference method for sulfur dioxide analyze is stipulated in EN 14212:2005- Ambient air quality - Standard method for the measurement of the concentration of sulphur dioxide by ultraviolet fluorescence.

Nitrogen Dioxide and Nitrogen Oxides of Nitrogen

The oxides of nitrogen are a gases group very reactive containing nitrogen and oxigen in variabile amounts. Most oxides of nitrogen are colorless or odorless gases. The main oxides of nitrogen are:

- Nitrogen monoxide (NO) is colorless and odorless gas;
- Nitrogen dioxide (NO_2) is a reddish brown gas with a strong odor.

The nitrogen dioxide combined with air particles can form a reddish brown coat. In the presence of sunlight the nitrogen oxides can react with hydrocarbons to form photochemical oxidants.

Nitrogen Oxides are responsible for acid rain which affects both the terrestrial and aquatic ecosystem.

Measuring Methods

The reference method for nitrogen dioxide and nitrogen oxide analyze is stipulated in EN 14211:2005 - Ambient air quality - Standard method for the measurement of the concentration of nitrogen dioxide and nitrogen monoxide by chemiluminescence

Ozone

It is a very oxidante and reactive gas with strong smell. It focuses on the stratosphere and protects against harmful UV radiation. Present ground level ozone acts as a component of “photochemical smog”. It is formed through reaction involving, in particular, nitrogen oxides and volatile organic compounds.

Measuring Methods

The reference method for ozone analyze is stipulated in EN 14625:2005 - Ambient air quality - Standard method for the measurement of the concentration of ozone by ultraviolet photometry.

Carbon Monoxide

At ambient temperature carbon monoxide is a colorless, odourless, tasteless gas, of both natural and antrophogenic origin. Carbon monoxide is formed primarily by the incomplete combustion of fossil fuels.

Measuring Methods

The reference method for carbon monoxide analyze is stipulated in EN 14626:2005 - Ambient air quality - Standard method for the measurement of the concentration of carbon monoxide by nondispersive infrared spectroscopy

Particulate Matter PM 10

Particulate Matter PM 2.5

Particulate matter represent a complex particules mixture of very small particules and liquid drops.

Measuring Methods

The reference method for PM 2.5 analyze is stipulated in EN 14907:2005 - Ambient air quality - Standard gravimetric measurement method for the determination of the PM2,5 mass fraction of suspended particulate matter.

The reference method for PM 10 analyse is stipulated in EN 12341:1999 - Air quality - Determination of the PM 10 fraction of suspended particulate matter - Reference method and field test procedure to demonstrate reference equivalence of measurement methods.

Lead

Toxic metals come from coal combustion, fuel, household waste, etc. and certain industrial processes.

Measuring Methods

The reference method for lead analyze is stipulated in EN 14902:2005 - Ambient air quality - Standard method for the measurement of Pb, Cd, As and Ni in the PM 10 fraction of suspended particulate matter.

Benzene

Very slitely aromatic compound, volatile and solubile in water.

90% of benzene in ambient air traffic comes from. The remaining 10% comes from evaporation of fuel from storage and distribution.

Measuring Methods

The reference method for benzene analyze plumbului is stipulated in:

- EN 14662-1:2005 - Ambient air quality - Standard method for measurement of benzene concentrations - Part 1 : Pumped sampling followed by thermal desorption and gas chromatography;
- EN 14662-2:2005 - Ambient air quality - Standard method for measurement of benzene concentrations - Part 2 : Pumped sampling followed by solvent desorption and gas chromatography;
- EN 14662-3:2005 - Ambient Air Quality - Standard method for the measurement of benzene concentrations - Part 3: Automated pumped sampling with in situ gas chromatography.

Quality Indices

The specific index for air quality, in short “state specific”, is a coding system recorded concentrations for each of the following pollutants monitored:

1. sulfure dioxide (SO_2)
2. nitrogene dioxid (NO_2)
3. ozone (O_3)
4. carbon monoxide (CO)
5. particulate matter (PM 2.5; PM 10)

The general index is established for each of automated stations of the Air Quality Monitoring National Network as most of the indices corresponding to specific pollutants monitored.

In order to calculate the overall index must be available at least 3 specific indices corresponding pollutants monitored. General index and specific indices are represented by integers between 1 and 6, each number corresponding to a colour (the figure will be represented as colours and numbers assigned to them).

Specific index corresponding **sulfur dioxide** is determined by classification of the average hourly concentrations in one of the area of concentrations listed in the table 3.1. below:

Table 3.1 - SO_2 Concentration Range

SO_2 Concentration Range [μg/m^3]	Specific Index
0 - 49	1
50 - 74	2
75 - 124	3
125 - 349	4
350 - 499	5
>500	6

Specific index corresponding **nitrogen dioxide** is determined by classification of the average hourly concentrations in one of the area of concentrations listed in the table 3.2. below:

Table 3.2 - NO_2 Concentration Range

NO_2 Concentration Range [μg/m^3]	Specific Index
0 - 49	1
50 - 99	2
100 - 139	3
140 - 199	4
200 - 399	5
>400	6

Specific index corresponding **ozone** is determined by classification of the average hourly concentrations in one of the area of concentrations listed in the table 3.3. below:

Table 3.3. - O_3 Concentration Range

O_3 Concentration Range [µg/m^3]	Specific Index
0 – 39	1
40 – 79	2
80 – 119	3
120 – 179	4
180 – 239	5
>240	6

Specific index corresponding **carbon monoxide** is determined by classification of the arithmetic hourly values average, recorded in the last 8 hours, in one of the area of concentrations listed in the table 3.4. below:

Table 3.4 - CO Concentration Range

CO Concentration Range [µg/m^3]	Specific Index
0 - 2	1
3 - 4	2
5 - 6	3
7 – 9	4
10 – 14	5
>15	6

Specific index corresponding **particulate matter** is determined by classification of the arithmetic hourly values average, recorded in the last 24 hours, in one of the area of concentrations listed in the table 3.5. below:

Table 3.5 - PM 10 Concentration Range

PM 10 Concentration Range (µg/m^3)	Specific Index
0 – 9	1
10 – 19	2
20 – 29	3
30 - 49	4
50 – 99	5
>100	6

For benzene limit value is 5 µg/m^3.

For lead (Pb) limit value is 0.5 µg/m^3 PM 10.

3.2. Transboundary Requirements

Directive 2008/50/CE of the European Parliament governing the:

Articolul 25: Transboundary air pollution:

1. Where any alert threshold, limit value or target value plus any relevant margin of tolerance or long-term objective is exceeded due to significant transboundary transport of air pollutants or their precursors, the Member States concerned shall cooperate and, where appropriate, draw up joint activities, such as the preparation of joint or coordinated air quality plans pursuant to Article 23 in order to remove such exceedances through the application of appropriate but proportionate measures.

2. The Commission shall be invited to be present and to assist in any cooperation referred to in paragraph 1. Where appropriate, the Commission shall, taking into account the reports established pursuant to Article 9 of Directive 2001/81/EC, consider whether further action should be taken at Community level in order to reduce precursor emissions responsible for transboundary pollution.

3. Member States shall, if appropriate pursuant to Article 24, prepare and implement joint short-term action plans covering neighbouring zones in other Member States. Member States shall ensure that neighbouring zones in other Member States which have developed short-term action plans receive all appropriate information.

4. Where the information threshold or alert thresholds are exceeded in zones or agglomerations close to national borders, information shall be provided as soon as possible to the competent authorities in the neighbouring Member States concerned. That information shall also be made available to the public.

5. In drawing up plans as provided for in paragraphs 1 and 3 and in informing the public as referred to in paragraph 4, Member States shall, where appropriate, endeavour to pursue cooperation with third countries, and in particular with candidate countries.

In Sofia in 1991 it was adopted Convention between Government of Romania and the Government of Bulgaria on cooperation environment protection and ratified in Romania by Law 97/1992.

The concept of "atmosphere" and the need to protect it. The concept of Air Pollution.

Law no. 137/1995 defines atmosphere as the air around the Earth, "air mass sorrounding land area, including the ozone layer" respectively.

The air is an important natural element of environment, essential for life and human health, fauna and flora and it must be protected by all means, both quantitatively and qualitatively.

The atmosphere is considered a transit environment for pollutants, but an evironment that spreds most rapidly and undergoing much grater distances than in other environments. Air pollution knows no national borders, it is a transboundary phenomen that is now a global problem which requires international cooperation and proper regulation appropriate and effective, likely to prevent air pollution by actions on the establishment sources of pollution, the measures imposed on all air users.

Air pollution is due to increased concentration of normal constituents of the atmosphere or of foreign compounds (radioactive elements, etc.). Thus, it is necessary to improve the legal system to protect the air by developing regulations.

The atmosphere is polluted whenever its quality or its composition are alterated, by overcoming the threshold air quality, which is dangerous for the environment and humans.

In documents drawn-up by the Council of Europe it is considered that the atmosphere pollution causes harm and is generated by the presence of foreign substances or their variation in the composition of air.

Representing an international phenomenon and cross-border par excellence, with particular implication for regional, the air pollution requires, in order to combat and diminish, a strict cooperation between the countries of our continent, accompanied appropriate legal means and tools.

Convention on transboundary air pollution in Geneva in 1979 defined air pollution as the introduction in the atmosphere by man, directly or undirectly, injorious substances or energy liable to endanger human health, harm living resources and ecosystems, to deteriorate material goods, recreation values or other legitimate uses of the environment. (art.1).

Long-range transboundary pollution is the pollution whose phisycal source is included (totally or partially) in the national jurisdiction of a state that can produce harmful effects in an area subject to national jurisdiction of another state, at a distance from it is not posible to distinguish the contribution of the pollution sources.

Air pollution is a problem both locally and across borders. Air pollutants emitted in one country may be transported in the atmosphere and human health and environmental damage elsewhere.

Two pollutants, particulate matter and ozone at ground level, are currently recognized as the most significants in terms of health effects. Maximum long-term exposure can lead to a variety of health effects, from minor effects on respiratory sytstem to premature mortality. Since 1997, it is possible that over 45% of Europe's urban population has been exposed to concentrations of particulate matter in the atmosphere, above the EU limit set to protect human health; and it is possible that a proportion of up to 60% of it has been exposed to ozone levels execeeding the EU target. It is estimated that PM 2.5 (particulate matter) in air reduced the statistical life expactancy in the EU with more than eight months.

3.3. Public information

3.3.1. Introduction

Transparence and public participation in the processes of decision making are recognized at the same time with the adoption of the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention). Both Romania and Bulgaria are parties of this Convention.

Knowing the way of accessing the information on air quality, its use in the corresponding context is not only a right, but also an obligation of citizen.

Romanian constitution recognizes the right to a healthy and clean environment.

Information on air state and quality is a component of the information of public interest, the access to it being guaranteed by:

- Romanian constitution, which at article 31 specifies:

„Right to information:

(1) Person right to have access to any information of public interest cannot be restricted;

(2) Public authorities, according to their respective powers, are obliged to assure the correct information of citizens on the public affairs and on personal problems”.

- Constitution of Bulgarian republic which, in article 41, stipulates the person right to have access to information.

3.3.2. Legislative framework

For assuring the mission of surveying air quality, the bodies responsible for this activity have a network of continuous measurement stations and may implement, if necessary, fixed means for temporary measurements.

3.3.2.1. European framework regarding public information

3.3.2.1.1. Aarhus Convention- Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters

UNECE convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters was adopted on 25 June 1998, in the Danish city Aarhus (Århus) at the fourth Ministerial Conference, as a part of the process "Environment for Europe". It entered into force on 30 October 2001.

Aarhus convention sets a lot of rights of the public (individuals and their associations) regarding the environment. The parties participating in the convention adopt the necessary provisions so as the public authorities (at national, regional or local level) to contribute to these rights for making them efficient. The convention provides:

- any person’s right to receive environmental information which is held by public authorities ("access to environmental information");
- right to participate in making environmental decisions;
- right to revise the procedures for contesting the public decisions which have been made without observing the two rights mentioned above or the environmental right in general ("access to justice").

Public information is not explicitly mentioned within the **Convention on Long-range Transboundary Air Pollution**, but its respective protocols take into account the public participation**:**

Aarhus protocol on Heavy Metals:

Article 4 – *Exchange of information and technology* provides the following:

- according to their own laws, regulations and practices, the parties must create conditions favorable to the exchanges of techniques and technology for reducing the heavy metal emissions, inclusively but not exclusively, for developing measures for product management and applying the best available technique, promoting especially:

  - commercial exchange of available technology;
  - direct contacts and cooperation at industrial level, joint ventures inclusively;
  - exchange of information and expertise;
  - assurance of technical assistance.

- in promoting the activities specified at paragraph (I), the parties should create favorable conditions by facilitating the contacts and cooperation between organizations and competent persons from public and private sectors, able to assure technologies, designing and engineering services, equipment or financial means.

Aarhus protocol on Persistent Organic Pollutants

Article 6 –*Public awareness*

In accordance with their own laws, regulations and practices, the parties must promote the information dissemination to general public, to those who are not direct users of persistent organic pollutant, inclusively.

Gothenburg protocol to Abate Acidification, Eutrophication and Ground-level Ozone:

Article 5 –*Public awareness* provides the following:

- each party, by acting according to its laws, regulations and practices, will support supplying information to general public, including information on:

  - national yearly emissions of sulfur, nitrogen oxides, ammonia and volatile organic compounds;

- advances with a view to complying to national emission ceiling or other obligations mentioned at Article 3;
- sediments and concentrations of those pollutants and, where appropriate, their sediments and concentrations related to the critical levels and content mentioned at Article 2;
- concentration of ground level ozone;
- strategies and applied measures, or measures going to be applied for alleviating the atmospheric pollution problems approached in this protocol and exposed in Article 6;

- besides, for reducing as much as possible the emissions, any party may act so as the general public has wide access to information on:

- less polluting fuels and combustibles, renewable energy sources and their energy efficiency, their use in transport sector inclusively;
- volatile organic compounds contained in products, their marking inclusively;
- options for managing the waste containing volatile organic compounds which are produced by the consumers;
- non polluting agricultural practices with a view to reducing the ammonia emissions;
- effects on health and environment associated to the pollutants covered by this Protocol;
- measures the enterprises and individuals can take for supporting the reduction of the pollutant emissions mentioned in this Protocol.

Framework Directive 2008/50/CE specifies the ways of informing the public and the information content.

These provide especially that the State should disseminate de information on SO2, NOx, particulates, lead, CO, benzene, ozone, certain heavy metals and certain HAPs to:

- public;
- environmental protection bodies;
- consumer associations ;
- bodies which represent the interests of sensitive persons and of heath-care bodies.

Member States assure themselves that the public and interested bodies are systematically and adequately informed on the pollutant concentrations from ambient air which are covered by the directive. In case of exceeding the alert thresholds and the possible informing thresholds, the Member States make available for the public:

- information on the exceedance or the observed exceedances (exceedance point or area, type of exceeded threshold, exceedance moment and duration, the highest concentration observed);
- prognoses for the next hours and days;
- information on the population group exposed, possible effects on health and recommended precaution measures;
- information on the actions for preventing and reducing the emissions.

Besides, the Member States put yearly reports referring to all the pollutants covered by the directive at the pubic disposal.

3.3.2.2. Public information in Romania

Romania has ratified the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters by the Law no. 86/2000, and the Aarchus protocol on Heavy Metals, Aarhus protocol on Persistent Organic Pollutants and Gothenburg protocol to Abate Acidification, Eutrophication and Ground-level Ozone by the Law 271/2003.

Environment Protection Law no. 265/2006, republished with modifications, stipulates in Art 6 that the state recognizes to *any person the right to a healthy and ecologically balanced environment,* guaranteeing for this purpose the *access to environmental information*, with the observance on the confidentiality conditions provided by the legislation in force and *the right to address*, directly or by means of the organizations for environment protection, administrative and/or judicial authorities, as appropriate, in environmental problems, irrespective if a prejudice occurred or not.

Decision no. 878/2005 regarding public access to environmental information assures the right of access to the environmental information held by or for the public authorities and establishes the conditions, basic terms and ways of exerting this right. Environmental information is progressively disseminated and put at the public disposal for achieving the widest and systematic accessibility and dissemination of this information. With a view to reaching the proposed goal, the use of electronic technology and/or computerized telecommunication is especially promoted.

Law 104/2011 on ambient air quality, at CHAPTER V: Public information, *Article 62 2* provides that public authorities for environment protection should assure public information, also the information of interested organizations, such as: environment protection organizations, consumer protection organizations, organizations representing the interest of some sensitive groups of population, other relevant bodies from healthcare field and relevant industrial organizations, adequately and in time. Moreover, in the same article it is provided that information is put at the public disposal for free, by means of any easily accessible media, internet inclusively or other adequate telecommunication means, and takes into account the provisions of Government Ordinance no.4/2010 regarding the establishment of national infrastructure for spatial information in Romania, approved with modifications by the Law no. 190/2010.

Article 63 provides that the territorial public authority for environment protection organized at county level and at Bucharest level makes available to the public, yearly, until 30 March, the report on ambient air quality for the previous year, with reference to all pollutants which are covered by this law.

Article 64 provides that if the information threshold or any of the alert thresholds provided at letter E from Annex no.3 are exceeded, the territorial public authority for environment protection organized at county level or at Bucharest level informs the public by mass media or internet.

Article 65 provides the following:

- information on ambient air quality is a public one, if it is not covered by the provisions of other normative documents for information protection.
- all the public authorities are obliged to assure the access to information and the public participation in making decisions in this field, under the conditions and terms provided by the laws in force.
- central public authority for environment protection informs the public on the authorities and bodies with duties and responsibilities for assessing and managing the ambient air quality.

Article 66 provides that all information supplied to the public should be clear, intelligible and accessible.

3.3.2.3. Public information in Bulgaria

Bulgaria has ratified:

- Aarhus Protocol on Long-Range Transboundary Air Pollution on Persistent Organic Pollutants in 2001 (State Gazette No 42/ 27 April 2001);
- Aarhus Protocol on Long-Range Transboundary Air Pollution on Heavy Metals in 2003 (State Gazette No 88/ 7 October 2003);
- Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone in 2005 (State Gazette No 38/ 3 May 2005)

Clean Air Act *Prom. SG. 45/28 May 1996 amend. SG. 6/23 Jan 2009:* The goal of this law is to protect the people's and their generation's health, the animals and the plants, their communities and places of habitation, the natural and cultural values from harmful effects, as well as to ward off dangers and damages to society, resulting from changes in the quality of the atmospheric air, due to various activities.

Law on Access to Public Information (State Gazette No 55/7.07.2000 amended SG No.104/05.12.2008). This act shall regulate the social relations relating to the access to public information, as well as re-use of public sector information. Public sector information shall be any kind of information materialized on paper, electronic or other carrier, including if it was held as audio or video record, and collected or generated by a public sector organization.

***Regulation no 7 from 3 May 1999 on ambient air quality assessment and management*, *Chapter Seven: Population information*,** provides the following:

Article. 37.(1)- The Ministry of Environment and Water together with the regional Environmental Inspectorates shall ensure that the lists referred to in article 30 are made available to the public in accordance with the relevant provisions of article 23 of the Clean Air Act.

Article 38 The Ministry of Environment and Water together with the regional Environmental Inspectorates shall disseminate within the population adequate information on the ambient air quality concerning the levels of the different pollutants in accordance with the specific provisions established on grounds of article 6 of the Clean Air Act.

Article 39 provides the following:

- when the alert thresholds are exceeded the corresponding competent authorities according to article 19 of the Clean Air Act, within their sphere of competence, shall undertake the necessary measures in order to inform the population in the affected areas by means of radio, television and the press, etc.
- the information which is presented to the population in order to comply with the provisions of the above paragraph shall be determined by the minister of environment and water and the minister of health depending on the type of individual pollutants.

3.3.3. Manners and Instruments for Public Information

A key problem approached in this section is that of the links between different information sources and the public as information receiver.

Dissemination of information on air quality is achieved on two levels:

- on one side, at local level, by APMs in Romania and RIEWs in Bulgaria;
- on the other side, at national level, so:
  a) in Romania, by ANPM, in partnership with the Ministry of Environment and Sustainable Development;
  b) in Bulgaria, by the Ministry of Environment and Water, in partnership with the Executive Agency for Environment.

Locally, many supports for information dissemination are created:

- real time information by means of some outdoor and indoor panels containing different messages. The outdoor panels (Figure 1) are located in the densely populated zones, and the indoor ones (Figure 2) are located in the City halls.
- real time information on a web page (Figure 3 and Figure 4);
- information in print media, on-line media, radio and television.
- dissemination of balances allowing to notice the air quality in each county, district respectively, by interpreting the measurement results, even giving advices on the behavior and health and being focused on limiting the impact of each source on air quality and individual exposure to those values.

At present, some APMs disseminate data (in general monthly), but there is a high need to adapt the information both to European requirements and to the decision makers at local level.

Figure 1- Outdoor panel

Figure 2 - Indoor panel

Figure 3 - Example of on-line information on air quality in Mehedinţi county

Figure 4 - Example of on-line information of air quality in the district Veliko Tarnovo (web page of RIEW- Veliko Tarnovo)

3.3.3.1. Useful addresses

Below there are presented the most important internet addresses from where population may get useful information on air quality.

Romania: **www.anpm.ro; www.calitateaer.ro**

Bulgaria: **www.eea.goverment.bg; www.emas-bulgaria.com; www.riosv-varna.org; www.vracakarst.com; www.riosvt.org; www.riosv-montana.com; www.riosv-ruse.org**

European Union: **www.emep.int; www.ceip.at; www.eea.europa.eu www.unece.org/env/lrtap/welcome.html; www.eionet.europa.eu http://webdab1.umweltbundesamt.at/scaled_country_year.html**

CHAPTER 4

AIR QUALITY MONITORING NETWORKS AND STATIONS IN ROMANIA-BULGARIA CROSS-BORDER AREA

4.1. AIR QUALITY MONITORING STATIONS AND NETWORKS IN ROMANIA

4.1.1. National System for Air Quality Assessment and Integrated Management in Romania

The responsibility for environmental air quality monitoring in Romania rests upon the authorities for environmental protection, in accordance with the provisions of the Law no.104/2011 on environmental air quality.

The National Agency for Environment Protection (NAEP) is the specialized institution of the central public administration, under the subordination of the Ministry of Environment and Forests, with competences in implementing the policies and legislation from environmental protection field, conferred on the basis of Government Decision no. 918/30.08.2010 on the re-organization and functioning of the National Agency for Environment Protection and of the public institutions under its subordination.

NAEP is designed to act for assuring a healthy environment to the people, in harmony with economic development and social progress in Romania. The mission of the national agency, also of other 8 regional agencies and 34 county agencies which are under its direct subordination, is to provide a better environment in Romania for the present and future generations and to achierve some major and continuous improvements of air, soil and water quality.

National System for Air Quality Assessment and Integrated Management (NSAQIM), under NAEP coordination, provides the organizational, institutional and legal framework for cooperation between public authorities and institutions with competences in the field, in order to assess and manage the environmental air quality, unitarily on the entire Romanian territory, also to inform the population and European and international bodies on the environmental air quality.

The national system for air quality assessment and integrated management includes:

- National system for air quality monitoring (NSAQM)

- National system for the inventory of atmospheric pollutant emissions (NSIAPE).

The information provided by the two sub-systems, NSAQM and NSIAPE, are integrated by the Air Quality Assessment Center (AQAC), in accordance with the national and international requirements in the field of air quality assessment and management.

NSAQM assures the environmental air quality monitoring through the National Network for Air Quality Monitoring (NNAQM), unit of national public interest, under the administration of the public central authority for environmental protection.

The monitored pollutants, measurement methods, limit values, alert and information thresholds and the criteria for locating the monitoring points are set by the national laws on atmosphere protection, complying with the requirements provided by European regulations.

The monitoring system allows the local authorities for environmental protection to:

- assess, know and inform permanently the public, other interested authorities and institutions, on the air quality level;

- take timely, prompt actions for diminishing and/or removing the pollution episodes or in case of emergencies;

- prevent the accidental pollution;

- warn and protect people in case of emergency.

At present, in Romania there are located 142 stations for the continuous air quality monitoring, equipped with automatic equipment for measuring the concentrations of the main atmospheric pollutants:

- 24 stations of traffic type;
- 57 stations of industrial type;
- 37 stations of urban background type;
- 15 stations of suburban background type;
- 6 stations of regional background type;
- 3 of EMEP type.

The main monitored atmospheric pollutants for which continuous measurements are performed are: sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), particulate matter (PM 10 and PM 2.5), benzene (C_6H_6), lead (Pb). Air quality in each station is represented by suggestive quality indicators, set on the basis of the concentration values for the main measured atmospheric pollutants.

A monitoring station provides air quality data which are representative for certain area around the station. The area in which the concentration does not differ from the concentration measured at station by more than a "specified quantity" (± 20%) is called „area of representativeness".

Station of traffic type

- assesses traffic influence on air quality;
- radius of the area of representativeness is 10-100m;
- monitored pollutants are sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), volatile organic compounds (VOC) and particulate matter (PM 10 and PM 2.5).

Station of industrial type

- assesses the industrial activity influences on air quality;
- radius of the area of representativeness is 100m-1km;
- monitored pollutants are sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), volatile organic compounds (VOC), particulate matter (PM 10 and PM 2.5) and meteorological parameters (wind direction and speed, pressure, temperature, solar radiation, relative humidity, precipitations).

Station of urban type

- assesses the "human settlements" influence on air quality;
- radius of the area of representativeness is 1-5 km;
- monitored pollutants are sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), volatile organic compounds (VOC), particulate matter (PM 10 and PM 2.5) and meteorological parameters (wind direction and speed, pressure, temperature, solar radiation, relative humidity, precipitations).

Station of suburban type

- assesses the "human settlements" influence on air quality;
- radius of the area of representativeness is 1-5 km;
- monitored pollutants are sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), volatile organic compounds (VOC), particulate matter (PM 10 and PM 2.5) and meteorological parameters (wind direction and speed, pressure, temperature, solar radiation, relative humidity, precipitations).

Station of regional type

- is reference station for air quality assessment;

- radius of the area of representativeness is 200-500km;

- monitored pollutants are sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), volatile organic compounds (VOC), particulate matter (PM 10 and PM 2.5) and meteorological parameters (wind direction and speed, pressure, temperature, solar radiation, relative humidity, precipitations).

Station of EMEP type

-monitors and assesses air pollution within cross-border context on long distances;

-is located in mountain area, at average altitude: Fundata, Semenic and Poiana Stampei;

- monitored pollutants are sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), volatile organic compounds (VOC), particulate matter (PM 10 and PM 2.5) and meteorological parameters (wind direction and speed, pressure, temperature, solar radiation, relative humidity, precipitations).

4.1.1.1. Data circuit

Information on air quality coming from the 142 monitoring stations and meteorological data received from the 119 monitoring stations are transmitted to Local Centers from the 41 Agencies for Environmental Protection.

The national network for air quality monitoring centralizes at present the data from the stations spread throughout Romanian territory. The stations are ascribed to the 41 Local Centers of the County Agencies for Environmental Protection.

The values measured on-line by the sensors of the analyzers installed within the stations are transmitted through GPRS to the local centers. These are interconnected, forming a network which contains also the central servers, where all the data arrive and from where they are made known in real time to the public, by means of the site www.calitateaer.ro, public displaying panels located in big cities and also by the informing points placed in city halls. After the primary validation within the Local Centers, data are transmitted for certification to the National Reference Laboratory for Air Quality (NRLAQ) within the framework of the National Agency for Environment Protection.

For informing as promptly as possible the public, the presented data are those ones transmitted on-line by the sensors of the analyzers from stations (raw data). So, the values must be considered provided that they are in fact only automatically validated (by software), following to be manually validated by the specialists at local centers, and subsequently to be centrally certified.

The central database stores and archives both raw data and the valid and certified ones. The specialists access these data both for different studies and for transmitting the Romania reports to the European forums.

Data on air quality coming from stations are presented to the public by means of some outdoor panel (conventionally located in the densely populated zones of the cities) and by means of some indoor panels (located in City Halls).

At national level, there are 107 points for informing the public (48 outdoor panel and 59 indoor panels).

On the area from the border with Bulgaria there are located 29 stations for monitoring the air quality:

Table 4.1 - Automatic stations for air quality monitoring located in Romania, in the counties from the Romania Bulgaria cross-border area

Name of the County Environmental Agency	Number of automatic stations for air quality monitoring
County Agency for Environmental Protection - Mehedinţi	1
County Agency for Environmental Protection - Dolj	5
County Agency for Environmental Protection - Olt	1
County Agency for Environmental Protection - Teleorman	5 (3 of DOAS type)
County Agency for Environmental Protection - Giurgiu	6 (2 of DOAS type)
County Agency for Environmental Protection - Calaraşi	4 (2 of DOAS type)
County Agency for Environmental Protection - Constanţa	7

During 2012, within the project "***Joint monitoring for emergencies in the Danube cross border area***", data centralizers regarding the equipment from the endowment of all the stations mentioned above were drawn up.

4.1.2 Air quality monitoring stations existing in the Romanian counties located near the Bulgarian border

4.1.2.1 MEHEDINŢI County

In Mehedinți County there is one monitoring station (Figure 4.1):

- MH-1 - Industrial 1

Figure 4.1 - Representation of the air quality monitoring stations in Mehedinti County

Figure 4.2 - Station MH-1- Industrial 1, located at Băile Romane street, no.3, Drobeta Turnu Severin

Figure 4.3 - Coordinates of the Station MH-1 - Industrial 1

Station address: Băile Romane street, no.3, Drobeta Turnu Severin, Mehedinti County
Station code: RO-MH-1; RO0166A
Location (geographic coordinates, altitude):
Latitude: 44.627491^0; Longitude: 22.694171^0; Altitude: 69 m
Latitude: 44° 37' 38.967"; Longitude: 22° 41' 39.0156"; Altitude: 69 m
Year of commissioning: 2009

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observa-tions
Industrial	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemilumines-cence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Dust analyzer, model LSPM10 Producer: UNITEC, Italy	
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	X	Orthogonal nephelometry SR EN 14907:2006	Dust analyzer, model LSPM10 Producer: UNITEC, Italy	
			Gravimetric SR EN 14907:2006	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C6H6)	X	Gas chromatography SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.2 DOLJ County

In Dolj County there are five monitoring stations (Figure 4.4):

- DJ-1;
- DJ-2;
- DJ-3;
- DJ-4;
- DJ-5.

Figure 4.4 - Representation of the air quality monitoring stations in Dolj County

4.1.2.2.1 Station DJ-1

Figure 4.5 - Station DJ-1, located in Calea Bucureşti street, Craiova

Figure 4.6 - Coordinates of the Station DJ-1

Station address: Calea Bucureşti street, Craiova, Dolj County
Station code: RO-DJ-1; RO0078A
Location (geographic coordinates, altitude):
Latitude: 44.31857^0; Longitude: 23.80624^0; Altitude: 110 m
Latitude: 44° 19' 6.85"; Longitudine: 23° 48' 22.46"; Altitude: 110 m
Year of commissioning: 2005 with data since 2006

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observa-tions
Traffic	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Dust analyzer, model LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observa-tions
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	–			
	Benzene (C6H6)	X	Gas chromatography SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.2.2 Station DJ-2

Figure 4.7 - Station DJ-2, located in A.I. Cuza street, City Hall, Craiova

Figura 4.8 - Coordinates of Station DJ-2

Station address: A.I. Cuza street, City Hall, Craiova, Dolj County
Station code: RO-DJ-2; RO0079A
Location (geographic coordinates, altitude):
Latitude: 44.31914^0; Longitude: 23.79671^0; Altitude: 100 m
Latitude: 44° 19' 8.90"; Longitude: 23° 47' 48.15"; Altitude: 100 m
Year of commissioning: 2005 with data since 2006

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B P Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	–			
	PM2.5	X	Gravimetric SR EN 14907:2006	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	Carbon monoxide (CO)	X	Non dispersive infrared spectrometry (NDIR SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O_3)	–			
	Benzene (C_6H_6)	X	Gas chromatography SR EN 14662-1:2006; SR EN 14662-2:2006; SR EN 14662-3:2006	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.2.3 Station DJ-3

Figure 4.9 - Station DJ-3, located in Maria Tănase street, BILLA, Craiova

Figure 4.10 - Coordinates of the Station DJ-3

Station address: Maria Tanase street, BILLA, Craiova, Judetul Dolj
Station code: RO-DJ-3; RO0080A
Location (geographic coordinates, altitude):
Latitude: 44.32677^0; Longitude: 23.77869^0; Altitude: 85 m
Latitude: 44° 19' 36.37"; Longitude: 23° 46' 43.28"; Altitude: 85 m
Year of commissioning: 2005 with data since 2006

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Indus-trial	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemilumines-cence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Dust analyzer model LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	–			
	Ozone (O_3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C_6H_6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.2.4 Station DJ-4

Figure 4.11 - Station DJ-4 located in Isalnita village, Dolj County

Figure 4.12 - Coordinates of Station DJ-4

Station address: Isalnita village, Dolj County
Station code: RO-DJ-4; RO0081A
Location (geographic coordinates, altitude):
Latitude: 44.38656^0; Longitude: 23.73366^0; Altitude: 98 m
Latitude: 44° 23' 11.61"; Longitude: 23° 44' 1.17"; Altitude: 98 m
Year of commissioning: 2005 with data since 2006

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Industrial	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemilumines-cence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Dust analyzer model LSPM10 Producer: UNITEC, Italy	

			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	–			
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.2.5 Station DJ-5

Figure 4.13 - Station DJ-5 located in Brestei street, FN, Breasta, Dolj County

Figure 4.14 - Coordinates of Station DJ-5

Station address: Brestei street, FN, Breasta, Dolj County

Station code: RO-DJ-5; RO0082A
Location (geographic coordinates, altitude):
Latitude: 44.34223^0; Longitude: 23.71962^0; Altitude: 80 m
Latitude: 44° 20' 32.03"; Longitude: 23° 43' 10.63"; Altitude: 80 m
Year of commissioning: 2005 with data since 2006

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Regional	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemilumines-cence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Dust analyzer model LSPM10 Producer: UNITEC, Italy	

			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide (CO)	X	Non dispersive infrared spectrometry (NDIR SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.3 OLT County

In Olt County, there is one center for public information and one monitoring station (Figure 4.15):

- OT-1

Figure 4.15 - Representation of the air quality monitoring stations in Olt County

Station OT-1

Figure 4.16 - Station Industrial 1, located at Dealul Gradiste, Slatina

Figure 4.17 - Coordinates of Station OT-1

Station address: Dealul Gradiste, Slatina, Olt County
Station code: RO-OT-1; RO0174A
Location (geographic coordinates, altitude):
Latitude: 44.42944^0; Longitude: 24.35111^0; Altitude: 169 m
Latitude: 44° 25' 45.9834"; Longitude: 24° 21' 3.9954"; Altitude: 169 m
Year of commissioning: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Industrial	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)				
	PM10	X	Orthogonal	Dust analyzer model LSPM10	

			nephelometry SR EN 12341:2008	Producer: UNITEC, Italy	
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide (CO)	X	Non dispersive infrared spectrometry (NDIR SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.4 TELEORMAN County

In Teleorman County there are five monitoring stations, among which three are automatic stations of DOAS type (Figure 4.18):

- TR-T1 - Turnu Măgurele City Hall – automatic station of DOAS type;
- TR-T2 - Cribs- automatic station of DOAS type;
- TR-Z1 - Zimnicea City Hall - automatic station of DOAS type;
- TR-1;
- TR-2;

Figure 4.18 - Representation of the air quality monitoring stations in Teleorman County

4.1.2.4.1 Station TR-T1 - Turnu Măgurele City Hall- automatic station of DOAS type

Figure 4.19 - Images from Station TR-T1 located at Turnu Măgurele City Hall

Figure 4.20 - Coordinates of Station TR-T1

Station address: Turnu Magurele City Hall, Teleorman County
Station code: TR-T1; RO0062A
Location (geographic coordinates, altitude):
Latitude: 43.747222^0; Longitude: 24.870836^0; Altitude: 28m
Latitude: 43°44' 50"; Longitude: 24°52'15.01"; Altitude: 28m
Year of commissioning: 2003
Year of operation cessation: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO_2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	Height of the sampling point: 18 m Calibration: manual and automatic type
	Nitrogen monoxide (NO)				
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			
	Hydrogen sulfide (H2S)	X	Ultraviolet fluorescence	Analyzer SO2 ML 9850B Converter CV 2000 G Producer: Monitor Europe Ltd, Great Britain	Converter achieves the H2S thermal conversion to SO2
	Ammonia (NH3)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	

4.1.2.4.2 Station TR-T2 - Cribs – automatic station of DOAS type

Figure 4.21 - Images from the Station TR-T2 located inside the water pumping station, 1.5 km west of S.C. Donau Chem S.R.L., Turnu Măgurele

Figure 4.22 - Coordinates of Station TR-T1

Station address: inside the water pumping station, 1.5 km west of SC Donau Chem SRL – Turnu Măgurele, Teleorman County
Station code: TR-T2; RO0063A
Location (geographic coordinates, altitude):
Latitude: 43.713889^{0}; Longitude: 24.886114^{0}; Altitude: 20 m
Latitude: 43 °42' 50"; Longitude: 24° 53' 10,01"; Altitude: 20 m
Year of commissioning: 2003
Year of operation cessation: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Industrial	Sulphur dioxide (SO2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	Height of the sampling point: 5m Calibration: manual and automatic type
	Nitrogen monoxide (NO)	X			
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	
	PM2.5	–			
	Carbon monoxide(CO)	–			
	Ozone (O3)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			
	Ammonia (NH3)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	

4.1.2.4.3 Station TR-Z1 - Zimnicea City Hall – automatic station of DOAS type

Figure 4.23 - Images from the Station TR-Z1 located in Primăria Zimnicea street, Zimnicea

Figura 4.24 - Coordinates of Station TR-Z1

Station address: at the City Hall of Zimnicea; Teleorman County
Station code: TR-Z1; RO0064A
Location (geographic coordinates, altitude):
Latitude: 43.655556^0; Longitude: 25.370836^0; Altitude: 31 m
Latitude: 43°39' 20.00"; Longitude: 25°22'15.01"; Altitude: 31 m
Year of commissioning: 2003
Year of operation cessation: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO_2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	Height of the sampling point: 20m Calibration: manual and automatic type
	Nitrogen monoxide (NO)	X			
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O_3)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	
	Benzene (C_6H_6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			
	Hydrogen sulfide (H_2S)	X	Ultraviolet fluorescence	Analyzer SO_2 ML 9850B Converter CV 2000 G Producer: Monitor Europe Ltd, Great Britain	Converter achieves the H_2S thermal conversion to SO_2
	Carbon disulphide (CS_2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	

4.1.2.4.4 Station TR-1

Figure 4.25 - Station TR-1 located in Dunării street, No.1, Alexandria

Figure 4.26 - Coordinates of Station TR-1

Station address: APM Teleorman headquarters, Dunarii street , No. 1, Alexandria, Teleorman County
Station code: RO-TR-1; RO0191A
Location (geographic coordinates, altitude):
Latitude: 43.98033^0; Longitude: 25.3124^0; Altitude: 41 m
Latitude: 43°58' 49.188"; Longitude: 25°18' 44.64"; Altitude: 41 m
Year of commissioning: 2010

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer MLU 43*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen monoxide (NO)	X	Chemilumines-cence SR EN 14211:2007	Analyzer MLU 42*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Dust analyzer, model LSPM10 Producer: UNITEC, Italy	
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer MLU 48*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer MLU 49*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Benzene (C6H6)	X	Gas chromatography SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.4.5 *Station TR-2*

Figure 4.27 - Station TR-2 located in Libertatii street, No.235bis, Turnu Magurele

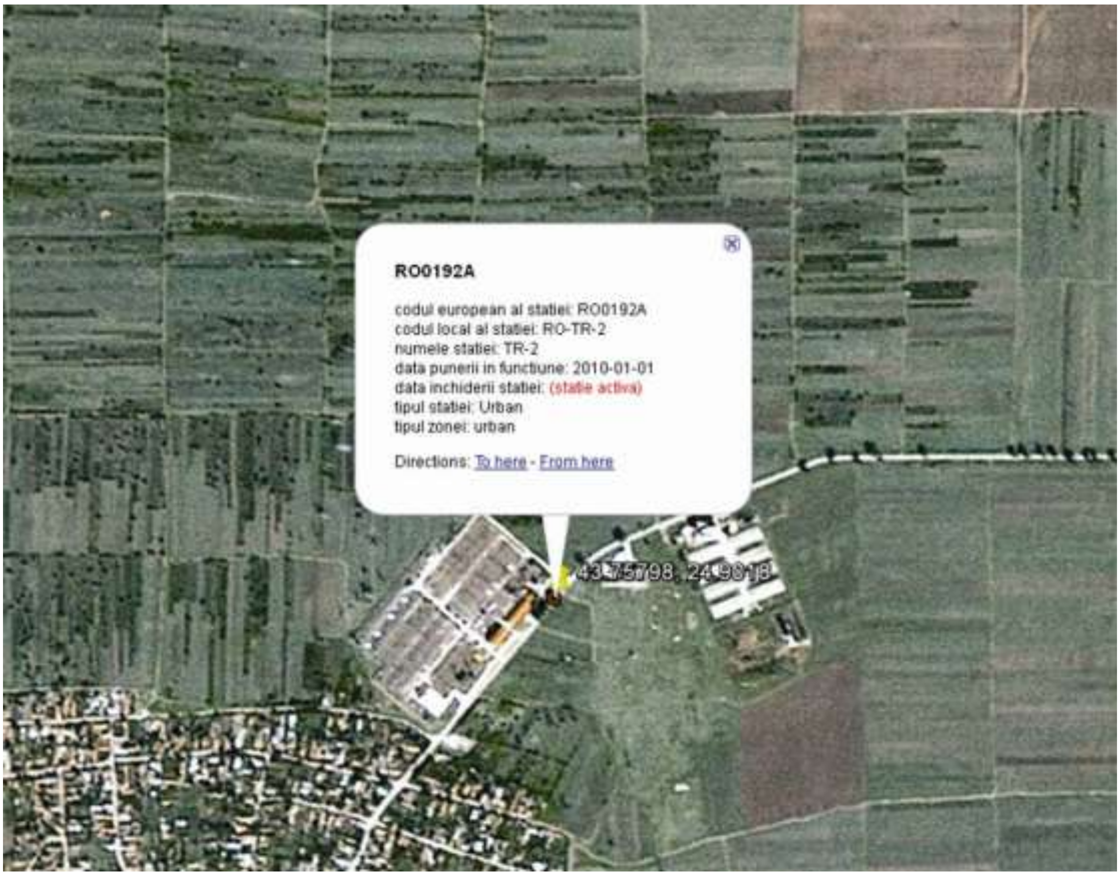


Figure 4.28 - Coordinates of Station TR-2

Station address: going out from Turnu Magurele, on DN 51A, Libertatii street, no. 235bis, Teleorman County
Station code: RO-TR2; RO0192A
Location (geographic coordinates, altitude):
Latitude: 43.75798^0; Longitude: 24.9018^0; Altitude: 31 m
Latitude: 43° 45' 28.728"; Longitude: 24° 54' 6.48"; Altitude: 31 m
Year of commissioning: 2010

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO_2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer MLU 43*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen monoxide (NO)	X	Chemilumines-cence SR EN 14211:2007	Analyzer MLU 42*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Dust analyzer, model LSPM10 Producer: UNITEC, Italy	
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer MLU 48*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Ozone (O_3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer MLU 49*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Benzene (C_6H_6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.5 GIURGIU County

In Giurgiu County there are six monitoring stations, two of them being automatic stations of DOAS type (Figure 4.29):

- G1 – APDF – automatic station of DOAS type;
- G2 - DGFP - automatic station of DOAS type;
- GR-1;
- GR-2;
- GR-3;
- GR-4;

Figura 4.29 - Representation of air quality monitoring stations in Giurgiu County

4.1.2.5.1 Station G1 - APDF – automatic station of DOAS type

Figura 4.30 - Station G1 - APDF located in the tower of the building of Fluvial Danube Ports Administration

Figure 4.31 - Coordinates of Station G1 - APDF

Station address: Giurgiu, the tower of the building of Fluvial Danube Ports Administration, Giurgiu County
Station code: G-1 – APDF
Location (geographic coordinates, altitude):
Latitude: 43.869521^{0}; Longitude: 25.964351^{0}; Altitude: 20 m
Latitude: 43° 52' 10.27"; Longitude: 25° 57' 51.66"; Altitude: 20 m
Year of commissioning: 2002

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Sub-urban	Sulphur dioxide (SO2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	Analyzer ML 9850B
	Nitrogen monoxide (NO)	X			
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	
	PM2.5	–			
	Carbon monoxide (CO)	X	Non dispersive infrared spectrometry	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.5.2 Station G-2 - DGFP - automatic station of DOAS type

Figure 4.32 - Station G-2 located in the building of General Direction of Public Finances - Giurgiu

Figure 4.33 - Coordinates of Station G-2 - DGFP

Station address: Giurgiu, headquarters of General Direction of Public Finances, Giurgiu County
Station code: G2 – DGFP
Location (geographic coordinates, altitude):
Latitude: 43.895548^0; Longitude: 25.96894^0; Altitude: 21 m
Latitude: 43° 53' 43.97"; Longitude: 25° 58' 8.18"; Altitude: 21 m
Year of commissioning: 2002

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO_2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	Analyzer ML 9850B
	Nitrogen monoxide (NO)	X			
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O_3)	X	Differential optical absorption	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			spectrometry		
	Benzene (C_6H_6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.5.3 Station GR-1

Figure 4.34 - Station GR-1 located at the entrance to Giurgiu, Calea Bucuresti street

Figure 4.35 - Coordinates of Station GR-1

Station address: at the entrance to Giurgiu, Calea Bucuresti street, Giurgiu County
Station code: RO-GR1; RO0058A
Location (geographic coordinates, altitude):
Latitude: 43.91143^{0}; Longitude: 25.972054^{0}; Altitude: 24 m
Latitude: 43° 54' 41.148"; Longitude: 25° 58' 19.3938"; Altitude: 24 m
Year of commissioning: 2003

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Traffic	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer MLU 43*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer MLU 42*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer MLU 48*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Ozone (O_3)	–			
	Benzene (C_6H_6)	X	Gas chromatography SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.5.4 Station GR-2

Figure 4.36 - Station GR-2 located in Elevilor Park, adjacent to Transilvania street, Road 1 Decembrie 1918, No. 12, Giurgiu

Figure 4.37 - Coordinates of Station GR-2

Station address: Giurgiu, Elevilor Park, adjacent to Transilvania street, Road 1 Decembrie 1918, no. 12, Giurgiu County
Station code: RO-GR2; RO0059A
Location (geographic coordinates, altitude):
Latitude: 43.894972^0, Longitudine: 25.957106^0, Altitudine: 22 m
Latitude: 43° 53' 41.89"; Longitudine: 25° 57' 25.58"; Altitudinea: 22 m
Year of commissioning: 2003

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer MLU 43*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer MLU 42*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer LSPM10 Producer: UNITEC, Italy	

			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer MLU 48*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer MLU 49*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Benzene (C6H6)	X	Gas chromato-graphy SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.5.5 Station GR-3

Figure 4.38 - Station GR-3 located in Sloboziei Road, headquarters of the meteorological station - Giurgiu

Figure 4.39 - Coordinates of Station GR-3

Station address: Sloboziei Road, headquarters of the meteorological station-Giurgiu, Giurgiu County
Station code: RO-GR-3; RO0209A
Location (geographic coordinates, altitude):
Latitude: 43.87544^0; Longitude: 25.93178^0; Altitude: 24 m
Latitude: 43° 52' 31.58"; Longitude: 25° 55' 54.4"; Altitude: 24 m
Year of commissioning: 2009

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Industrial	Sulphur dioxide (SO_2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer MLU 43*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer MLU 42*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer LSPM10 Producer: UNITEC, Italy	
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	X	Orthogonal nephelometry SR EN 14907:2006	Particulate matter analyzer LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 14907:2006	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer MLU 48*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Ozone (O_3)	–			
	Benzene (C_6H_6)	–			
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.5.6 Station GR-4

Figura 4.40 - Station GR-4 located in Branistea hamlet, Oinacu village, Giurgiu County

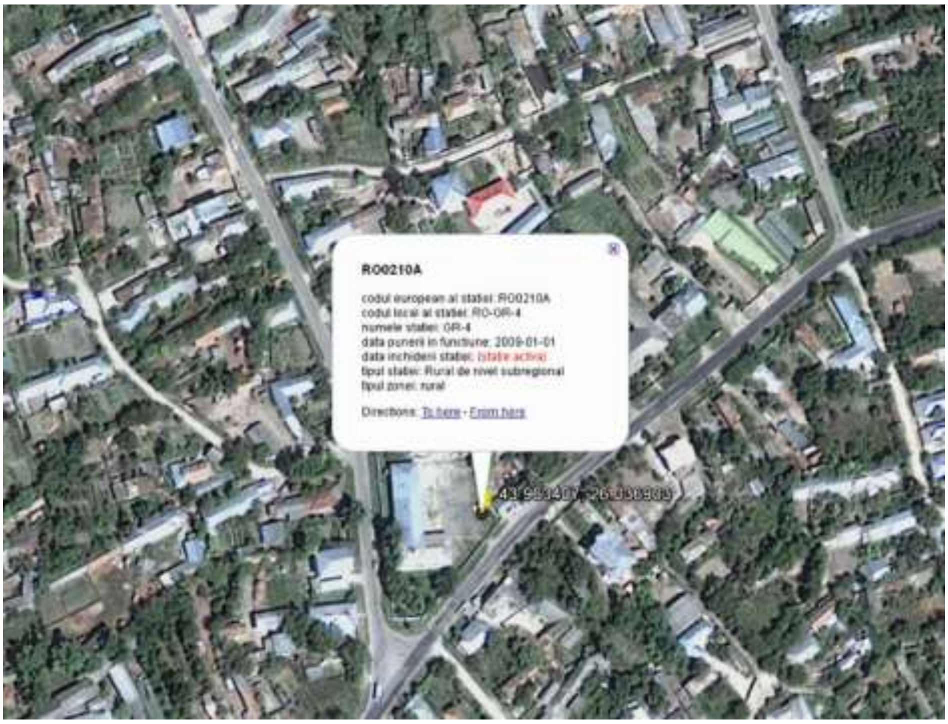


Figure 4.41 - Coordinates of Station GR-4

Station address: Braniștea hamlet, Oinacu village, Giurgiu County
Station code: RO-GR4; RO0210A
Location (geographic coordinates, altitude):
Latitude: 43.963407^{0}; Longitude: 26.036903^{0}; Altitude: 20 m
Latitude: 43° 57' 48.26"; Longitude: 26° 2' 12.85"; Altitude: 20 m
Year of commissioning: 2009

<table>
<tr><th>Station type</th><th colspan="2">Monitored pollutants</th><th>Reference method</th><th>Equipment/Producer</th><th>Observations</th></tr>
<tr><td rowspan="6">Rural, of sub-regional level</td><td>Sulphur dioxide (SO_2)</td><td>X</td><td>Ultraviolet fluorescence SR EN 14212:2007</td><td>Analyzer MLU 43i
Producer: THERMO FISHER SCIENTIFIC, Netherlands</td><td></td></tr>
<tr><td>Nitrogen monoxide (NO)</td><td>X</td><td rowspan="3">Chemiluminescence SR EN 14211:2007</td><td rowspan="3">Analyzer MLU 42i
Producer: THERMO FISHER SCIENTIFIC, Netherlands</td><td rowspan="3"></td></tr>
<tr><td>Nitrogen dioxide (NO_2)</td><td>X</td></tr>
<tr><td>Nitrogen oxides (NO_x)</td><td>X</td></tr>
<tr><td rowspan="2">PM10</td><td rowspan="2">X</td><td>Orthogonal nephelometry SR EN 12341:2008</td><td>Particulate matter analyzer LSPM10
Producer: UNITEC, Italy</td><td></td></tr>
<tr><td>Gravimetric SR EN 12341:2008</td><td>Sequential sampler, model Sentinel TCR TECORA
Producer: TCR TECORA, Italy</td><td></td></tr>
</table>

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer MLU 48*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Ozone (O3)	–	Ultraviolet photometry SR EN 14625:2005	Analyzer MLU 49*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Benzene (C6H6)	–	Gas chromato graphy SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.6 CALARASI COUNTY

In Calarasi county there are four monitoring stations, two of them being automatic stations of DOAS type (Figure 4.42):

- C-1 - Chiciu - automatic stations of DOAS type;
- C-2 - DSV - automatic stations of DOAS type;
- CL-1;
- CL-2;

Figure 4.42 - Representation of air quality monitoring stations in Calarasi County

4.1.2.6.1 Station C-1 - Chiciu – automatic station of DOAS type

Figure 4.43 - Station C-1 located at Chiciu, at the border– Km 375 Danube, Calarasi County

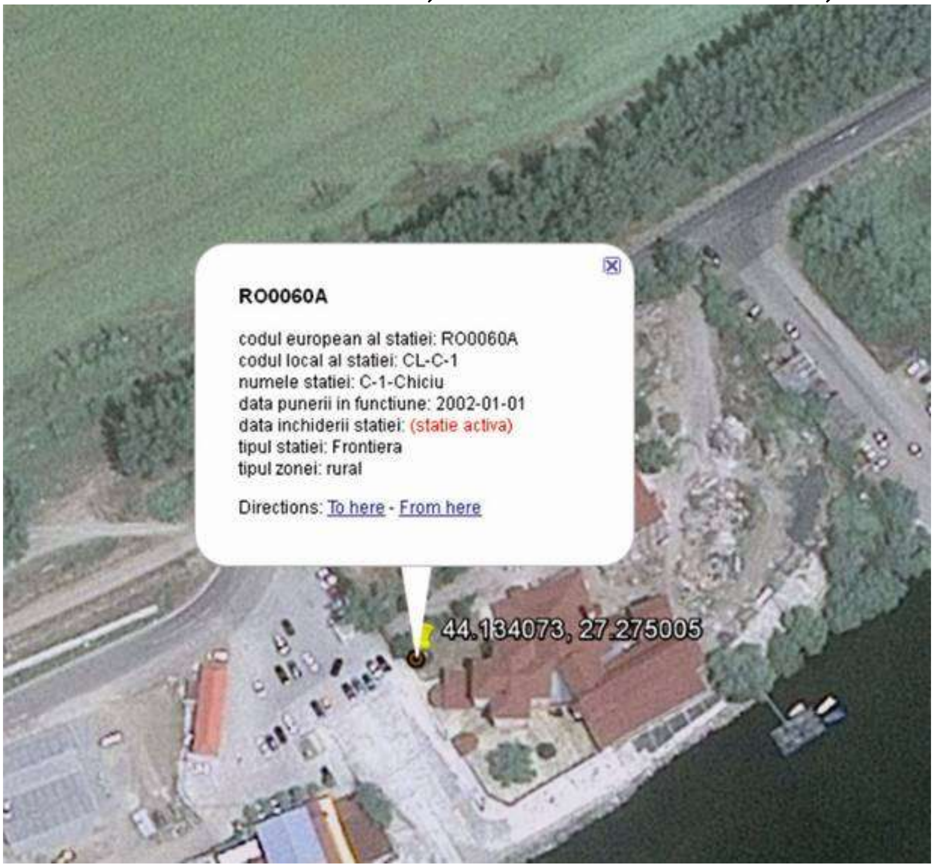


Figure 4.44 - Coordinates of Station C-1

Station address: Chiciu, at the border – Km 375 Danube, Calarasi, Calarasi County
Station code: CL-C-1; RO0060A
Location (geographic coordinates, altitude):
Latitude: 44.134073^{0}; Longitude: 27.27005^{0}; Altitude: 10 m
Latitude: 44° 8' 2.6628"; Longitude: 27° 16' 30.02"; Altitude: 10 m
Year of commissioning: 2002

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Border	Sulphur dioxide (SO2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	Analyzer ML 9850B
	Nitrogen monoxide (NO)	X			
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	
	PM2.5	–			
	Carbon monoxide (CO)	X			
	Ozone (O3)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.6.2 Station C-2 - DSV – automatic station of DOAS type

Figure 4.45 - Station C-2 located at SVD (Sanitary Veterinary Directorate), Prelungirea Dobrogei street, No. 4, Calarasi

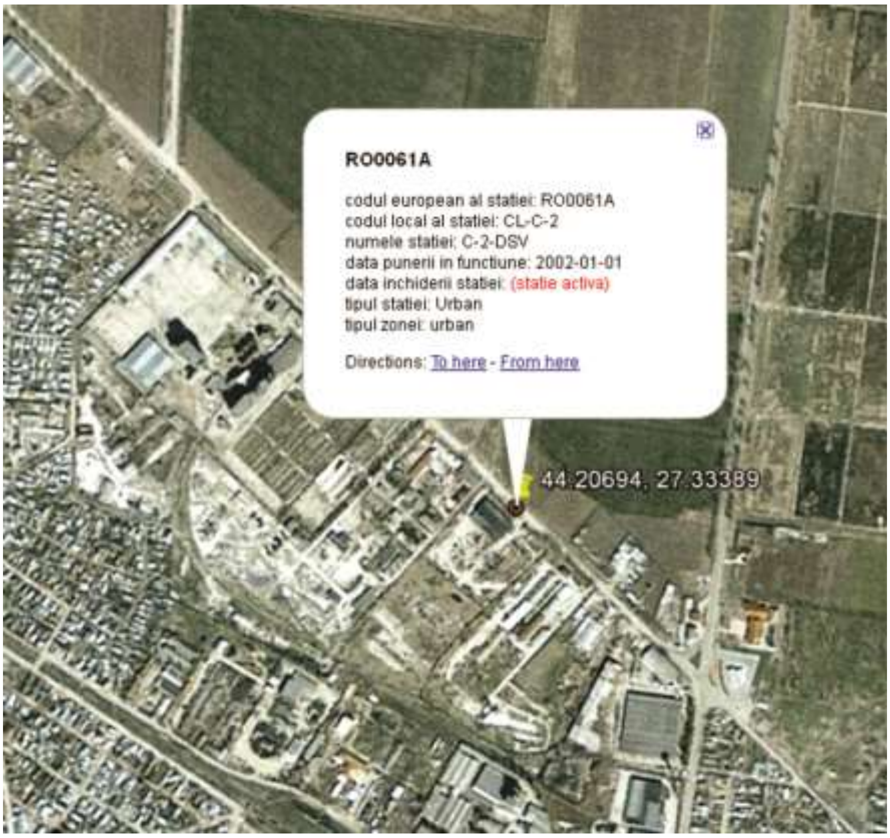


Figura 4.46 - Coordinates of Station C-2

Station address: SVD (Sanitary Veterinary Directorate), Prelungirea Dobrogei street, No. 4, Calarasi, Calarasi County
Station code: CL-C-2; RO0061A
Location (geographic coordinates, altitude):
Latitude: 44.20694^0; Longitude: 27.33389^0; Altitude: 17 m
Latitude: 44° 12' 25"; Longitude: 27° 20' 2"; Altitude: 17 m
Year of commissioning: 2002

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	Analyzer ML 9850B
	Nitrogen monoxide (NO)	X			
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	PM2.5	–			
	Carbon monoxide (CO)	–			
	Ozone (O_3)	X	Differential optical absorption spectro-metry	System DOAS OPSIS AR500 Producer: Opsis AB, Sweden	
	Benzene (C_6H_6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.6.3 Station CL-1

Figure 4.47 - Station CL-1 located in Prelungirea Bucureşti street, (Orizont area), Calarasi

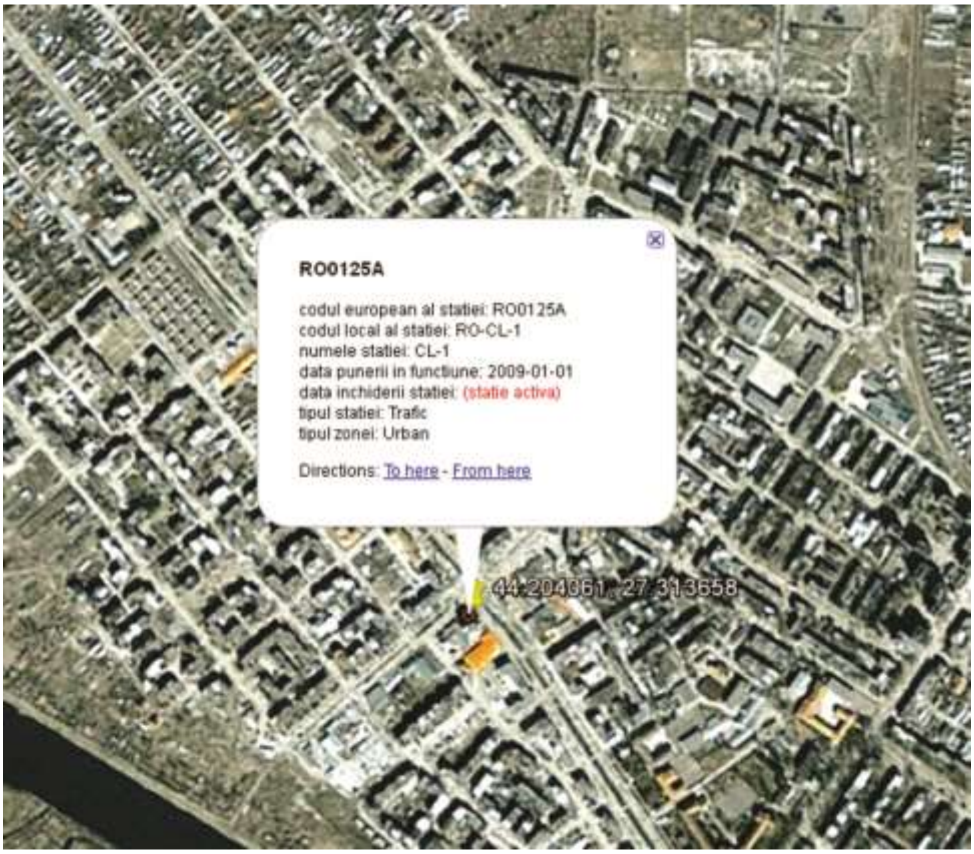


Figure 4.48 - Coordinates of Station CL-1

Station address: Prelungirea Bucuresti street, (Orizont area), Calarasi, Calarasi County
Station Code: RO-CL-1; RO0125A
Location (geographic coordinates, altitude):
Latitude: 44.204061^0; Longitude: 27.313658^0; Altitude: 18 m
Latitude: 44° 12' 14.62"; Longitude: 27° 18' 49.17"; Altitude: 18 m
Year of commissioning: 2009

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Traffic	Sulphur dioxide (SO_2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer MLU 43*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen monoxide (NO)	X			
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer, model LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide- (CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer MLU 48*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Ozone (O3)	–			
	Benzene (C6H6)	X	Gas chromato-graphy SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.6.4 Station CL-2

Figure 4.49 - Station CL-2 located in Tudor Vladimirescu street, No. 69, (Municipal Stadium area), Calarasi

Figure 4.50 - Coordinates of Station CL-2

Station address: Tudor Vladimirescu street, no. 69, (Municipal Stadium area), Calarasi, Calarasi County
Station code: RO-CL-2; RO0126A
Location (geographic coordinates, altitude):
Latitude: 44.201737^{0}; Longitude: 27.328054^{0}; Altitude: 22 m
Latitude: 44° 12' 6.25"; Longitude: 27° 19' 41"; Altitude: 22 m
Year of commissioning: 2009

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer MLU 43*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer MLU 42*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer, model LSPM10 Producer: UNITEC, Italy	

Sta-tion type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR) SR EN 14626:2005	Analyzer MLU 48*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Ozone (O_3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer MLU 49*i* Producer: THERMO FISHER SCIENTIFIC, Netherlands	
	Benzene (C_6H_6)	X	Gas chromato-graphy SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.7 CONSTANTA County

In Constanta County there are two centers for public information located at Constanta City Hall and APM – Constanta, and seven monitoring stations (Figure 4.51):

- CT-1, Culture House;
- CT-2, Fantazio theater;
- CT-3, Navodari camp;
- CT-4, Mangalia;
- CT-5, Prelungirea Liliacului;
- CT-6, Chemistry High School;
- CT-7, Medgidia.

Figure 4.51 - Representation of air quality monitoring stations in Constanta County

4.1.2.7.1 Station CT-1

Figure 4.52 - Station CT-1 located at Culture House, Constanta

Figure 4.53 - Coordinates of Station CT-1

Station address: Culture House, Constanta, Constanta County
Station code: RO-CT-1, RO0131A
Location (geographic coordinates, altitude):
Latitude: 44.177952^{0}; Longitude: 28.636391^{0}; Altitude: 20 m
Latitude: 44° 10' 40.6266"; Longitude: 28° 38' 11.007"; Altitude: 20 m
Year of commissioning: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Traffic	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer, model LSPM10 Producer: UNITEC, Italy	

Sta-tion type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	—			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	-			
	Benzene (C6H6)	X	Gas chromatography SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	

4.1.2.7.2 Station CT-2

Figure 4.54 - Station CT-2 located in Mihai Viteazu street, Tomis summer garden, Constanta

Figur 4.55 - Coordinates of Station CT-2

Station address: Mihai Viteazu street, Tomis summer garden, Constanta, Constanta County
Station code: RO-CT- 2, RO132A
Location (geographic coordinates, altitude):
Latitude: 44.17649^0; Longitude: 28.64977^0; Altitude: 20 m
Latitude: 44° 10' 35.364"; Longitude: 28° 38' 59.172"; Altitude: 20 m
Year of commissioning: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	–			
	PM2.5	X	Orthogonal nephelometry SR EN 14907:2006	Particulate matter analyzer, model LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 14907:2006	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	Carbon monoxide (CO)	X	Non dispersive infrared spectrometry SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O_3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C_6H_6)	X	Gas chromatography SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.7.3 Station CT-3

Figure 4.56 - Station CT-3 located in the yard of Victoria camp, Năvodari

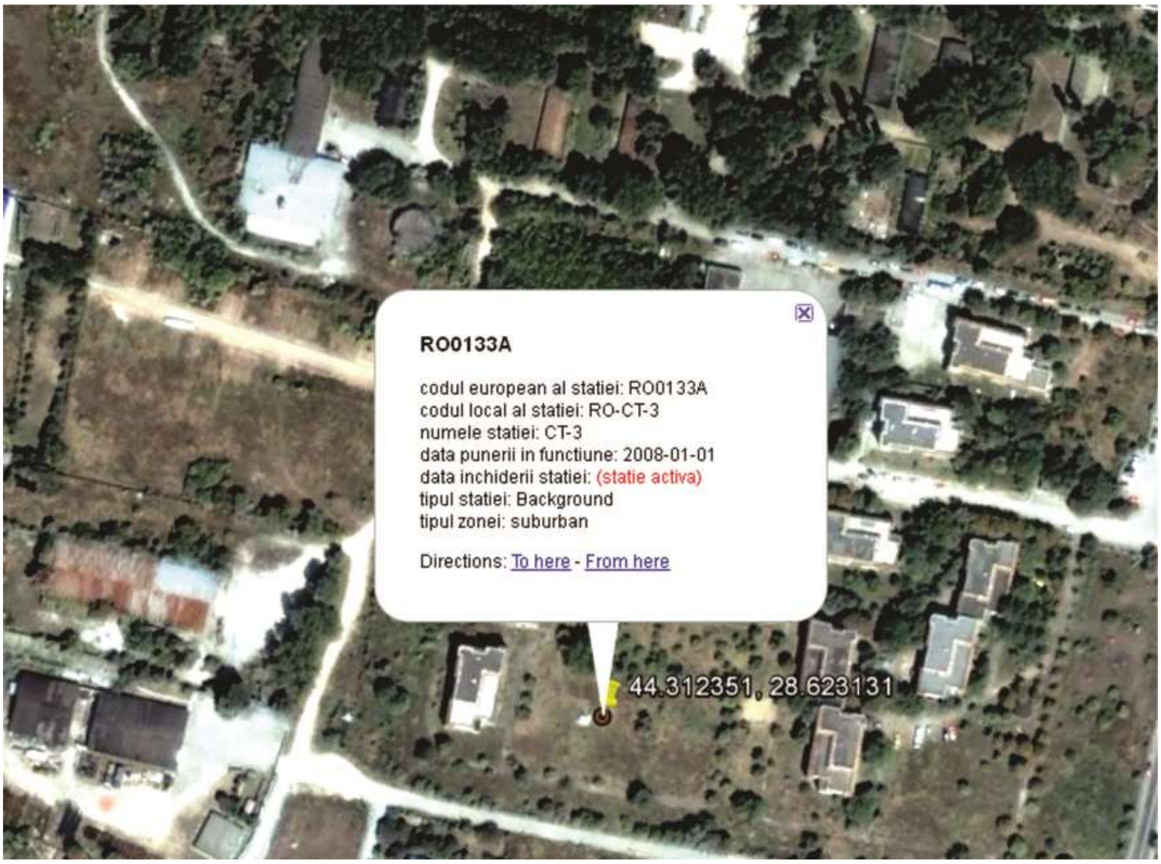


Figure 4.57 - Coordinates of Station CT-3

Station address: Navodari, yard of Victoria camp, Navodari, Constanta County
Station code: RO - CT- 3, RO133A
Location (geographic coordinates, altitude):
Latitude: 44.312351^0; Longitude: 28.623131^0; Altitude: 20 m
Latitude: 44° 18' 44.463"; Longitude: 28° 37' 23.2716"; Altitude: 20 m
Year of commissioning: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Sub-urban	Sulphur dioxide (SO_2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer, model LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C6H6)	X	Gas chromatography SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	

4.1.2.7.4 Station CT-4

Figure 4.58 - Station CT-4- Mangalia, located in Constanţei road, Bl. PX3, Mangalia

Figure 4.59 - Coordinates of Station CT-4

Station address: Mangalia, Constanței road, Bl. PX3, Constanta County
Station code: RO–CT-4, RO0134A
Location (geographic coordinates, altitude):
Latitude: 43.815163^0; Longitude: 28.582516^0; Altitude: 15 m
Latitude: 43° 48' 54.58"; Longitude: 28° 34' 57.05"; Altitude: 15 m
Year of commissioning: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Traffic	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer, model LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	–			
	Benzene (C6H6)	X	Gas chromato-graphy SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.1.2.7.5 Station CT-5

Figure 4.60 - Station CT-5 located in Prelungirea Liliacului street, No. 6, Constanţa

Figure 4.61 - Coordinates of Station CT-5

Station address: Prelungirea Liliacului street, No. 6, Constanta, Constanta County
Station code: RO-CT–5, RO0135A
Location (geographic coordinates, altitude):
Latitude: 44.149406^0; Longitude: 28.623802^0; Altitude: 20 m
Latitude: 44° 8' 57.86"; Longitude: 28° 37' 25.68"; Altitude: 20 m
Year of commissioning: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Industrial	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer, model LSPM10 Producer: UNITEC, Italy	
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.1.2.7.6 Station CT-6

Figure 4.62 - Station CT-6-Chemistry High School located in Sanatatii steet, no. 2

Figura 4.63 - Coordinates of Station "Chemistry High School"

Station address: Navodari, Sănătății street, No. 2, Constanta County
Station code RO–CT-6, RO0136A
Location (geographic coordinates, altitude):
Latitude: 44.319626^0; Longitude: 28.610256^0; Altitude: 20 m
Latitude: 44° 19' 10.65"; Longitude: 28° 36' 36.92"; Altitude: 20 m
Year of commissioning: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Industrial	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Particulate matter analyzer, model LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	PM2.5	–			
	Carbon monoxide (CO)	X	Non dispersive infrared spectrometry SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O3)	X	Ultraviolet photometry SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C6H6)	X	Gas chromatography SR EN 14662-1:2005; SR EN 14662-2:2005; SR EN 14662-3:2005	Analyzer BTX 2000 Producer: ORION SRL, Italy	

4.1.2.7.7 Station CT-7

Figure 4.64 - Station CT-7 located in Decebal street, No. 3, Medgidia

Figure 4.65 - Coordinates of Station CT-7

Station address: Medgidia, Decebal street, No. 33, Constanta County
Station code: RO–CT-7, RO0174A
Location (geographic coordinates, altitude):
Latitude: 44.248329^0; Longitude: 28.26123^0; Altitude: 60 m
Latitude: 44° 14' 53.98"; Longitude: 28° 15' 40.43"; Altitude: 60 m
Year of commissioning: 2008

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Industrial	Sulphur dioxide (SO_2)	X	Ultraviolet fluorescence SR EN 14212:2007	Analyzer ML 9850B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen monoxide (NO)	X	Chemiluminescence SR EN 14211:2007	Analyzer ML 9841B Producer: Monitor Europe Ltd, Great Britain	
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			
	PM10	X	Orthogonal nephelometry SR EN 12341:2008	Pariculate matter analyzer, model LSPM10 Producer: UNITEC, Italy	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
			Gravimetric SR EN 12341:2008	Sequential sampler, model Sentinel TCR TECORA Producer: TCR TECORA, Italy	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry SR EN 14626:2005	Analyzer ML 9830B Producer: Monitor Europe Ltd, Great Britain	
	Ozone (O_3)	X	Gas chromatography SR EN 14625:2005	Analyzer ML 9810B Producer: Monitor Europe Ltd, Great Britain	
	Benzene (C_6H_6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.2. Air Quality Monitoring Stations and Networks in Bulgaria

4.2.1. National System for Air Monitoring in Bulgaria

Under the direct coordination of the Bulgarian Ministry of Environment and Water, the Executive Agency for Environment from Sofia, having as main functions the management, coordination and information on the environmental protection in Bulgaria, operates.

The agency is the National Reference Center Agency within the European Environment Agency and also a member of the Networks of Heads of Environment Agencies in Europe (EPA Network). The Networks of Heads of Environment Agencies in Europe brings together the heads of the environmental protection agencies and similar bodies from Europe and essentially is a working group which makes exchange of information referring to points of view and experiences in issues of common interest in implementing the environmental policies in everyday life.

The Executive Agency for Environment establishes the architecture and coordinates the National System for Environment Monitoring to obtain information and to monitor all the factors which influence the environment from the Bulgarian territory.

The National System for Environment Monitoring from Bulgaria is founded and operates in accordance with Article 1, point 7 of the Environmental Protection Law. The system offers safe and timely information on the quality of environment and influence factors. On the basis of this information, analyses, assessments and forecasts which are the starting point of the activities of conserving and protecting the environment against the harmful factors are performed.

The Ministry of Environment and Water Management from Bulgaria leads the National System for Environment Monitoring by means of the Executive agency for Environment. All things that mean assurance and management of resources: material, technical, methodologies and software necessary to the operation and development of the national system for environment monitoring, are the responsibilities of the Executive Agency for Environment. All the measurements regarding the environment quality also the findings got after analyzing the measurements are performed by the structures of the Executive Agency for Environment. The unitary methods used for preparing, sampling and analyzing the samples are in accordance with the procedures assuring the data and measurements quality. All the laboratories within the Agency are accredited according to the standard EN ISO/IEC 17025 : 2005 – General requirements for the competence of testing and calibration laboratories.

The databases at regional and national level are structured per components depending on the field they are referring to, using a common terminology.

The assessments of environmental components and the reports on the data at national level are responsibilities of the Agency, while the assessments at regional level are performed by the Regional Inspectorates of Environment and Water Management.

A distinct field is the assessment and reporting of data on the water resources at the level of river basins, field which is under the jurisdiction of the 4 Directorates for river basins.

The Regional Inspectorates of Environment and Water Management and the Directorates for river basins are structures under the subordination of the Ministry of Environment and Water Management.

The Regional Inspectorates of Environment and Water Management were established as authorities representing the Ministry of Environment and Water Management at regional level, and have the role to lead the policy of environmental protection in the districts which are under their jurisdiction. They also cooperate with the municipalities in developing the action plans for implementing the environmental policies.

The National System for Environment Monitoring is organized in accordance with chapter 8 of the Environmental Protection Law and includes the national monitoring networks for:

-air;

-water;

-land and soil;

-forests and protected areas;

-biodiversity;

-noise and radioactivity.

The information and control systems related to the emissions of hazardous substances in air, water contamination, waste and protection of natural deposits are also included in the National System for Environment Monitoring.

An important part of the National System for Environment Monitoring from Bulgaria is the National System for Air Quality Monitoring which, at present, is composed of a network having 53 fixed stations. The 53 fixed stations are as follows:

- 14 conventional automatic stations;
- 9 automatic stations – DOAS method;
- 26 manual stations – manual sampling and chemical analyses;
- 4 automatic background stations.

The automatic stations operate continuously, and the data are collected in the databases at local and regional level, through the National Network for Real Time Transmission of Information on Air Quality. The data received from stations are in a preliminary form, and the final validated form is published in the Annual Report on environment state.

From the 53 fixed stations which form the National system for Air Quality Monitoring, 10 stations are located in the districts from the Romanian border.

Table 4.2 - Air quality monitoring stations located in Bulgaria, in the districts from Bulgaria-Romania cross-border area

Name of the Regional Inspectorates of Environment and Water Management	Number of air quality monitoring stations	Number of measurement points
Inspectorate of Environment and Water Management - Montana	1	1
Inspectorate of Environment and Water Management -Vratsa	1	1
Inspectorate of Environment and Water Management -Pleven	2 (1 of DOAS type)	-
Inspectorate of Environment and Water Management -Veliko Tarnovo	2 (1 of DOAS type)	1
Inspectorate of Environment and Water Management -Ruse	3 (2 of DOAS type)	-
Inspectorate of Environment and Water Management -Varna	1	-

The information related to a number of 6 stations listened below are updated at the level of 2011, as a result of the travels of the team members of the project ***„Joint monitoring of the risks for emergencies in the Danube cross border area“***, at the headquarters of each station:

- Automatic station „ZHP Gara“ – Vratsa District - Inspectorate of Environment and Water Management - Vratsa;
- Automatic station „Pleven“ –Pleven District - Inspectorate of Environment and Water Management - Pleven;
- Automatic station „Gorna Oreahovitsa“ –Veliko Tarnovo District - Inspectorate of Environment and Water Management - Veliko Tarnovo;
- Automatic station „Vazrazhdane“ –Ruse District - Inspectorate of Environment and Water Management - Ruse;
- Automatic station „Jiti“ –Ruse District - Inspectorate of Environment and Water Management - Ruse;
- Automatic station „Dobrich“ –Dobrich District - Inspectorate of Environment and Water Management - Varna.

4.2.2. Air quality monitoring systems existing in Bulgarian districts located near the Romanian border

4.2.2.1. Regional Inspectorate of Environment and Water Management - MONTANA

Regional Inspectorate of Environment and Water Management (RIEWM) - Montana has in its structure and processes the data from the monitoring stations in Vidin and Montana Districts (Figure 4.66).

Figure 4.66 - Representation of the air monitoring stations in RIEW- Montana

4.2.2.1.1 Vidin District

In Vidin District there is one automatic station for air quality monitoring, "Vidin".

Figure 4.67 - Geographical representation of the station "Vidin"

Station address: Hristov Botev street, Vidin
European station code: BG0062A
Location (geographic coordinates, altitude):
Latitude: 43° 59' 30"; Longitude: 22° 52' 30"; Altitude: 35 m
Year of commissioning: 2010

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Traffic	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence	Analyzer MLU 43i Producer: MLU - A Multinational Group, Austria	
	Nitrogen monoxide (NO)	–			
	Nitrogen dioxide (NO2)	–			
	Nitrogen oxides (NOx)	–			
	PM10	X	By combining the beta attenuation and light scattering methods	Analyzer Model 5030 SHARP Monitor Producer: MLU - A Multinational Group, Austria	Real time determination

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	PM2.5	–			
	Carbon monoxide (CO)	–			
	Ozone (O3)	–			
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.2.2.1.2 Montana District

In Montana District, at the headquarters of the Regional Inspectorate of Environment and Water Management (RIEWM) - Montana (Figure 4.68), there is one measurement point - Montana Regional Laboratory.

Figure 4.68 - RIEWM headquarters - Montana

Figure 4.69 - Images of the measurement point - Montana Regional Laboratory

Figure 4.70 - Geographical representation of the measurement point - Montana Regional Laboratory

Station address: Iulius Irasek street, No. 4, Montana

European station code: BG0060A

Location (geographic coordinates, altitude) :

Latitude: 43° 24' 58"; Longitude: 23° 13' 25"; Altitude: 151 m

Year of commissioning: 1990, modernized in 2004

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observa-tions
Ur-ban	Sulphur dioxide (SO_2)	X	Manual By spectrometry in system UV/VIS	HELIOS Model ALPHA; PerkinElmer Model Lambda 2S Producer: Perkin Elmer Instruments, USA	
	Nitrogen monoxide (NO)	–			
	Nitrogen dioxide (NO_2)	X	Manual By spectrometry in system UV/VIS	HELIOS Model ALPHA; PerkinElmer Model Lambda 2S Producer: Perkin Elmer Instruments, USA	
	Nitrogen oxides (NO_x)	–			
	PM10	X	Gravimetric	TCR Tecora model EchoPM + TCR Tecora model Bravo M *plus* Producer: TCR TECORA, Italy	
		–			
	PM2.5	–			
		–			
	Carbon monoxide (CO)	X	Manual By spectrometry in system UV/VIS	HELIOS Model ALPHA; PerkinElmer Model Lambda 2S Producer: Perkin Elmer Instruments, USA	
	Ozone (O_3)	–			
	Benzene (C_6H_6)	–			
	Toluene	–			
	Nickel (Ni)	X	Ni determination in PM10 fraction of particulate matter	TCR Tecora model EchoPM + TCR Tecora model Bravo M *plus* Producer: TCR TECORA, Italy	

4.2.2.2 Regional Inspectorate of Environment and Water Management - VRATSA

4.2.2.2.1 Vratsa District

In Vratsa District there is one automatic station for air quality monitoring, "ZHP-Gara Vratsa - Vratsa", and one measurement point – Regional Inspectorate of Environment and Water Management, Vratsa:

Figure 4.71 - Representation of the air quality monitoring stations in Vratsa District

4.2.2.2.1.1 Automatic station for air quality monitoring, "ZHP-Gara Vratsa"

Figure 4.72 - Automatic station "ZHP-Gara Vratsa" located in Vasil Kanchev street

Figure 4.73 - Coordinates of the automatic station "ZHP-Gara Vratsa"

Station address: Vasil Kanchev street, Vratsa

European station code: BG0043A

Location (geographic coordinates, altitude):

tude: 43° 12' 49"; Longitude: 23° 33' 31"; Altitude: 350 m

Year of commissioning: 1993

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO_2)	X	Ultraviolet fluorescence	Analyzer MLU100A Producer: MLU - A Multinational Group, Austria	
	Nitrogen monoxide (NO)	X	Chemiluminescence	Horiba APNA370 Producer: HORIBA, Japan	
	Nitrogen dioxide (NO_2)	X			
	Nitrogen oxides (NO_x)	X			
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	
		–			
	PM2.5	X	Non dispersive infrared absorption (NDIR)	Horiba APMA370 Producer: HORIBA, Japan	
		X	Ultraviolet absorption photometry	Horiba APOA370 Producer: HORIBA, Japan	
	Carbon monoxide(CO)	–			
	Ozone (O_3)	–			
	Benzene (C_6H_6)	–			
	Toluene	–			
	Ammonia (NH_3)	X	Chemiluminescence	Analyzer MLU 201A Producer: MLU - A Multinational Group, Austria	
	Hydrogen sulfide (H_2S)	X	Ultraviolet fluorescence	Analyzer MLU 101A Producer: MLU - A Multinational Group, Austria	

4.2.2.2.1.2 Measurement point – Regional Inspectorate of Environment and Water Management, Vratsa (Figure 4.74)

Figure 4.74 - Images from the measurement point – Regional Inspectorate of Environment and Water Management, located in Ekzarh Iosif street, No.81, Vratsa

Figure 4.75 - Coordinates of the measurement point - Regional Inspectorate of Environment and Water Management, Vratsa.

Station address: Ekzarh Iosif street No.81, Vratsa

European station code:

Location (geographic coordinates, altitude):

tude: 43° 12' 06"; Longitude: 23° 33' 24"; Altitude: 385 m

Year of commissioning:

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Suburban	Sulphur dioxide (SO2)	–			
	Nitrogen monoxide (NO)	–			
	Nitrogen dioxide (NO2)	–			
	Nitrogen oxides (NOx)	–			
	PM10	X	Gravimetric	TCR Tecora model EchoPM + TCR Tecora model Bravo M Plus Producer: TCR TECORA, Italy	
	PM2.5	X			
	Carbon monoxide(CO)	–			
	Ozone (O3)	–			
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.2.2.3. Regional Inspectorate of Environment and Water Management – PLEVEN

4.2.2.3.1. Pleven District

In Pleven District there is one automatic station for air quality monitoring, "Pleven" (Figure 4.76):

Figure 4.76 - Representation of air quality monitoring stations in Pleven District

Automatic station for air quality monitoring, "Pleven"

Figure 4.77 - Automatic station "Pleven" located in Dorian street No.100

Figure 4.78 - Coordinates of the automatic station "Pleven"

Station address: Dorian street, No. 100, Pleven
European station code: BG0019A
Location (geographic coordinates, altitude):
tude: 43° 24' 42"; Longitude: 24° 37' 54"; Altitude: 139 m
Year of commissioning: 1991

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence	Analyzer MLU43i Producer: MLU - A Multinational Group, Austria	
	Nitrogen monoxide (NO)	X	Chemiluminescence	Analyzer MLU42i Producer: MLU - A Multinational Group, Austria	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			

Sta-tion type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	PM10	X	By combining the beta attenuation and light scattering methods	Analyzer Model 5030 SHARP Monitor Producer: MLU - A Multinational Group, Austria	Real time determination
			Gravimetric	Sequential sampler, model Sentinel TCR TECORA + TCR Tecora model Charlie Producer: TCR TECORA, Italy	Manual
	PM2.5	–			
	Carbon monoxide (CO)	X	Non dispersive infrared spectroscopy	Analyzer MLU48i Producer: MLU - A Multinational Group, Austria	
	Ozone (O3)	X	Ultraviolet fluorescence	Horiba APOA370 Producer: HORIBA, Japan	
	Benzene (C6H6)	X	Sampling by aspiration through an absorbing cartridge, then gas chromatography	Chromatotec airTOXIC^{BTX} Producer: MLU - A Multinational Group, Austria	
	Toluene	X			
	Ethylbenzene	X			
	o,m,p-xylene	X			

4.2.2.4. Regional Inspectorate of Environment and Water Management - VELIKO TARNOVO

4.2.2.4.1. Veliko Tarnovo District

In Veliko Tarnovo District there is one automatic station for air quality monitoring, "Gorna Oreahovita - Veliko Tarnovo", and one measurement point - Regional Inspectorate of Environment and Water Management (Figure 4.79):

Figure 4.79 - Representation of the automatic monitoring station and measurement point for air quality in Veliko Tarnovo District

4.2.2.4.1.1. *Automatic monitoring station "Gorna Oreahovita - Veliko Tarnovo"*

Figure 4.80 - Automatic station "Gorna Oreahovita" located in Veliko Tarnovo.

Figure 4.81 - Coordinates of the automatic station "Gorna Oreahovita"

Station address: Gorna Oreahovita, Veliko Tarnovo

European station code: BG0057A

Location (geographic coordinates, altitude):

Latitude: 43° 7' 30"; Longitude: 25° 41' 31.02"; Altitude 160 m

Year of commissioning: 2006

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Sub-urban	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence	Analyzer: MLU43i Producer: MLU - A Multinational Group, Austria	
	Nitrogen monoxide (NO)	X	Chemiluminescence	Analyzer: MLU42i Producer: MLU - A Multinational Group, Austria	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			
	PM10	X	By combining the beta attenuation and light scattering methods	Analyzer: Model 5030 SHARP Monitor Producer: MLU - A Multinational Group, Austria	Real time determination
	PM2.5	–			
	Carbon monoxide (CO)	–			
	Ozone (O3)	X	Ultraviolet fluorescence	Analyzer: MLU49i Producer: MLU - A Multinational Group, Austria	
	Benzene (C6H6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.2.2.4.1.2 Measurement point - Regional Inspectorate of Environment and Water Management, Veliko Tarnovo (Figure 4.82)

Figure 4.82 - Image from the measurement point - Regional Inspectorate of Environment and Water Management located in N. Gabrovski street, Veliko Tarnovo.

Station address: Julius Vrasek Street, No. 4, Veliko Tarnovo
European station code: BG0020A
Location (geographic coordinates, altitude):
Latitude: 43° 4' 40"; Longitude: 25° 37' 33"; Altitude: 200 m
Year of commissioning: 1991

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Sub-urban	Sulphur dioxide (SO_2)	–			
	Nitrogen monoxide (NO)	–			
	Nitrogen dioxide (NO_2)	–			
	Nitrogen oxides (NO_x)	–			
	PM10	X	Gravimetric	TCR Tecora model EchoPM + TCR Tecora model Bravo M Plus Producer: TCR TECORA, Italy	
	PM2.5	X			
	Carbon monoxide(CO)	–			

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	Ozone (O_3)	–			
	Benzene (C_6H_6)	–			
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.2.2.5 Regional Inspectorate of Environment and Water Management - RUSE

4.2.2.5.1. Ruse District

In Ruse District there is one center for public information (Figure 4.83) and two monitoring stations (Figure 4.84):

- Automatic station for air quality monitoring, "Vazrajdane - Ruse";
- DOAS –type automatic station for air quality monitoring, "Jiti-Ruse".

Figure 4.83 - Panels for public information

Figure 4.84 - Representation of the air quality monitoring stations in Ruse District

4.2.2.5.1.1 Automatic monitoring station "Vazrajdane - Ruse"

Figure 4.85 - Automatic station "Vazrajdane" located in Nish street, Ruse.

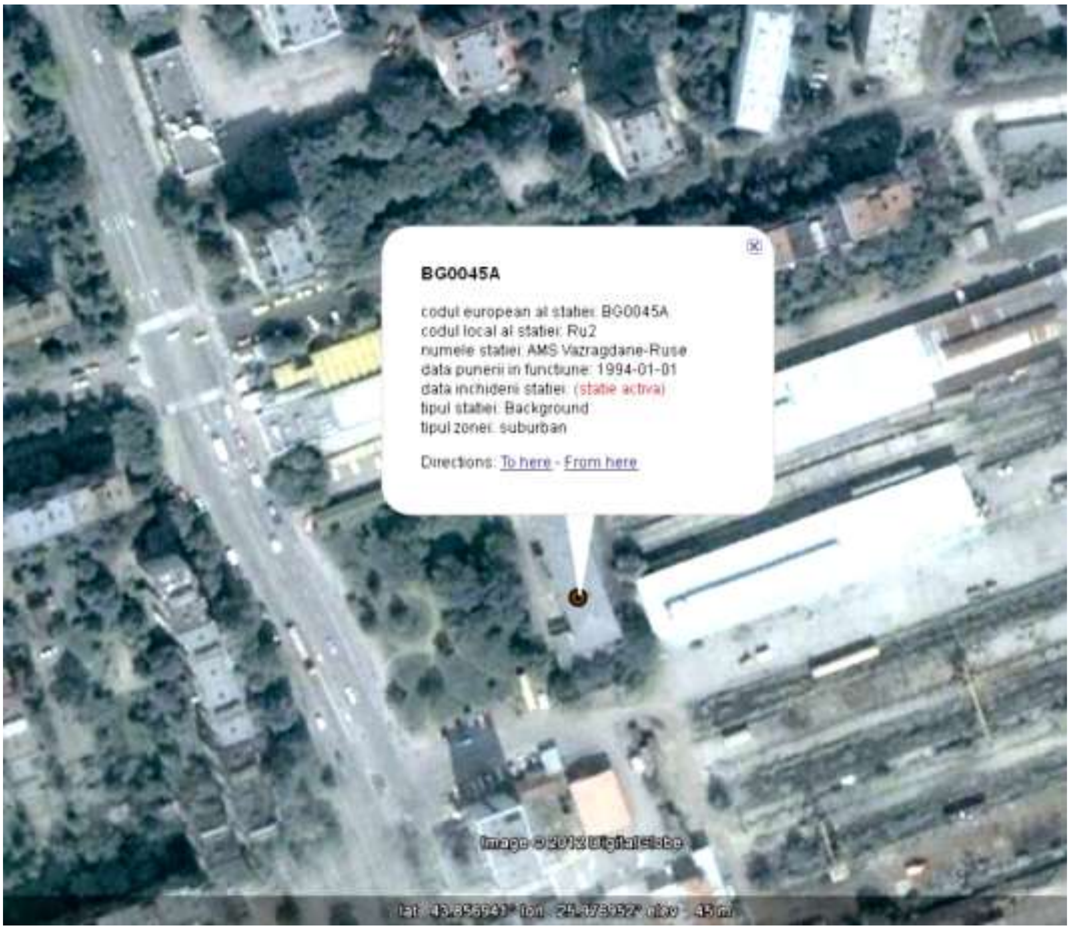


Figure 4.86 - Coordinates of the automatic station "Vazrajdane"

Station address: Nish street, Ruse

European station code: BG0045A

Location (geographic coordinates, altitude):

Latitude: 43° 51' 25"; Longitude: 25° 58' 37"; Altitude: 45 m

Year of commissioning: 1993

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Sub-urban	Sulphur dioxide (SO2)	X	Ultraviolet fluorescence	Analyzer MLU100A Producer: MLU - A Multinational Group, Austria	
	Nitrogen monoxide (NO)	X	Chemiluminescence	Analyzer MLU200A Producer: MLU - A Multinational Group, Austria	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	X			

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	PM10	X	Gravimetric	Pasrticulate matter sampler OPSIS SM200 Producer: Opsis AB, Suedia	
	PM2.5	X	By combining the beta attenuation and light scattering methods	Analyzer Model 5030 SHARP Monitor Producer: MLU - A Multinational Group, Austria	Real time determi nation
	Carbon monoxide(CO)	X	Non dispersive infrared spectrometry (NDIR)	Analizor MLU300 Producer: MLU - A Multinational Group, Austria	
	Ozone (O3)	X	Ultraviolet fluorescence	Horiba APOA370 Producer: HORIBA, Japan	
	Benzene (C6H6)	X	Sampling by aspiration through an absorbing cartridge, then gas chromatography	Syntrec Spectras GC855 Producer: SYNSPEC, Netherlands	
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.2.2.5.1.2. Automatic station of DOAS type, "Jiti-Ruse".

Figure 4.87 - Images from the automatic station of DOAS type, "Jiti", located at Jiti Factory, Ruse

Figure 4.88 - Coordinates of the DOAS-type automatic station, "Jiti"

Station address: 3 March Avenue, inside the Jiti Factory, Ruse

European station code: BG0155A

Location (geographic coordinates, altitude):

Latitude: 43° 49' 51"; Longitude: 25° 56' 19"; Altitude: 30 m

Year of commissioning: 2003

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO2)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	Analyzer ML 9850B
	Nitrogen monoxide (NO)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	
	Nitrogen dioxide (NO2)	X			
	Nitrogen oxides (NOx)	–			
	PM10	X	Gravimetric	Particulate matter sampler OPSIS SM200 Producer: Opsis AB, Sweden	
	PM2.5	–			
	Carbon monoxide(CO)	X	Non dispersive infrared photometry	Analyzer ML 9830B Producer: MONITOR EUROPE, Great Britain	

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
	Ozone (O3)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	
	Benzene (C6H6)	X	Differential optical absorption spectrometry	System DOAS OPSIS AR520 Producer: Opsis AB, Sweden	
	Toluene	–			
	Ethylbenzene	–			
	o,m,p-xylene	–			

4.2.2.6 Regional Inspectorate of Environment and Water Management - VARNA

The Regional Inspectorate of Environment and Water Management (RIEWM) Varna has in its structure and processes data from the automatic monitoring station in Dobrich District.

4.2.2.6.1. Dobrich District

In Dobrich District there is one automatic station for air quality monitoring, "Dobrich" (Figure 4.89):

Figure 4.89 - Representation of the air quality monitoring stations from Dobrich District

Dobrich station

Figure 4.90 - Automatic station "Dobrich" located in Otets Paisiy (Tata Paisi) street

Figure 4.91 - Coordinates of the automatic station "Dobrich"

Station address: Otets Paisiy (Tata Paisi) street, Dobrich

European station code: BG0067A

Location (geographic coordinates, altitude):

Latitude: 43° 34' 11"; Longitude: 27° 49' 36"; Altitude: 225 m

Year of commissioning: 1990 and modernized in 2009

Station type	Monitored pollutants		Reference method	Equipment/Producer	Observations
Urban	Sulphur dioxide (SO_2)	—			
	Nitrogen monoxide (NO)				
	Nitrogen dioxide (NO_2)	—			
	Nitrogen oxides (NO_x)	—			
	PM10	X	By combining the beta attenuation and light scattering method	Analyzer Model 5030 SHARP Monitor Producer: MLU - A Multinational Group, Austria	Real time determination
	PM2.5	—			
	Carbon monoxide(CO)	—			
	Ozone (O_3)	—			
	Benzene (C_6H_6)	—			
	Toluene	—			
	Ethylbenzene	—			
	o,m,p-xylene	—			

4.3 Monitoring Air Quality System in Romania-Bulgaria Cross-Border Area along the Lower Danube

The Project "Air Quality Monitoring Joint System in the cities from Romania-Bulgaria Border Area along the Lower Danube" financed under PHARE CBC RO/BG 1999 was implemented in 2002. The project provided the endwoment with air quality monitoring automated systems on four areas (pairs of cities), placed along the two borders of the Lower Danube. Each area has one city from Romania border and the correspondent city from Bulgaria border.

The four areas in the mirror are:

- Giurgiu - Ruse;
- Turnu Măgurele – Nikopol;
- Zimnicea – Svistov;
- Călăraşi - Silistra.

The network from the romanian border is composed of seven air quality monitoring stations:

- Giurgiu - 2 stations: Giurgiu 1, Giurgiu 2;
- Turnu Măgurele - 2 stations: Turnu 1, Turnu 2;
- Zimnicea – 1 station;
- Călăraşi - 2 stations: Călăraşi 1, Călăraşi 2.

The romanian border cities of the Lower Danube are equipped with the following air quality monitoring apparatus:

- 7 DOAS systems (Differential Optical Absorption Spectroscopy);
- 7 samplers for PM10;
- 6 analyzers for CO;
- 6 analyzers for H_2S;
- 1 analyzer for CS_2: - Zimnicea;
- 7 standard meteorogical equipments; each measuring station is equipped with sensors for speed and wind direction, temperature and atmospheric pressure. The data provided is used to calculate the correction to standard conditions;
- 4 display units for public information;

- 2 meterogical stations located in Călăraşi, Tr. Măgurele respectively. The stations are designed to general weather record representative for pollutant dispersion (Breur diagrams) ;
- radio data transmission systems;
- 4 computers for acquisition, processing and reporting the data.

There are the following equipments “in the mirror” four cities located in Bulgaria:

- 7 DOAS systems;
- 7 samplers for PM10;
- 4 analyzers for CO;
- 7 analyzers for H_2S;
- 1 analyzer for CS_2 : Svishtov;
- 7 standard meteorogical equipments; each measuring station is equipped with sensors for speed and wind direction, temperature and atmospheric pressure. The data provided is used to calculate the correction to standard conditions;
- 4 display units for public information;
- 2 meterogical stations located in Ruse, Svishtov respecively. The stations are designed to general weather record representative for pollutant dispersion (Breur diagrams) ;
- radio data transmission systems;
- 4 computers for acquisition, processing and reporting the data.

The results of meteorological measurements are automated verified and then they are presented on display panels for public information. The panels are located in the central square of each city. Also, the data is transmitted automatically to the three County Agencies for Environment Protection from Romania and to the three Regional Inspectorates of Environment and Water from Bulgaria.

The Regional Centers for Data Collecting (The Executive Environment Agency from Sofia and The County Agency for Environment Protection from Giurgiu) submit data regulary to the both environment ministries from Romania and Bulgaria .

DOAS System

DOAS (Differential Optical Absorption Spectroscopy) is an optical method for anlysis. The method is based on light radiation absorbtion by air pollutants.

Depending on the chemical composition of the pollutants, radiation absorbtion of light take place at different.

The scheme of such a system is shown in Figure 4.92 and it includes: the emitter, the receiver, the spectrometer, the detector and the computer. The light radiation from the emitter passes through the optical path where its absorbtion occurs. The absorbtion depend on the composition and the concentration of the existing pollutants in the monitoring area. The light radiation taken by the receiver is sent to analysis and detection system where there is a qualitative and quantitive determination of the pollutants.

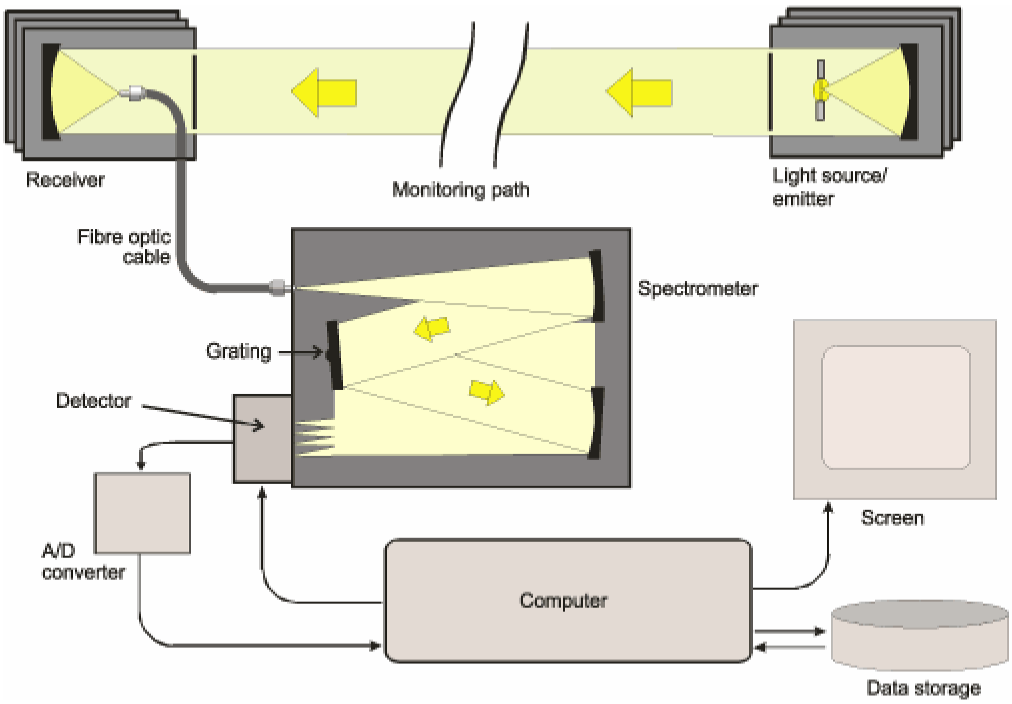


Figure 4.92 – The Scheme of DOAS System

The Monitoring Stations - Romania

The air quality monitoring system, located on the romanian side of the Danube river, collects the concentration values of the pollutants from seven measurement stations placed in Giurgiu (2 stations), Zimnicea (1 station), Turnu Măgurele (2 stations) and Călărași (2 stations). The station locations are:

Location. Name of the measurement point (GPS denomination)

Giurgiu 1 - Port Giurgiu Area

Giurgiu 2 – Financial Administration

Zimnicea - City Hall Zimnicea

Turnu 1 - City Hall Turnu Măgurele

Turnu 2 – Open Field

Călăraşi 2 – Sanitary-Veterinary Department Călăraşi

Călăraşi 1 – Chiciu Area

The Monitoring Stations – Bulgaria

The air quality monitoring system, located on the romanian side of the Danube river, collects the concentration values of the pollutants from seven measurement stations placed in Ruse (3 stations), Svishtov (1 station), Nikopol (1 station) and Silistra (2 stations). The station locations are:

Location. Name of the measurement point (GPS denomination)

Ruse 1 – Center of the city, Measuring point: "RIEW Ruse"

Ruse 2 – Industrial West Area, Measuring point: "Zhiti AD"

Ruse 3 – Industrial Est Area, Measuring point: "Hlebna Maya AD"

Svishtov – Central Area – City Hall Svishtov, Measuring point: "OBS"

Nikopol – Center of the city – City Hall, Measuring point: "OBS"

Silistra 1 – Center of the city, Measuring point: "Profsayuzite"

Silistra 2 – Industrial West Area, Measuring point: "Lesilmash AD"

In each mentioned above city there are specially locations for the measuring equipment. The receivers, the meteorological station, the analyzers for CO and H_2S and the samplers for PM10 are in properly designed enclosures installed on the roofs.

The pollutants measured in Romania and in Bulgaria are presented in the table below:

Tabel 4.3 – The pollutants measured by the monitoring system from Ro-Bg border of the Lower Danube

Measuring Points	Pollutants
Calarasi 1	SO_2, NO_2, O_3, C_6H_5OH, NO, H_2S, CO, PM10
Calarasi 2	SO_2, NO_2, O_3, C_6H_5OH, NO, H_2S, CO, PM10
Silistra 1	SO_2, NO_2, O_3, C_6H_5OH, NO, H_2S, PM10
Silistra 2	SO_2, NO_2, O_3, C_6H_5OH, NO, H_2S, PM10
Svishtov	SO_2, NO_2, O_3, CS_2, NO, H_2S, PM10
Zimnicea	SO_2, NO_2, O_3, CS_2, NO, CO, H_2S, PM10
Turnu 1 Nikopol	SO_2, NO_2, O_3, NO, NH_3, CO, H_2S, PM10 SO_2, NO_2, O_3, NO, NH_3, CO, H_2S, PM10
Turnu 2	SO_2, NO_2, O_3, NO, NH_3, PM10
Giurgiu 1	SO_2, NO_2, O_3, C_6H_5OH, C_6H_6, Toluen, Xilen, Stiren, Cl_2, HCL,NO, CO, H_2S, PM10
Giurgiu 2	SO_2, NO_2, O_3, C_6H_5OH, C_6H_6, Toluen, Xilen, Stiren, Cl_2, HCL,NO, CO, H_2S, PM10
Ruse 1	SO_2, NO_2, O_3, C_6H_5OH, C_6H_6, Toluen, Xilen, Stiren, Cl_2, HCL,NO, CO, H_2S, PM10
Ruse 2	SO_2, NO_2, O_3, C_6H_5OH, C_6H_6, Toluen, Xilen, Stiren, Cl_2, HCL,NO, CO, H_2S, PM10
Ruse 3	SO_2, NO_2, O_3, C_6H_5OH, C_6H_6, Toluen, Xilen, Stiren, Cl_2, HCL,NO, CO, H_2S, PM10

Information System

The Air Quality Monitoring System from Romania-Bulgaria cross-border area collects the concentration values of pollutants from the fourteen (14) measuring stations placed along both sides of the Danube.

The measured pollutants and meteorological data are transmitted to CBS local servers. Then, the data are processed and received by the system of the environment protection agencies – the central station from each twin city. The data are stored in the server of each agency involved.

Subsequently, all data aquired from the measuring stations are concentrated in the Regional Data Center.

At the moment of writing the study, only the following stations from the Romania-Bulgaria cross-border network are still operating:

-In Romania: 2 stations – Calarasi County

2 stations – Giurgiu County

-In Bulgaria: 2 stations – Ruse District

1 station – Veliko Turnovo District

1 station – Pleven District

CHAPTER 5

WAY OF REPORTING THE AIR QUALITY DATA IN ROMANIA AND BULGARIA

5.1 Introduction

The way of reporting the air quality data in Romania is widely stipulated in the LAW no. 104 from 15 June 2011 regarding the environmental air, which provides measures ant national level referring to:

a) definition and establishment of the objectives for environmental air quality, intended to avoid and prevent the occurrence of some harmful events and to reduce their effects on human health and on environment as a whole;

b) assessment of environmental air quality on the whole territory of the country, on the basis of some joint methods and criteria, established at European level;

c) obtaining of information on environmental air quality for supporting the process of combating the air pollution and discomfort generated by it, also for monitoring on long term the trends and improvements resulted after the measures taken at national and European level;

d) ensuring that information on environmental air quality are put at the public disposal;

e) maintaining the environmental air quality where this is adequate and/or its improvement in other cases;

f) promotion of an enhanced cooperation with the other EU Member States in order to reduce air pollution;

g) fulfillment of the obligations assumed by the international agreements, conventions and treaties to which Romania is a party.

Implementation of the provisions of this law is achieved by the National System for Assessment and Integrated Management of Air Quality, further on named NSAIMAQ, which provides the organizational, institutional and legal framework of cooperation between the public authorities and institutions, with competences in the field, in order to assess and manage the environmental air quality , unitarily throughout Romania, also to inform the people and European and international bodies on environmental air quality.

5.2. Information Transmission and Reporting

The central public authority for environmental protection sends to European Commission information on environmental air quality, at the terms and in the formats established by EC.

Until applying the implementation measures developed by European Commission, the central public authority transmits to it:

a) information on the level of sulphur dioxide, nitrogen dioxide or, where appropriate, nitrogen oxides, particulate matter PM10 and PM2.5, lead, benzene or carbon monoxide, arsenic, cadmium, nickel and benzo(a)pyrene;

b) within 9 months from the end of each year, information on the areas and agglomerations where the levels of one or many pollutants exceed the limit values plus the tolerance, or the limit values in case of pollutants for which no tolerance was fixed or, as the case may be, the target value, on the data or periods when these exceedances were recorded, on the recorded values and on the causes of each recorded exceedance.

Until applying the implementation measures developed by the European Commission, the central public authority for environmental protection transmits to it information on the level of ozone concentrations for each month, from April and since September, provisionally, so:

a) until the end of the next month the latest, the date, total number of exceedance hours, maximum values of ozone per hour, for each day when the information and/or alert threshold is exceeded;

b) until 31 October of each year the latest, information for the entire period April-September and, additionally, for each day when the long term objective or the target value was exceeded, the date and maximum daily value of the average for 8 hours.

Until applying the implementation measures developed by the European Commission, the central public authority for environmental protection sends to it, within 9 months from the end of each year, information on the level of ozone concentrations, also validated information for the previous year referring to:

a) date, total number of exceedance hours, maximum values of ozone per month, for each day of exceeding the information and/or alert threshold;

b) information for each day when the long term objective or the target value was exceeded, date and maximum daily value of the average per 8 hours;

c) annual average concentrations for the ozone precursors;

d) AOT 40 values for protecting the vegetation and forest.

For the information collected since the second calendar year after entering into force the implementation measures developed by the European Commission, the central public authority for environmental protection transmits to it, within 9 months from the end of each year, the following:

a) information on the changes of the area and agglomeration delimitations for assessing and managing the environmental air quality;

b) list of areas and agglomerations where the levels of one or many pollutants exceed the limit values, plus the tolerances, where the case may be, or where they exceed the target value or the critical levels.

The central public authority for environmental protection transmits provisionally to European Commission information on the exceedances of the alert or information thresholds: recorded level, place and period when the the exceedance was recorded.

The central public authority for environmental protection transmits to European Commission information on air quality plans, i.e. integrated plans for air quality, in the shortest time, but not later than 2 years from the end of the year when the exceedances were recorded.

The central public authority for environmental protection transmits to European Commission, for information, for certain year, lists with the areas or agglomerations where the exceedances of the limit values for certain pollutant are assigned to the contributions from natural sources.

The supplied information refers to concentrations and pollution sources, also to the demonstration of the fact that the exceedances of the limit values could be assigned to natural sources.

The central public authority for environmental protection transmits to European Commission, for certain year, if the case may be, lists with areas and agglomerations where the exceedance of the limit values for PM 10 are due to the re-suspension of the particulates, as a result of treating the road by sand or salt during winter.

The supplied information refers to concentrations and pollution sources, also to the demonstration of the fact that the exceedances of the limit values could be assigned to particulate re-suspension and that all the reasonable measures for reducing the concentrations were taken.

The central public authority for environmental protection transmits all the necessary information to the Central Commission, so as this Commission to assess if all the relevant conditions are fulfilled or not.

In case of some objections of the European Commission, at its request, the air quality plans are modified or new plans are supplied.

The central public authority for environmental protection informs the European Commission on the methods used for sampling and measuring:

a) volatile organic compounds, ozone precursors;

b) arsenic, cadmium, mercury, nickel and benzo(a)pyrene;

c) chemical composition of particulate matter PM2.5.

The methods used for the preliminary assessment of environmental air quality for the pollutants: arsenic, cadmium, mercury, nickel and benzo(a)pyrene are transmitted for information to the European Commission.

The central public authority for environmental protection transmits the air quality plans developed for this purpose to the European Commission.

5.3 Building the Macro- Inventory

5.3.1. Required qualities of an inventory

An emission inventory achieved without concerns as regards the observance of the essential qualities described below is, practically, unusable, even if it is very well drawn up. It must be achieved so that it ensures: consistency, accuracy, comparability and transparence.

For assuring the inventory **consistency,** all the sources which are within the specified field must be analyzed in the same way as the emissions about which which there is information.

The emission inventories are not an exact science. The uncertainty associated to different information and hypotheses cannot be calculated. However, for assuring **the accuracy** of an inventory, it is important to try to supply a qualitative assessment and, if possible, a quantitative one, for the uncertainty referring to the got results. In general, this indication is limited to the overall results and/or to some entities whose contributions are important.

It should be remarked that seldom is an inventory intended to be isolated; most times it serves as a comparison element (comparison of geographic areas, economic sectors, time evolution or even of all these factors together). This **comparability** can be guaranteed only by using identical referential data. For this purpose, the use of some recognized methods should be emphasized.

For ensuring the **transparency** of an inventory, the information it contains shall be enough complete and detailed for allowing a third party to re-build the inventory. This feature facilitates the up-dating and improvement of the inventory and allows avoiding some important comparability mistakes, when in the course of time the hypotheses and methods for determining the main basic data, also the emission factors, evoluate. These features ease also the indispensable operations of result verification and validation.

5.3.2 Building the macro-inventory

In Romania, there are two types of inventories:

- Macro-inventory, which is the basis of the national inventory in Romania and is the object of a reporting at European level;
- Micro-inventory, which is especially used for supplying the modeling tools.

The macro-inventory is developed by the Agencies for Environmental Protection (AEP) for each county. At its basis stay a lot of surveys intended to the emitting sectors and a combination of answers using methods for assessing the emissions and the related emission coefficients.

For certain special activities, which require a regular revision of the emission coefficients (e.g. the road transport with the permanent evolution of the existent number of vehicles), a Romanian legislative text specifies regularly the coefficients to be taken into account.

The macro-inventory is built (Figure 5.1) and managed by a computerized interface common to all the Agencies for Environmental Protection and then transmitted to National Agency for Environmental Protection (NAEP) for validation and/or revaluation/utilization. The Agencies for Environmental Protection send this inventory to the National Agency for Environmental Protection, which uses it especially for preparing the annual report on environment state.

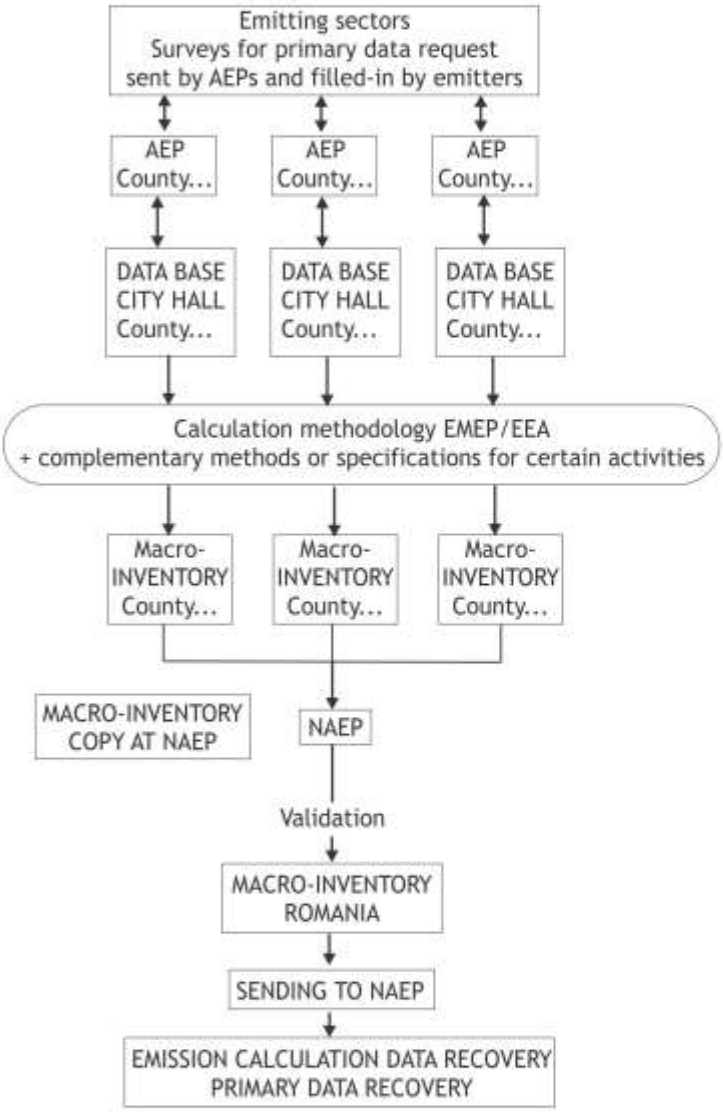


Figure 5.1 - Building the macro-inventory

5.3.3. Types of inventories

For knowing the atmosphere polluting emissions, many types of inventories are used, namely those ones having as objective the sources, products and economic effects.

Inventory having the sources as objective

This approach is based on the knowledge of the residues due to chemical, physical, biological etc. phenomena, like crushing, evaporation, combustion, chemical reactions, fermentation. Each element of the inventory presents the emission caused by a technology or natural phenomenon, related to the environment.

Inventory depends on the characteristics specific to the examined entity, especially the conditions of manifestation, and possibly on other external parameters.

Inventory having the products as objective

The approach has as purpose the quantification of the amounts of pollutants related to a product or service, taking into consideration the totality of its life cycle, i.e. the emissions which take place as a result of its manufacture, use and decision regarding its destiny (recycling, destruction, storage etc).

This analysis needs the knowledge of the emissions due to numerous industrial processes.

Inventory having economic effects as objective

After analyzing the environment parameters, they are introduced in macro-economic models. It is necessary that, within an economic sector, to analyze the amount of emissions in atmosphere, in close connection with the data offered by the turnover and other production indicators. This information allows analyzing all the technologies existing in an activity field and mainly their contribution as regards the emissions in atmosphere.

5.3.4. Verification methods

General framework proposed by IPCC

IPCC (Intergovernmental Panel on Climate Change) developed a method for quality assurance and control, and also for verifying the emission inventories (2006 IPPC Guidelines for National Greenhouse Gas Inventories, chapter 6).

The objective of IPCC activity is to assure the fact that the inventories of the parties involved in the framework convention on climate change are complete, consistent, comparable, accurate and transparent, achieved within a step for continuous progress and are sent in time to the one that requires them.

All these exigencies may be applied at the level of the macro-inventories achieved by AEPs, which have to be the object of some procedures for control and quality assurance, also of some verification.

Quality Control: system of daily activities performed by those who draw up the inventories in order to verify data acquisition, implemented calculation, application of standardized methods, archiving, reporting and uncertainty calculation.

Quality assurance: planned system of audit procedures implemented by a third party, which gives us the possibility to assure ourselves that the inventory is the best possible assessment of emissions.

Verification: set of activities and procedures performed during or after the inventory works, assuring the inventory reliability in terms of potential uses.

Reporting of control operations

The control operations implemented by AEPs shall be the object of an internal note giving the possibility to assure traceability of the actions.

The control operations implemented by AEPs shall be the object of a note intended for AEPs, note that will be used as a guide for the internal verifications and for the possible corrections within each AEP.

Once the controls and corrections are performed, the inventories may be sent to NAEP for the possible additional controls and for being used.

The diagram from below (Figure 5.2) illustrates the circuit of the transmission of the inventories including control operations at national level.

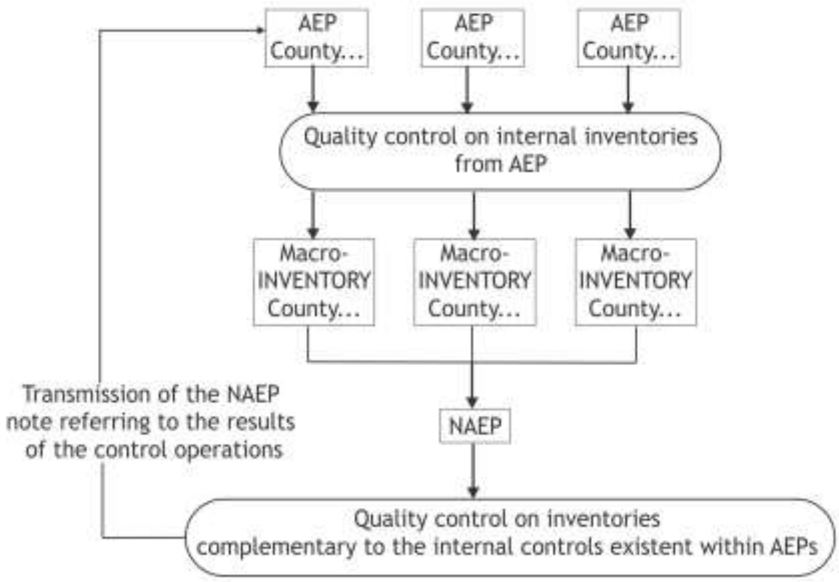


Figure 5.2 - Circuit of inventory transmission

5.4. EPRTR Register

5.4.1. E-PRTR Register at European level

The European Pollutant Release and Transfer Register (E-PRTR) is achieved by the 27 EU Member States, together with Island, Liechtenstein and Norway.

So, the European register contains the annual data reported by 24 000 industrial complexes covering 65 economic activities grouped in 9 industrial sectors as follows:

1. energy;
2. production and processing of metals;
3. mineral industry;
4. chemical industry;
5. waste and wastewater management;
6. paper and wood;
7. intensive production livestock and aquaculture;
8. animal and vegetable products from the food and beverage sector;
9. other activities.

The data are supplied in Register for **91 pollutants** which belong to the following 7 **groups**:

1. Greenhouse gases

2. Other gases
3. Heavy metals
4. Pesticides
5. Chlorinated organic substances
6. Other organic substances
7. Inorganic substances

The presence of these pollutants is traced in at least one of the following environments: air, water and soil (according to Annex II of the Regulation no.166 / 2006)

5.4.2. E-PRTR Register at national level

The National Register complies with the concept expressed by the definition given in the PRTR Protocol, E-PRTR Regulation respectively, namely to be a catalog of the pollutants released and transferred from a variety of sources, which may have potential harmful effect on environment, under the form of an electronic database accessible to the public.

Through reporting, the industrial sectors specific to the national economy have been covered, reflecting by the collections of annual data the dynamics recorded by them.

The Romanian catalog started with the collection of the data related to industrial activities performed by the industrial complexes in 2007. So, as a result of exceeding the threshold values established in the Annex II of E-PRTR Regulation, **458 industrial complexes** were written in the Register.

5.5. Mode of Reporting the Data From the Automatic Stations for Air Quality Monitoring, in Romania

The monitoring system allows the local authorities for environmental protection to:

- assess, know and inform permanently the public , other interested authorities and institutions on the air quality level;

- take timely, prompt measures for diminishing and/or eliminating the pollution episodes in case of some emergencies;
- prevent accidental pollutions;
- warn and protect population in case of emergency.

Information on air quality coming from the 142 monitoring stations and meteorological data received from the 119 monitoring stations will be transmitted to the Local Centers from the 41 Agencies for Environmental Protection.

Data on air quality coming from the stations will be presented to the public by means of some **outdoor panels**, Figure 5.3 (conventionally located in densely populated areas of the cities)

Figure 5.3 - Outdoor panel for presenting the air quality data

and by means of some **indoor panels**, Figure 5.4 (located in City Halls).

Figure 5.4 - Indoor panel for presenting the air quality data

At national level, there are 107 points for informing the public (48 outdoor panels and 59 indoor panels).

The national network for air quality monitoring centralizes now the data from the 142 stations spread throughout Romania. The stations are ascribed to the 41 Local Centers, located in the Agencies for Environment Protection.
The values measured on-line by the sensors of the analyzers mounted in stations are transmitted through GPRS to the local centers. They are interconnected, forming a network that contains also the central servers, where all the data arrive and from where they are made known to the public, in real time, by means of this site, public displaying panels located in big cities also by means of the information points from the City Halls. For informing as promptly as possible the public, the data presented are those one sent on-line by the sensors of the analyzers from stations (raw data). So, the values shall be considered provided that they are only automatically validated actually (by software), and then at the local centers the specialists will validate manually all these data; subsequently they will be centrally certified.

The central database stores and archives both raw data and the valid and certified data. The specialists access these data both for different studies and for sending the Romania reports to the European Forums (Figure 5.5.).

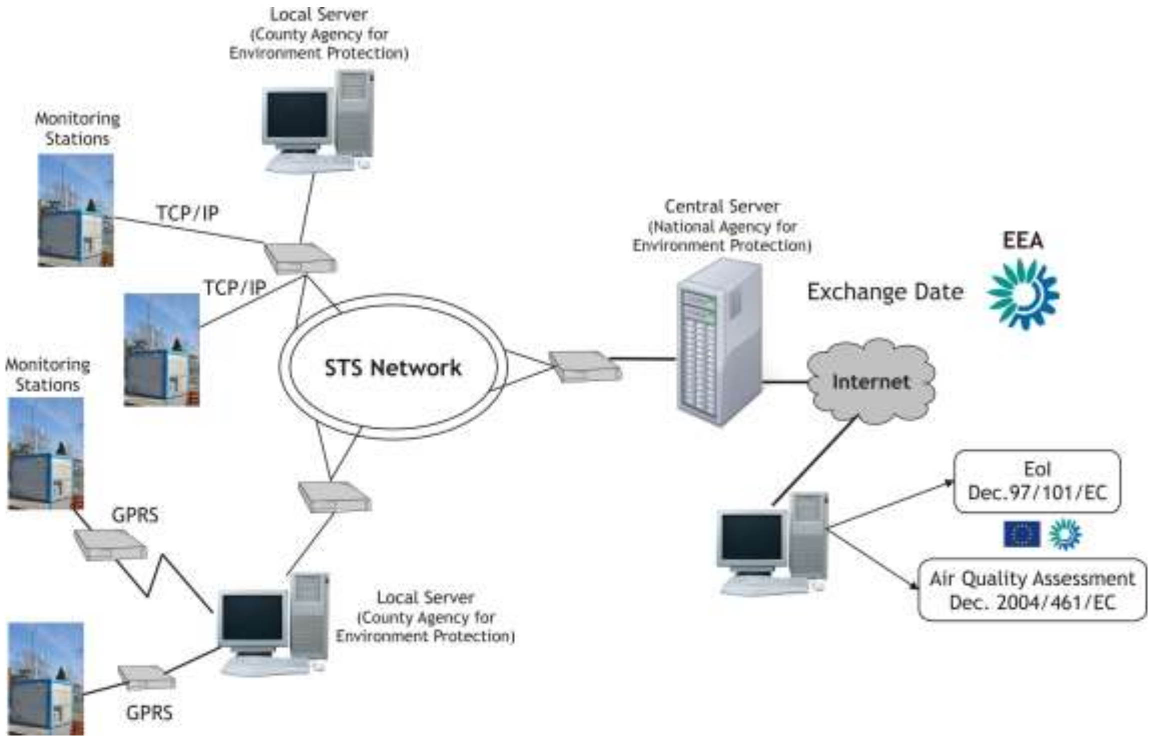


Figure 5.5 - Schematic diagram of the way of reporting the data from the automatic stations for air quality monitoring

Example of presenting the pollutant emissions in Romania in accordance with the reporting imposed by CLRTAP

By accessing the web page [2], the way of reporting the data for the pollutants presented in Figure 5.7 may be visualized. The accessing mode is presented in the following figures:

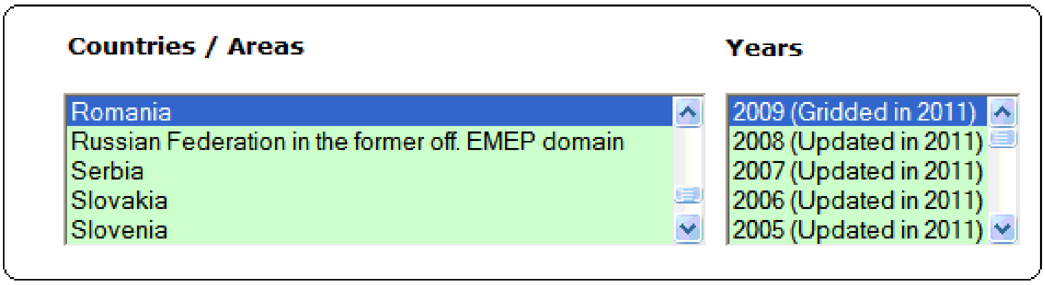


Figure 5.6 - Selection of the country and year when the data were reported [2]

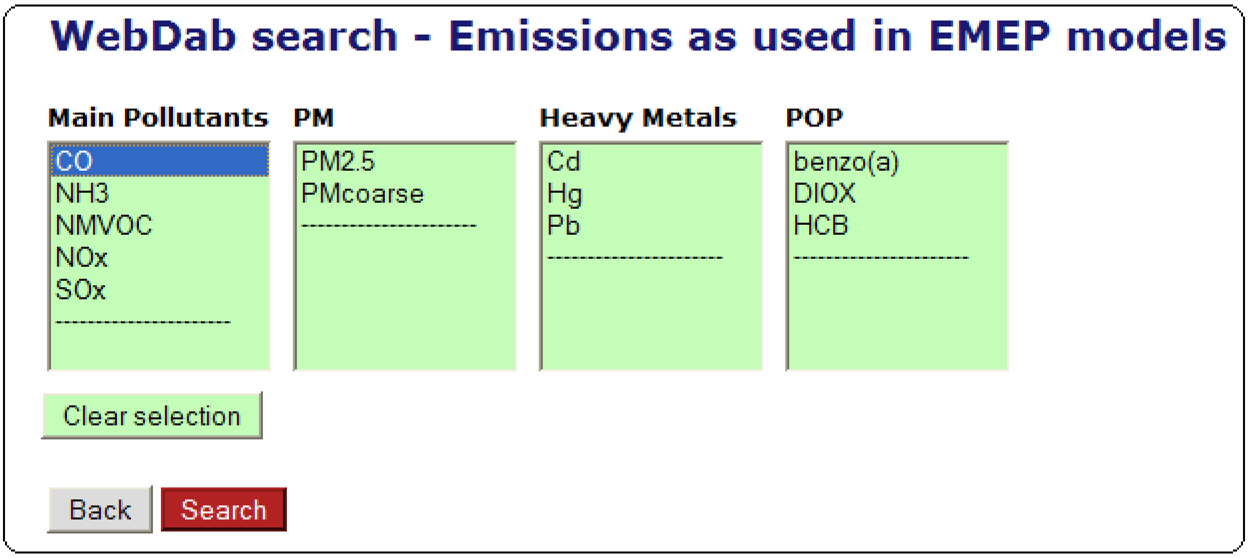


Figure 5.7 - Selection of pollutant [2]

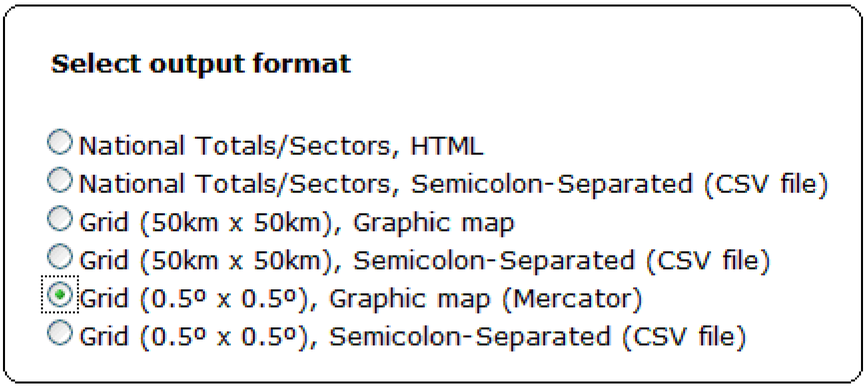


Figure 5.8 - Selection of the way of reporting the data [2]

National Total (without S11)

S1 - Combustion in energy and transformation industries (stat. sources)
S2 - Non-industrial combustion plants (stationary sources)
S3 - Combustion in manufacturing industry (stationary sources)
S4 - Production processes (stationary sources)
S5 - Extraction and distribution of fossil fuels and geothermal energy
S6 - Solvent use and other product use
S7 - Road transport
S8 - Other mobile sources and machinery
S9 - Waste treatment and disposal
S10 - Agriculture
S11 - Other sources and sinks

Figure 5.9 - Selection of pollution sources [2]

The gas emissions, reported for 2009 in Romania, within Romania Bulgaria cross-border area inclusively, are presented in the next figures.

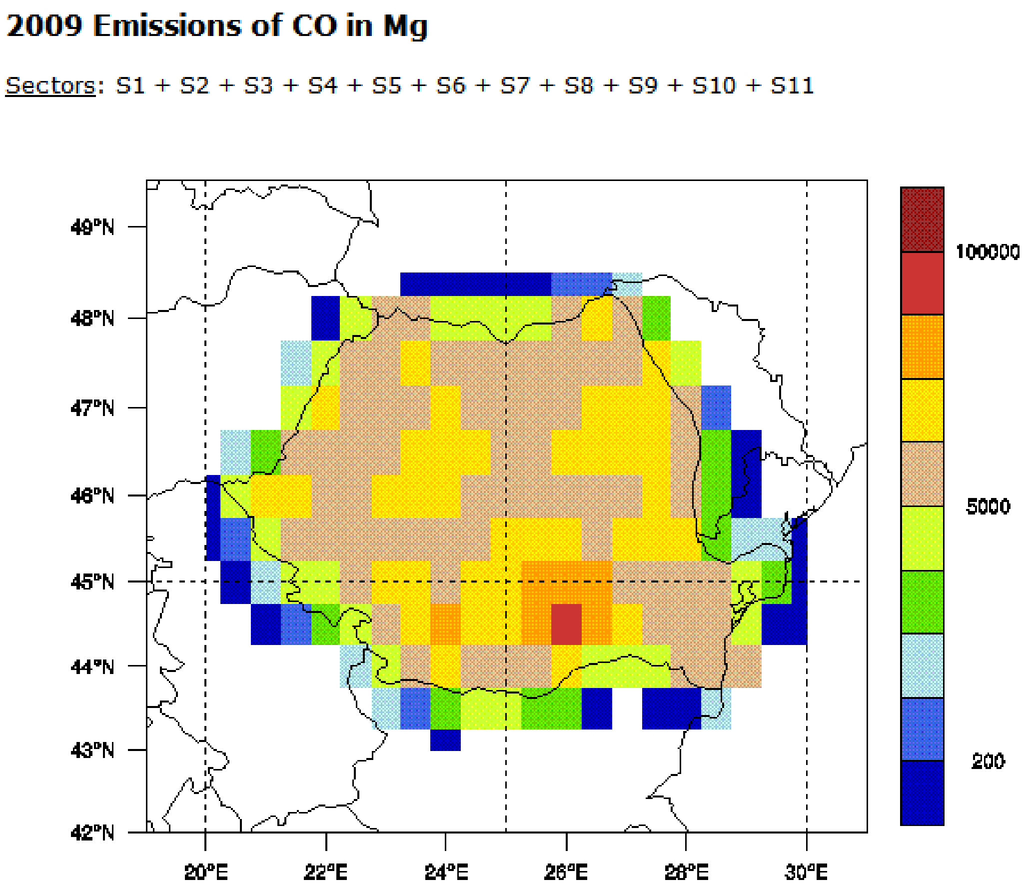


Figure 5.10 - Presentation of CO emissions [2]

2009 Emissions of NH3 in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

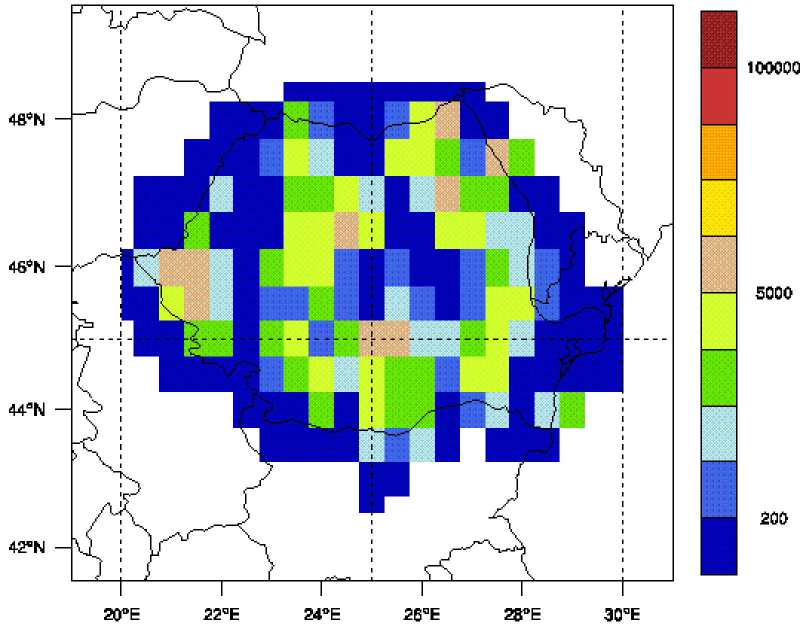


Figure 5.11 - Presentation of NH_3 emissions [2]

2009 Emissions of NMVOC in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

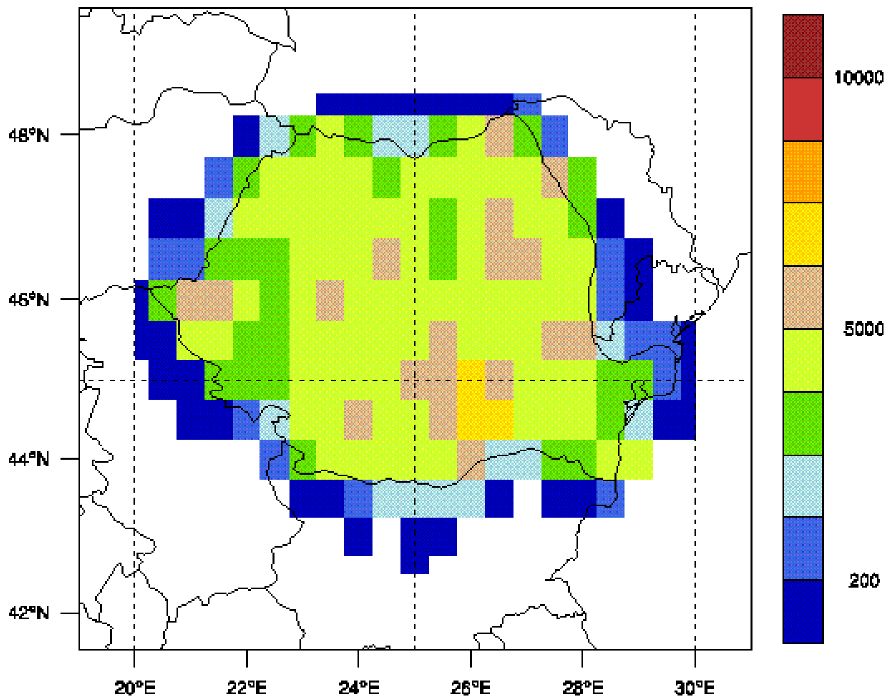


Figure 5.12 - Presentation of NMVOC emissions [2]

2009 Emissions of NOx in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

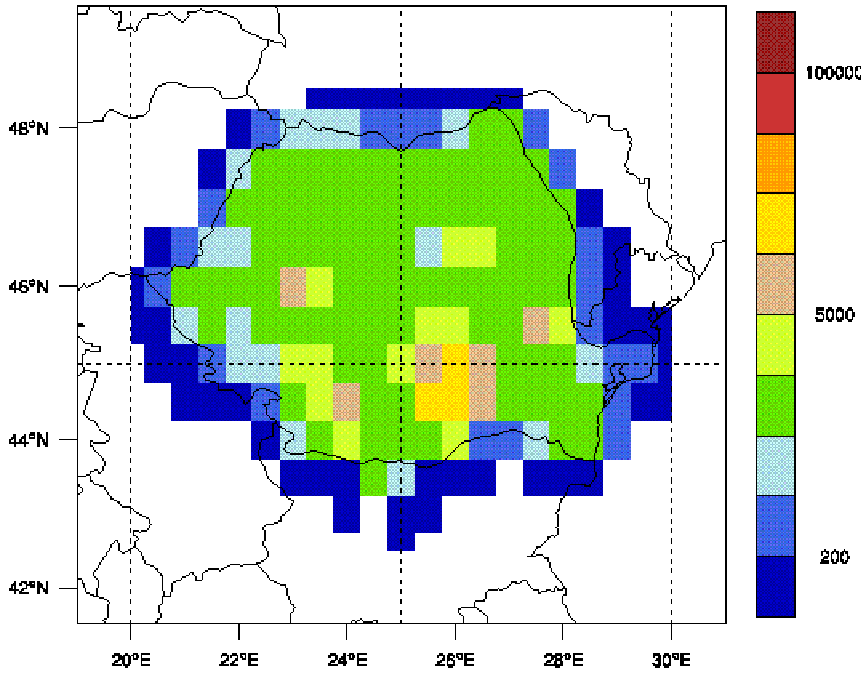


Figure 5.13 - Presentation of NOx emissions [2]

2009 Emissions of SOx in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

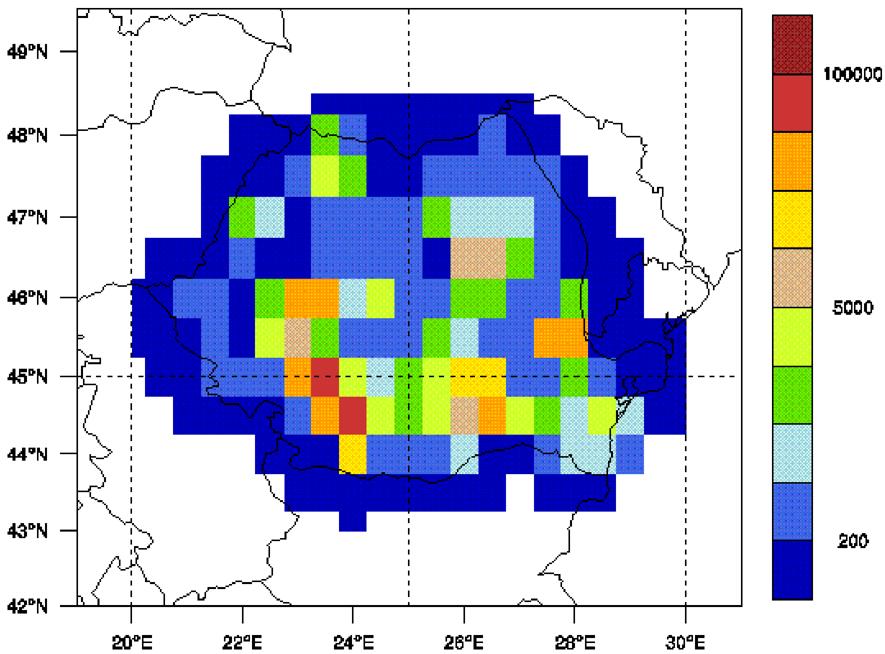


Figure 5.14 - Presentation of SOx emissions [2]

2009 Emissions of PM2.5 in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

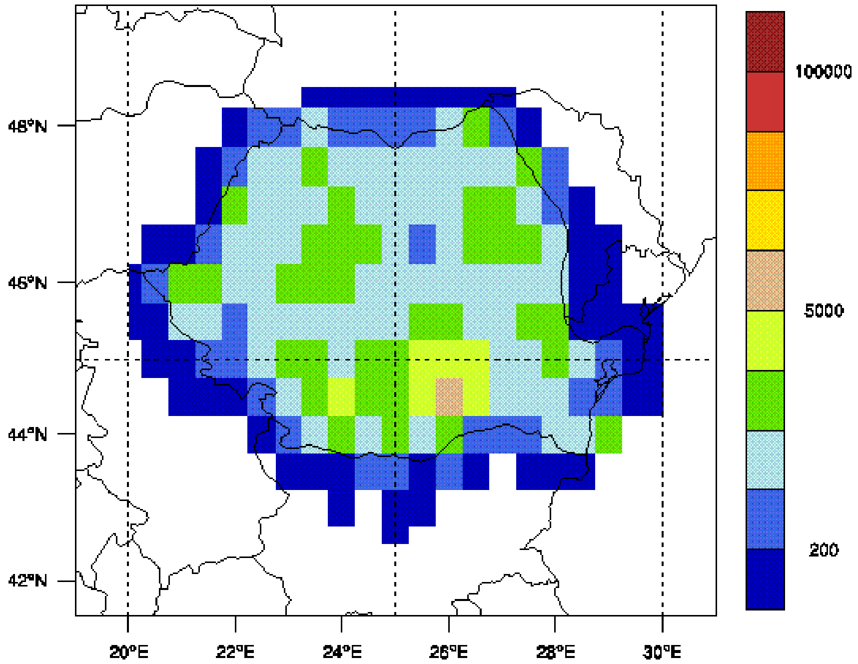


Figure 5.15 - Presentation of PM 2.5 emissions [2]

2009 Emissions of PMcoarse in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

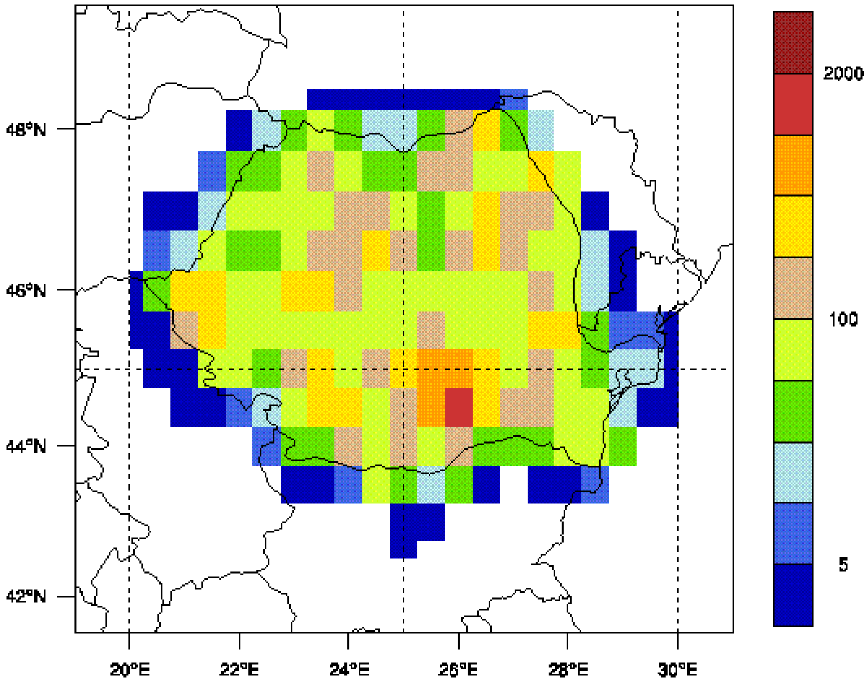


Figure 5.16 - Presentation of PMcoarse emissions [2]

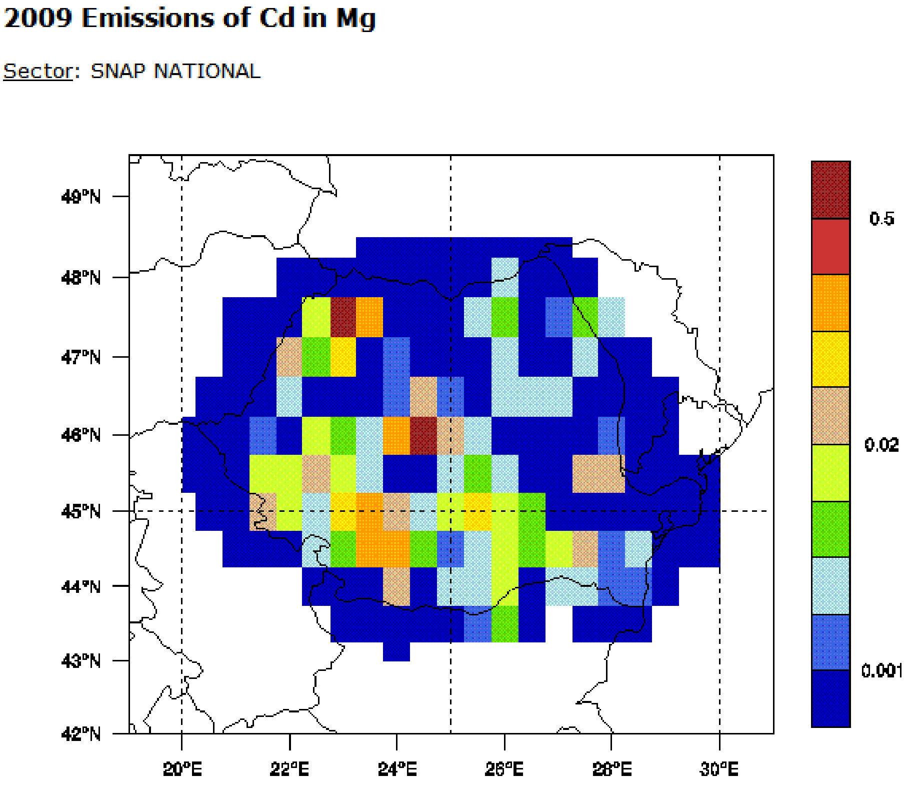


Figure 5.17 - Presentation of Cd emissions [2]

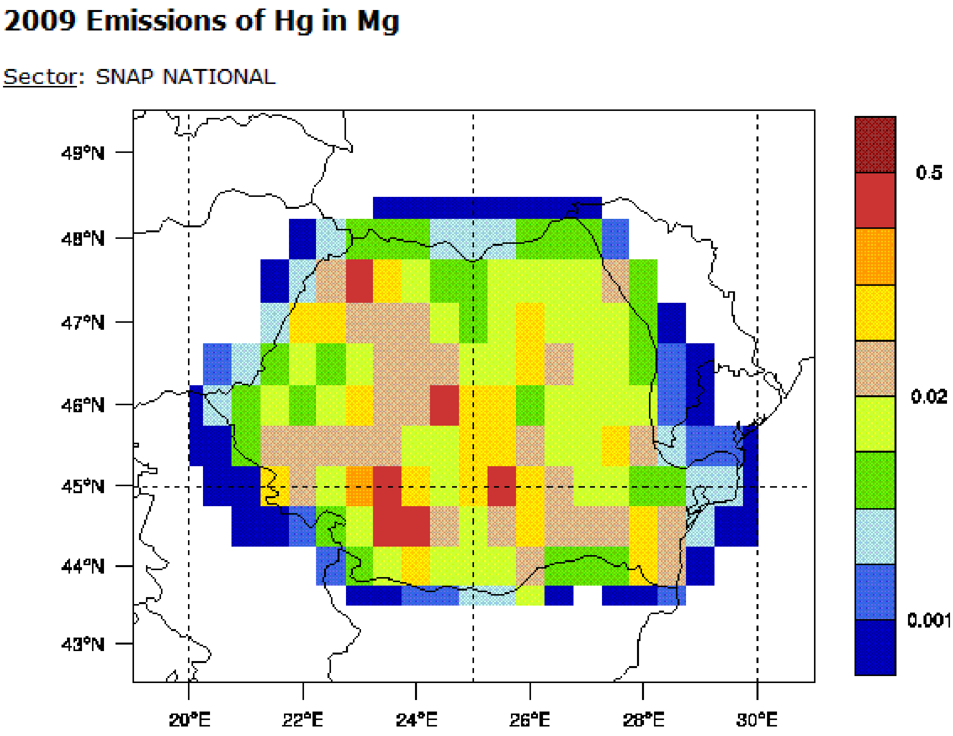


Figure 5.18 - Presentation of Hg emissions [2]

2009 Emissions of Pb in Mg

Sector: SNAP NATIONAL

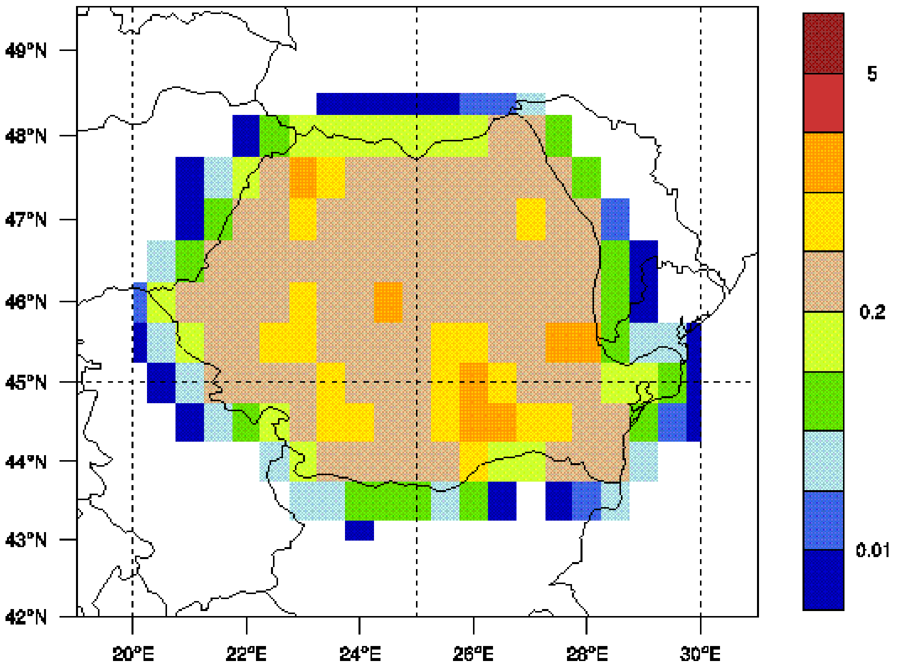


Figure 5.19 - Presentation of Pb emissions [2]

2009 Emissions of benzo(a) in Mg

Sector: SNAP NATIONAL

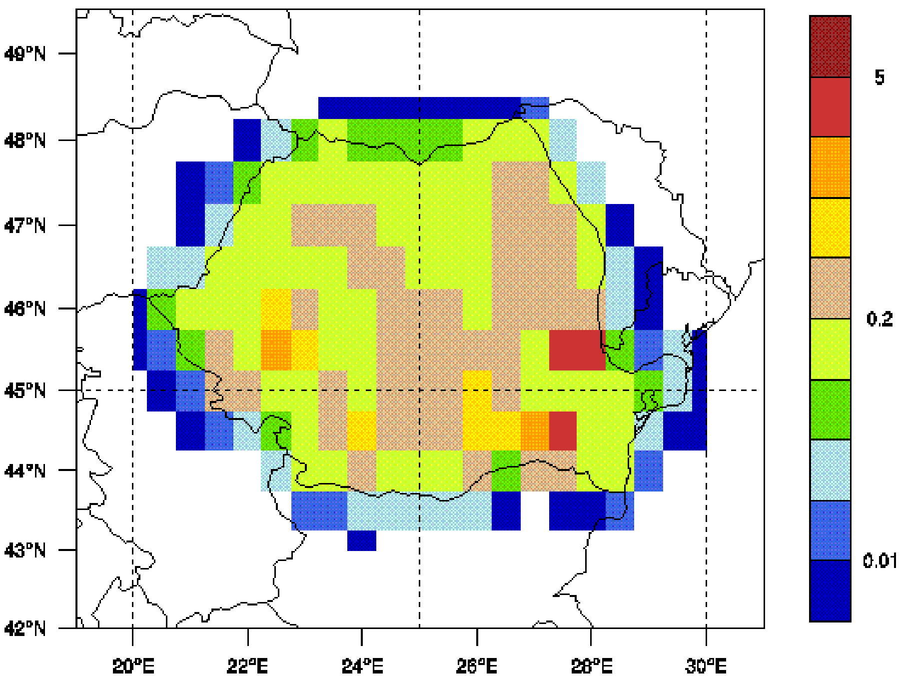


Figure 5.20 - Presentation of benzene emissions [2]

2009 Emissions of DIOX in Mg

Sector: SNAP NATIONAL

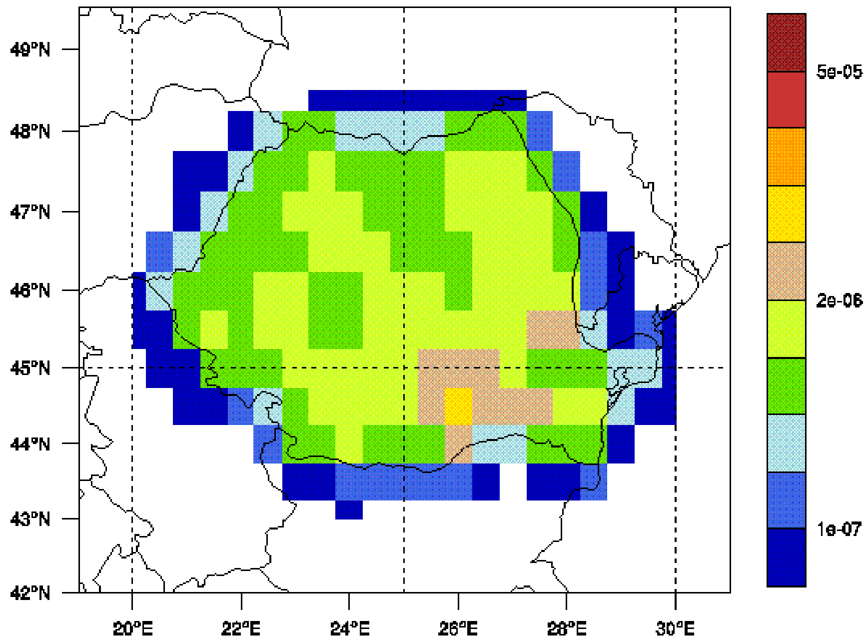


Figure 5.21 - Presentation of DIOX emissions [2]

2009 Emissions of HCB in Mg

Sector: SNAP NATIONAL

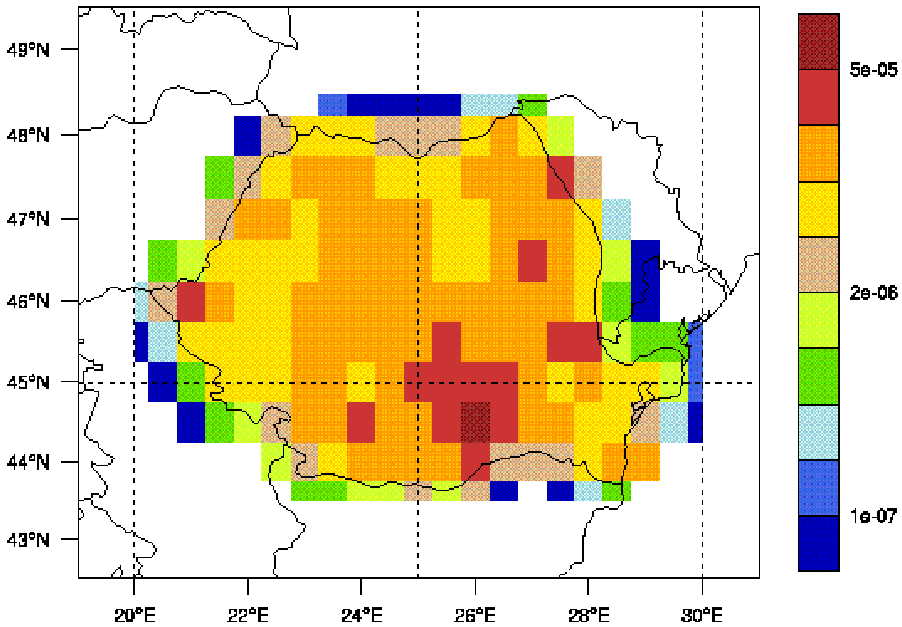


Figure 5.22- Presentation of HCB emissions [2]

Example of presenting the pollutant emissions in Bulgaria in accordance with the reporting imposed by CLRTAP

By accessing the web page [2] the way of reporting the data for the pollutants presented in Figure 5.24 may be visualized. The accessing mode is presented in the following figures:

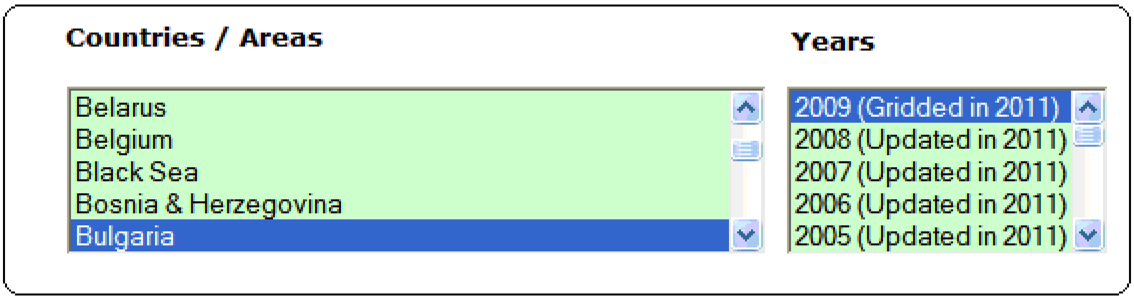


Figure 5.23 - Selection of the country and year when the data were reported [2]

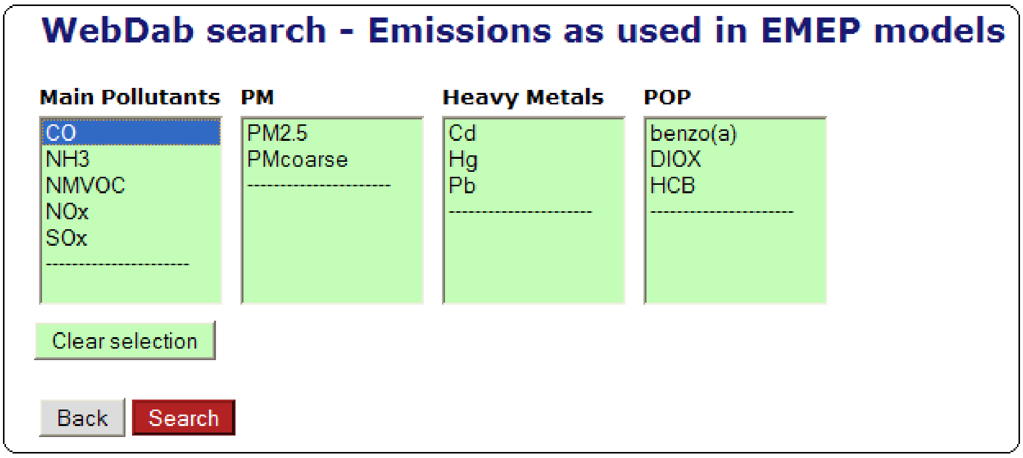


Figure 5.24 - Selection of pollutant [2]

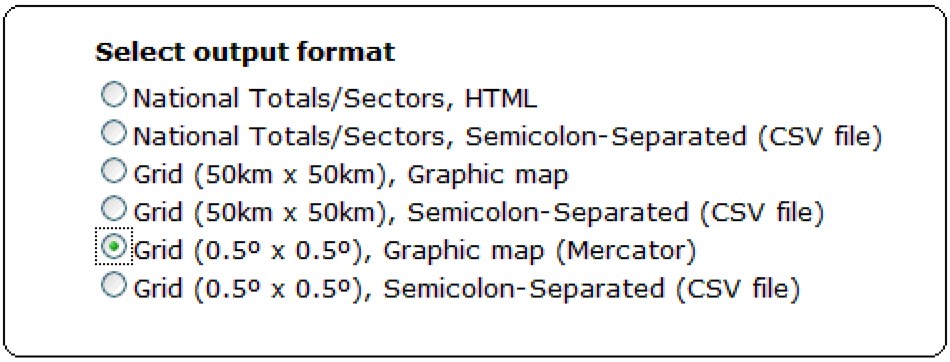


Figura 5.25 - Selection of the mode of reporting the data [2]

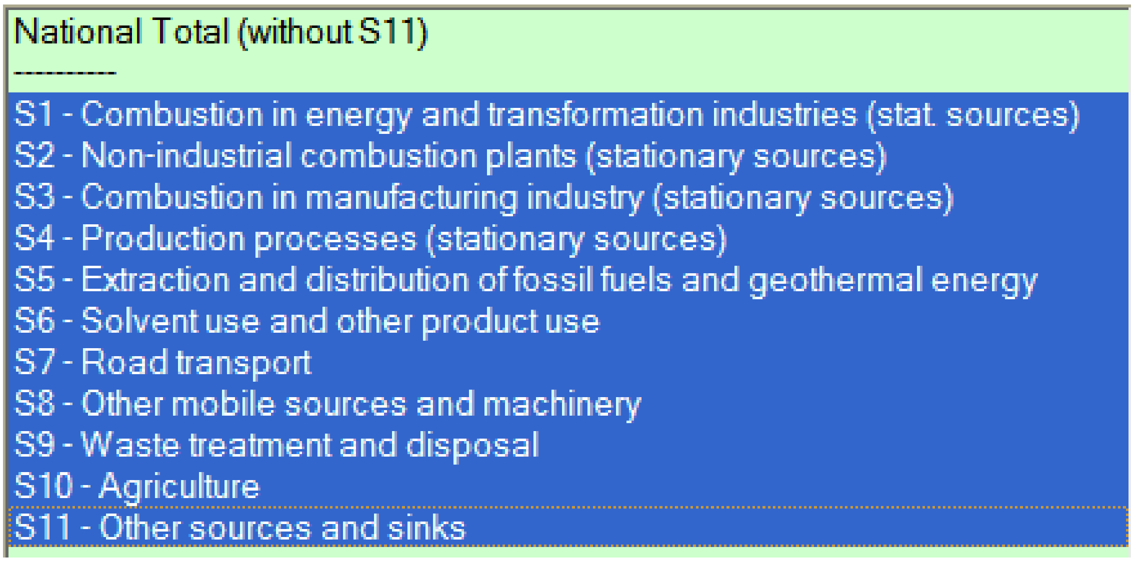


Figure 5.26 - Selection of pollution sources [2]

The gas emissions, reported for 2009 in Bulgaria, within Romania Bulgaria cross-border area inclusively, are presented in the next figures.

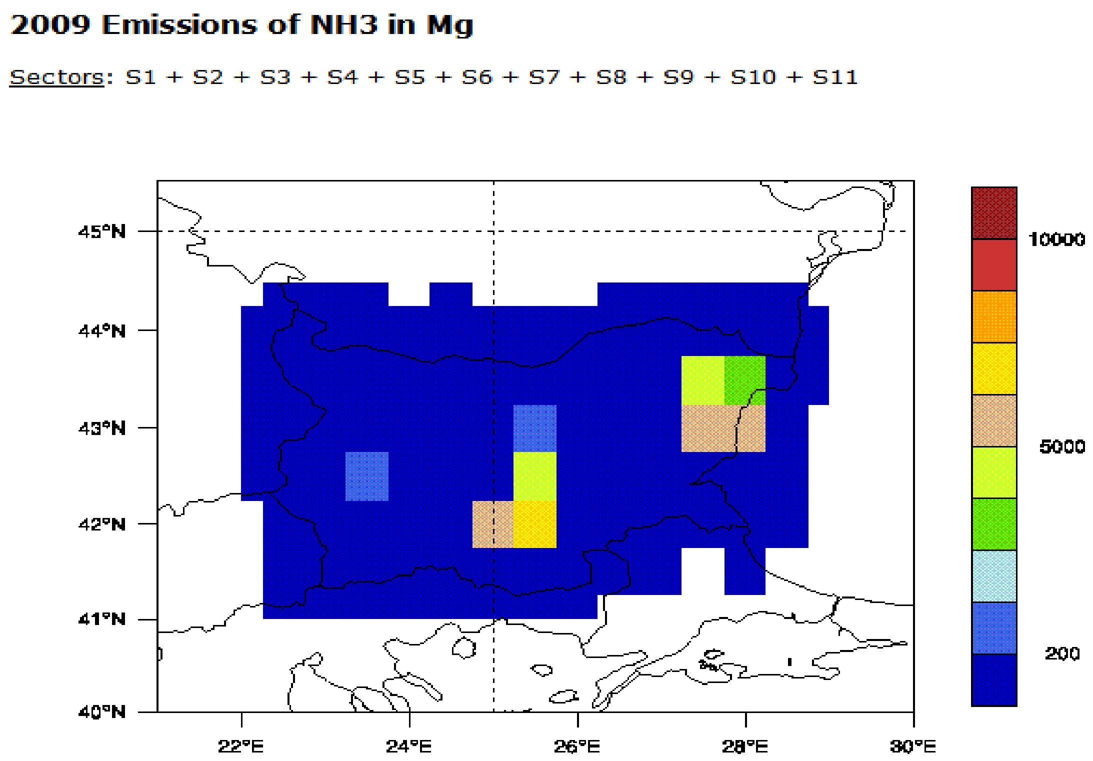


Figure 5.27 - Presentation of NH_3 emissions [2]

2009 Emissions of CO in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

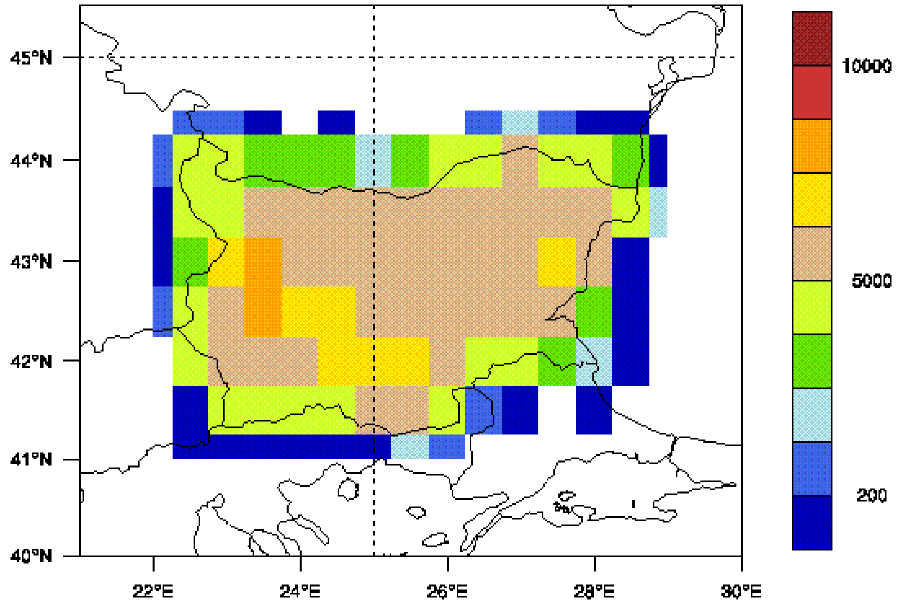


Figure 5.28 - Presentation of CO emissions [2]

2009 Emissions of NMVOC in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

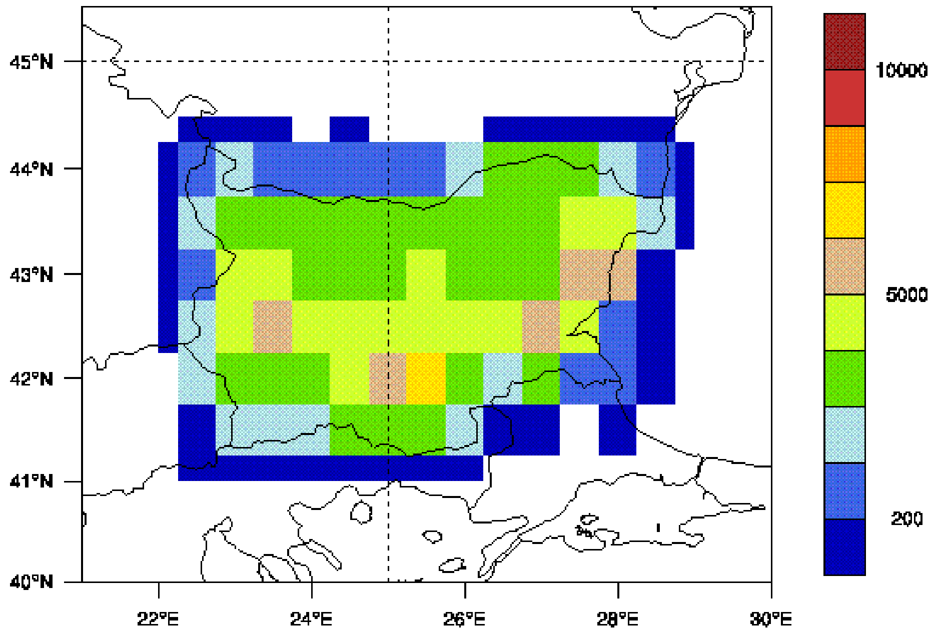


Figure 5.29 - Presentation of NMVOC emissions [2]

2009 Emissions of NOx in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

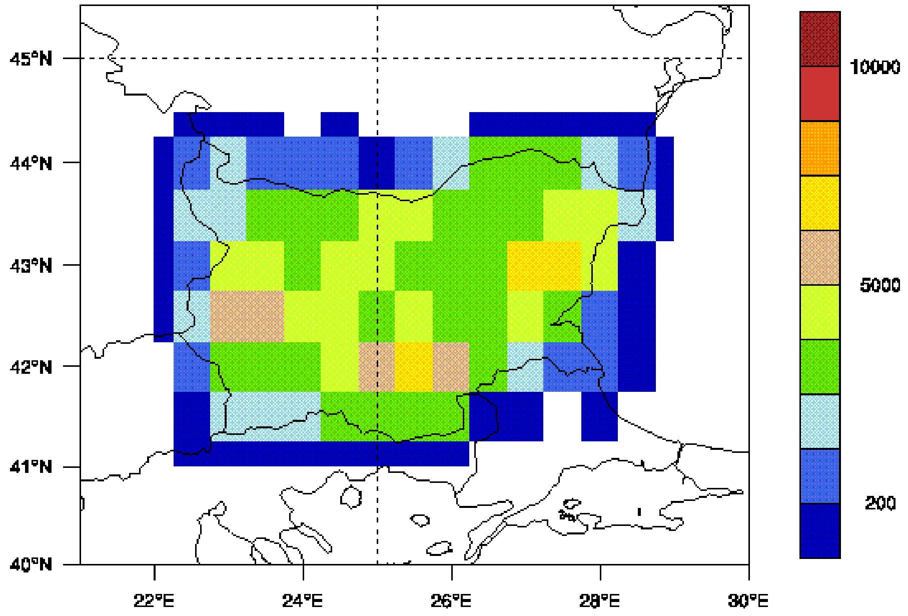


Figure 5.30 - Presentation of NOx emissions [2]

2009 Emissions of SOx in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

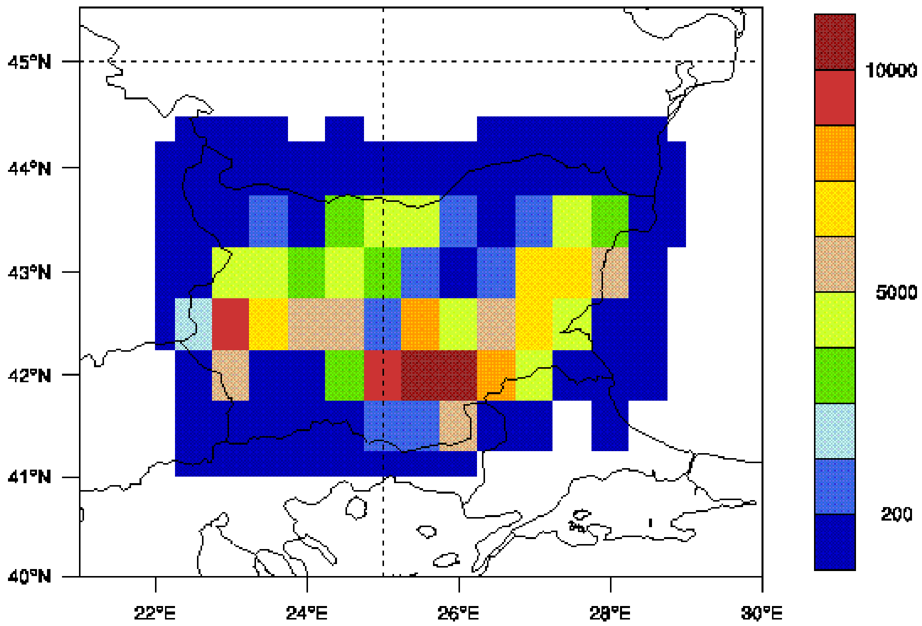


Figure 5.31 - Presentation of SOx emissions [2]

2009 Emissions of PM2.5 in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

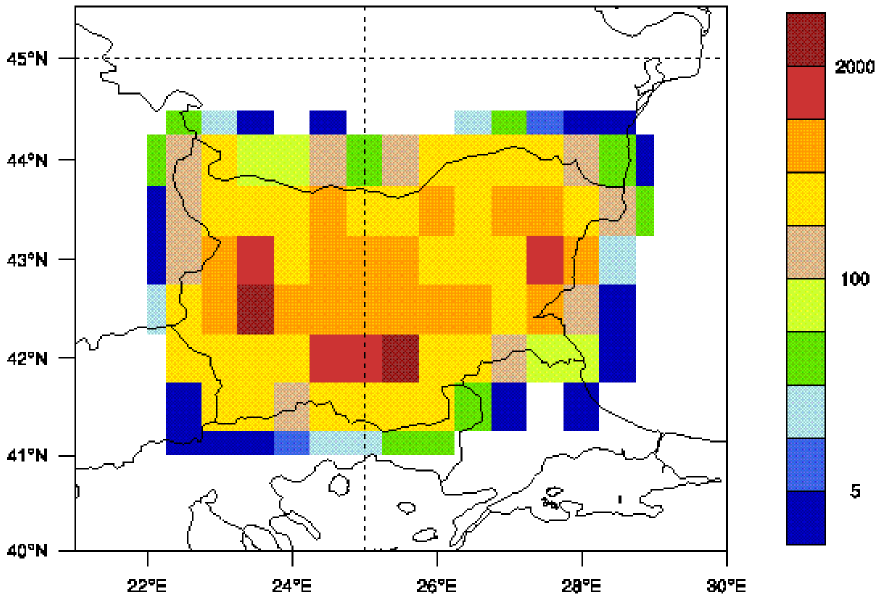


Figure 5.32 - Presentation of PM 2.5 emissions [2]

2009 Emissions of PMcoarse in Mg

Sectors: S1 + S2 + S3 + S4 + S5 + S6 + S7 + S8 + S9 + S10 + S11

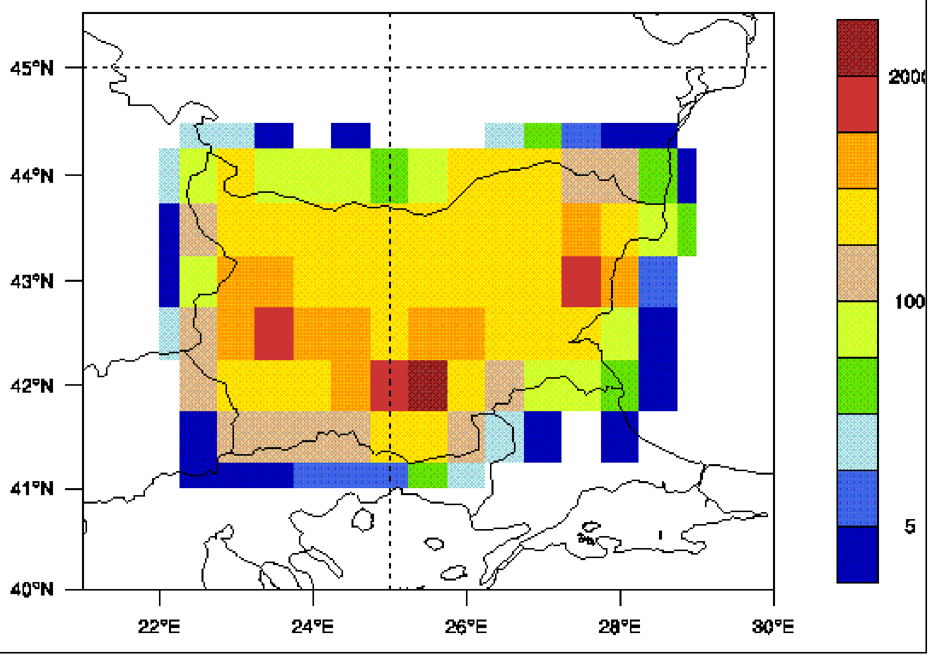


Figure 5.33 - Presentation of Pmcoarse emissions [2]

2009 Emissions of Cd in Mg

Sector: SNAP NATIONAL

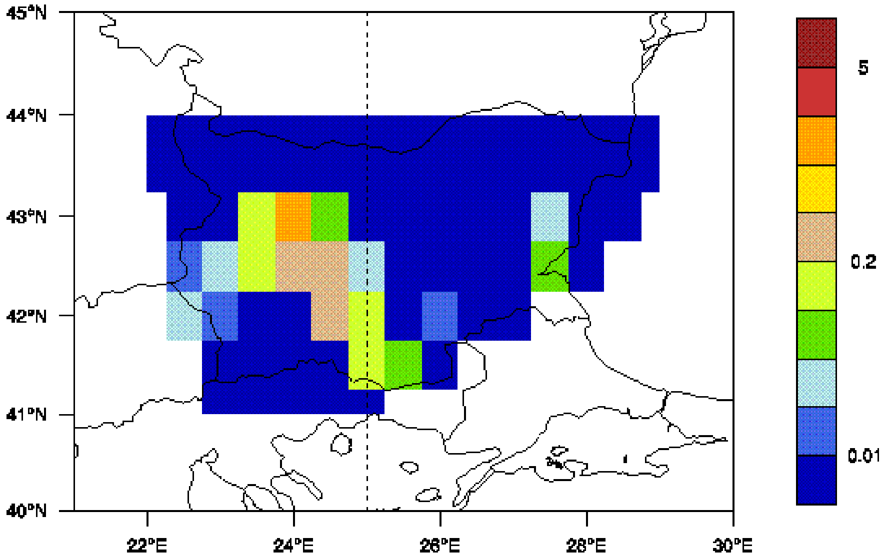


Figure 5.34 - Presentation of Cd emissions [2]

2009 Emissions of Hg in Mg

Sector: SNAP NATIONAL

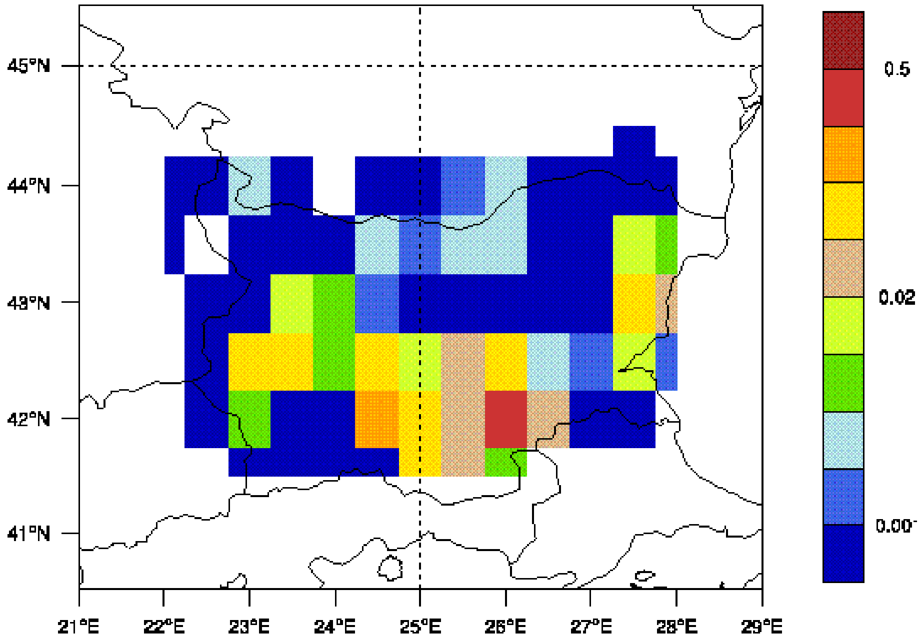


Figure 5.35 - Presentation of Hg emissions [2]

2009 Emissions of Pb in Mg

Sector: SNAP NATIONAL

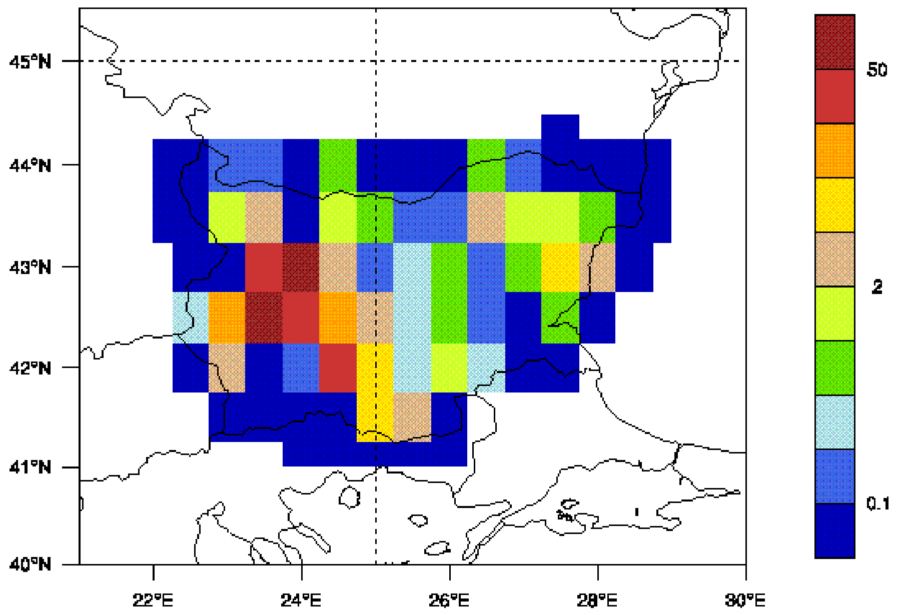


Figure 5.36 - Presentation of Pb emissions [2]

2009 Emissions of benzo(a) in Mg

Sector: SNAP NATIONAL

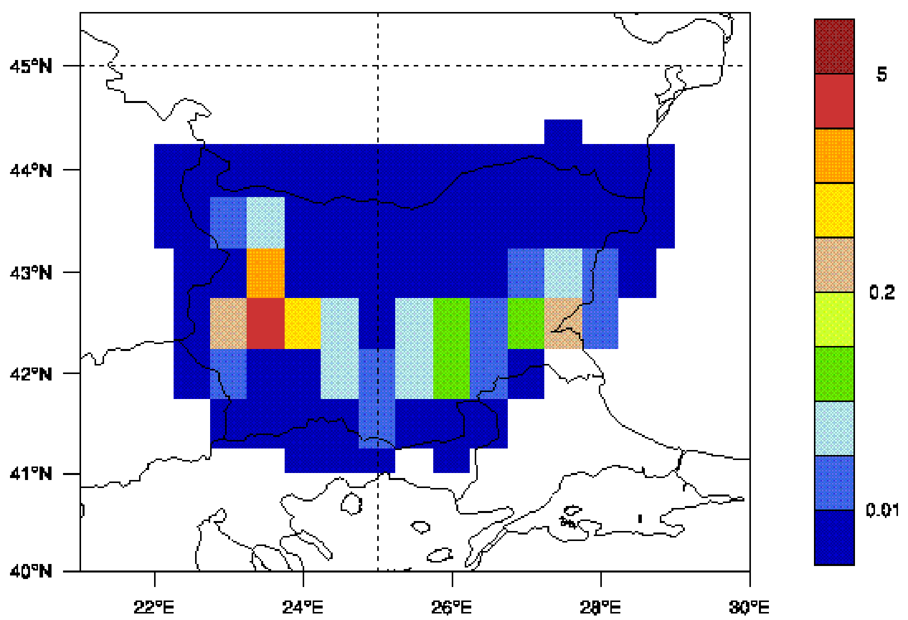


Figure 5.37 - Presentation of benzene emissions [2]

2009 Emissions of DIOX in Mg

<u>Sector</u>: SNAP NATIONAL

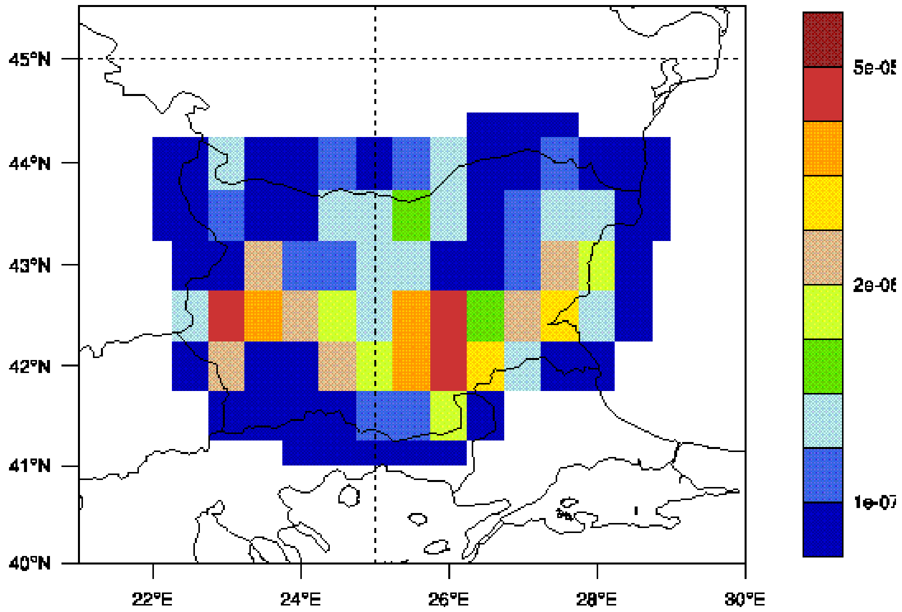


Figure 5.38 - Presentation of DIOX emissions [2]

2009 Emissions of HCB in Mg

<u>Sector</u>: SNAP NATIONAL

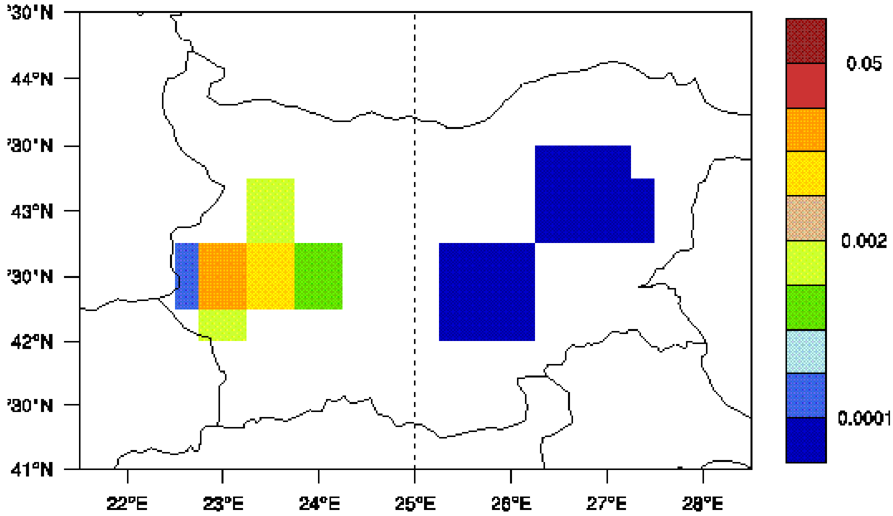


Figure 5.39 - Presentation of HCB emissions [2]

Example of reporting the identification data of the automatic monitoring stations from Romania and Bulgaria

On the web page http://www.eea.europa.eu/themes/air/airbase/map-stations there are presented information on automatic stations, measurements, measurement method etc.

The way of accessing the data is presented in the next figures:

- For visualizing the automatic stations from Europe, one should select "AirBase-The European air quality"

Figure 5.40 - Selection of the interest field: air quality database

A windows appears, in which one should select: country, economic sector and environment topics

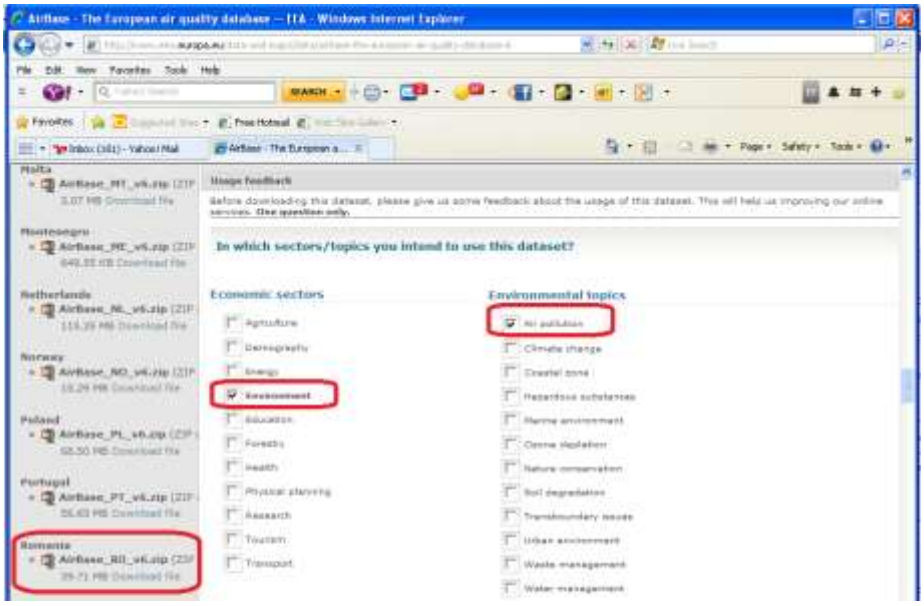


Figure 5.41 - Selection of the country, economic sector and environment topics

The selection result is a table with the automatic stations for air quality monitoring from Romania, named with the European code where information specific to each station could be found

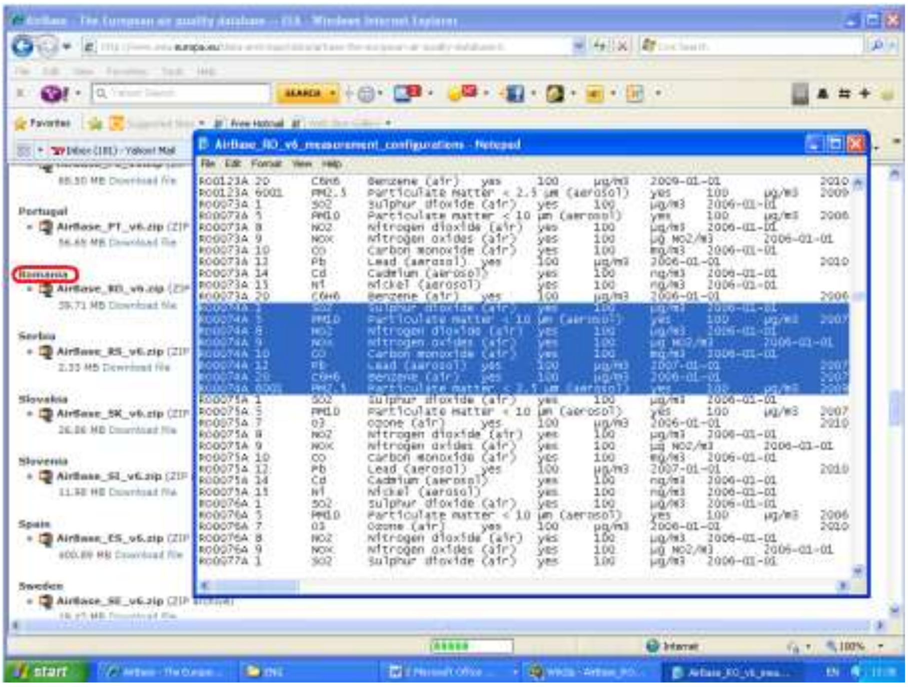


Figure 5.42 - Selection of station and visualization of specific data [8]

Similarly, the specific information of the automatic stations for air quality monitoring from Bulgaria could be visualized.

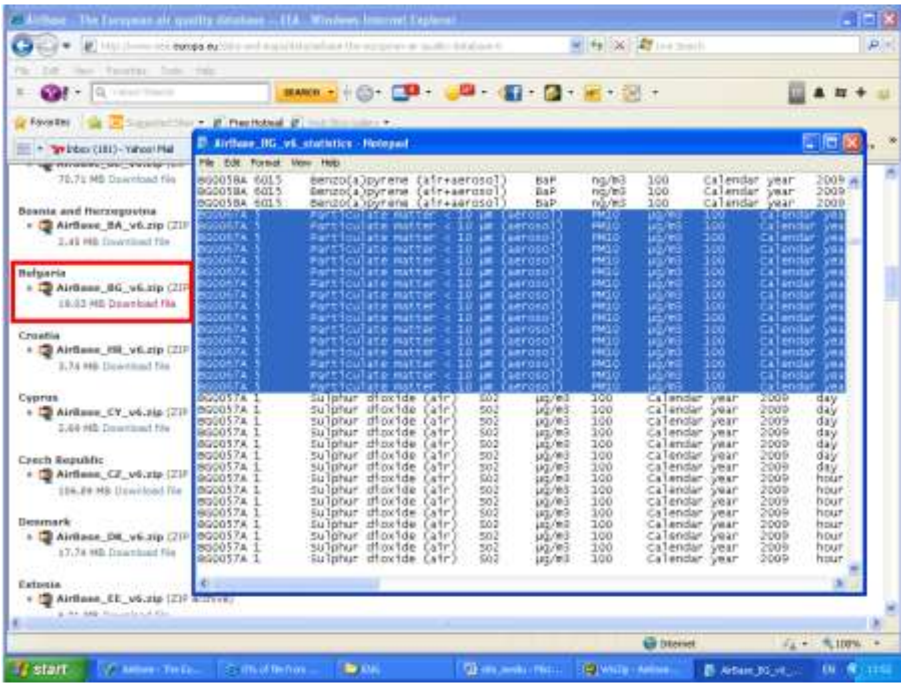


Figure 5.43 - Selection of station and visualization of specific data [8]

Example of accessing and reporting the data in the E-PRTR Register

For visualizing the data in the E- PRTR Register the web page web: http://prtr.anpm.ro/Activities.aspx is accessed, and from the main window "Search on map" is selected. For visualizing the data reported by certain economic unit, its activity profile is selected.

In the example from Figure 5.44 „ production and processing of metals" was selected, and all the economic units with this activity profile from Romania appeared symbolized. For visualization, the button „Display on map" is selected.

Further on, I selected SC ALTUR SA SLATINA.

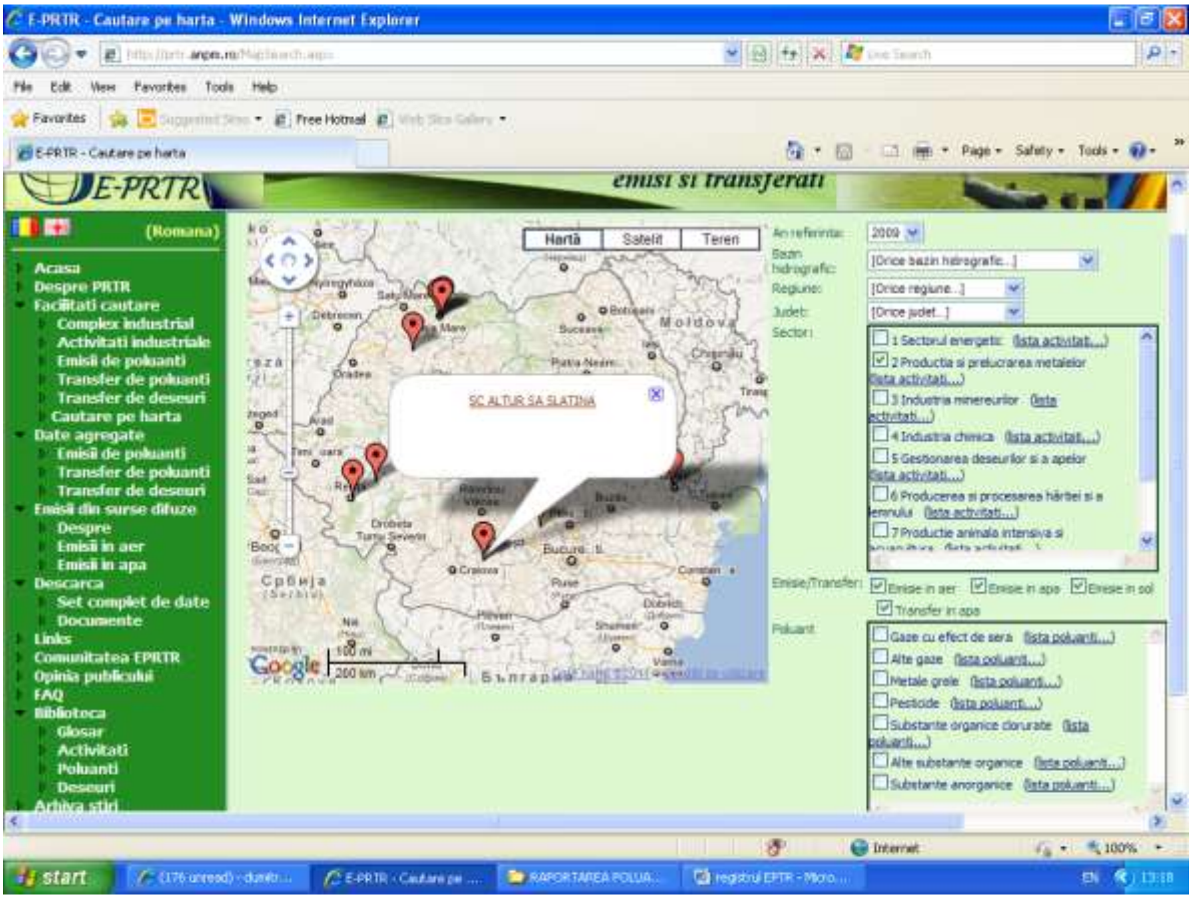


Figure 5.44 - Way of identifying an economic unit

By accessing the buttion "Industrial complex", a window with the economic unit will appear after the performed selection, with the address and possibility to visualize more details.

Example of daily reporting of the data from the automatic monitoring stations from Romania

Data source: www.calitateaer.ro

CECA / NAEP – AIR QUALITY REPORT

Date/period: 2 February 2012

In the following figures, the way of reporting the values of some pollutants is presented, on the basis of the measurements sent from the automatic stations for air quality monitoring in Romania. From the data analysis, the following conclusions were drawn:

- No exceedances of the alert thresholds for NO2 and SO2, alert threshold and information threshold for ozone were recorded;
- Daily limit value for PM10 (50µg/mc) was exceeded at the stations: BH4-Techea (industrial), CJ4-Cluj (industrial), HD2-Deva (industrial), HD4-Calan (industrial), HR1-Miercurea Ciuc (rural), IS3-Iasi (industrial), IS6-Ungheni (urban), MM1-Baia Mare (traffic), MM3-Baia Mare (suburban), NT1-Piatra Neamt (urban), PH1-Ploieşti (traffic), (data validated by the local AEP).

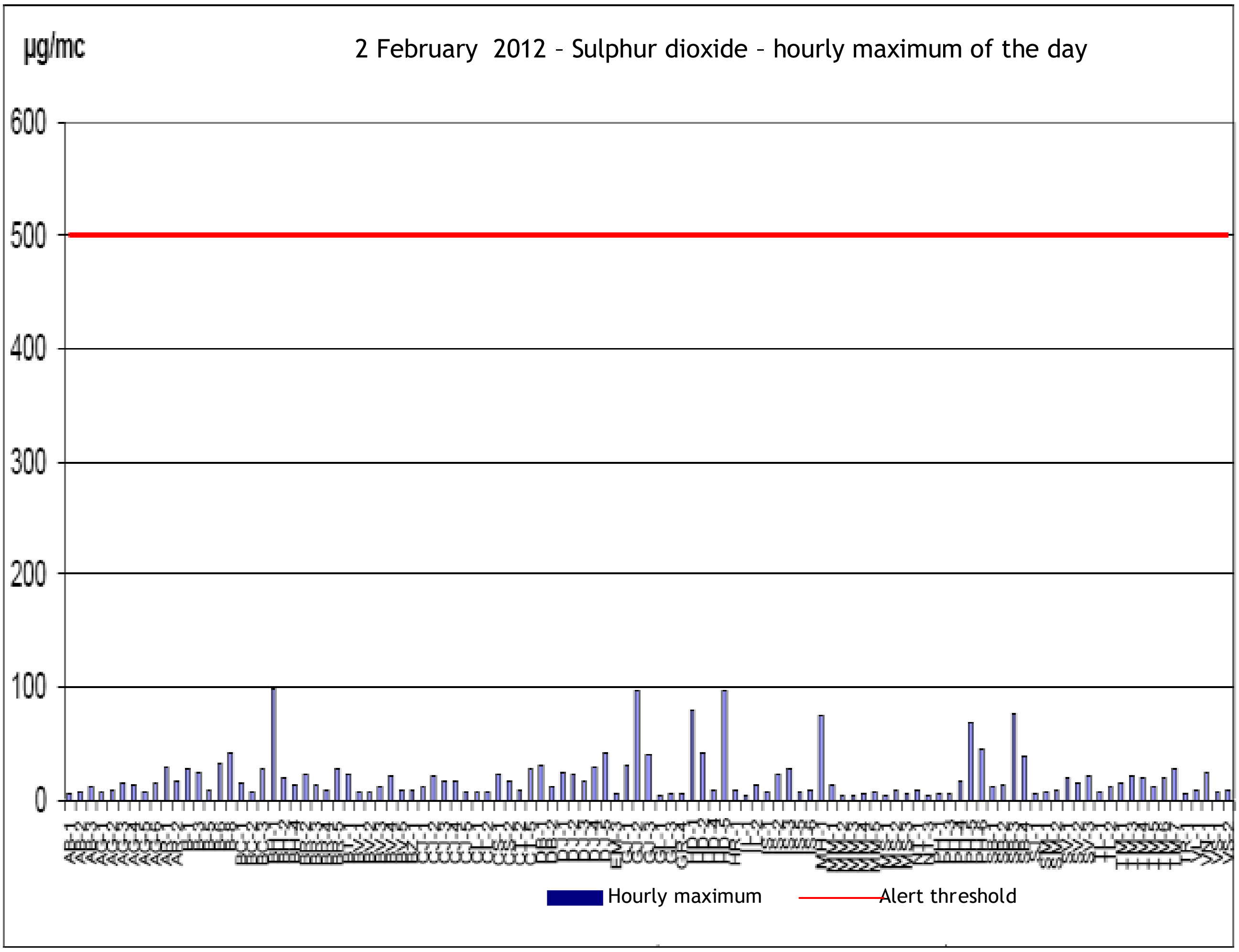


Figure 5.45 - Reporting of the sulphur dioxide concentration from the automatic stations in Romania, on 2 February 2012

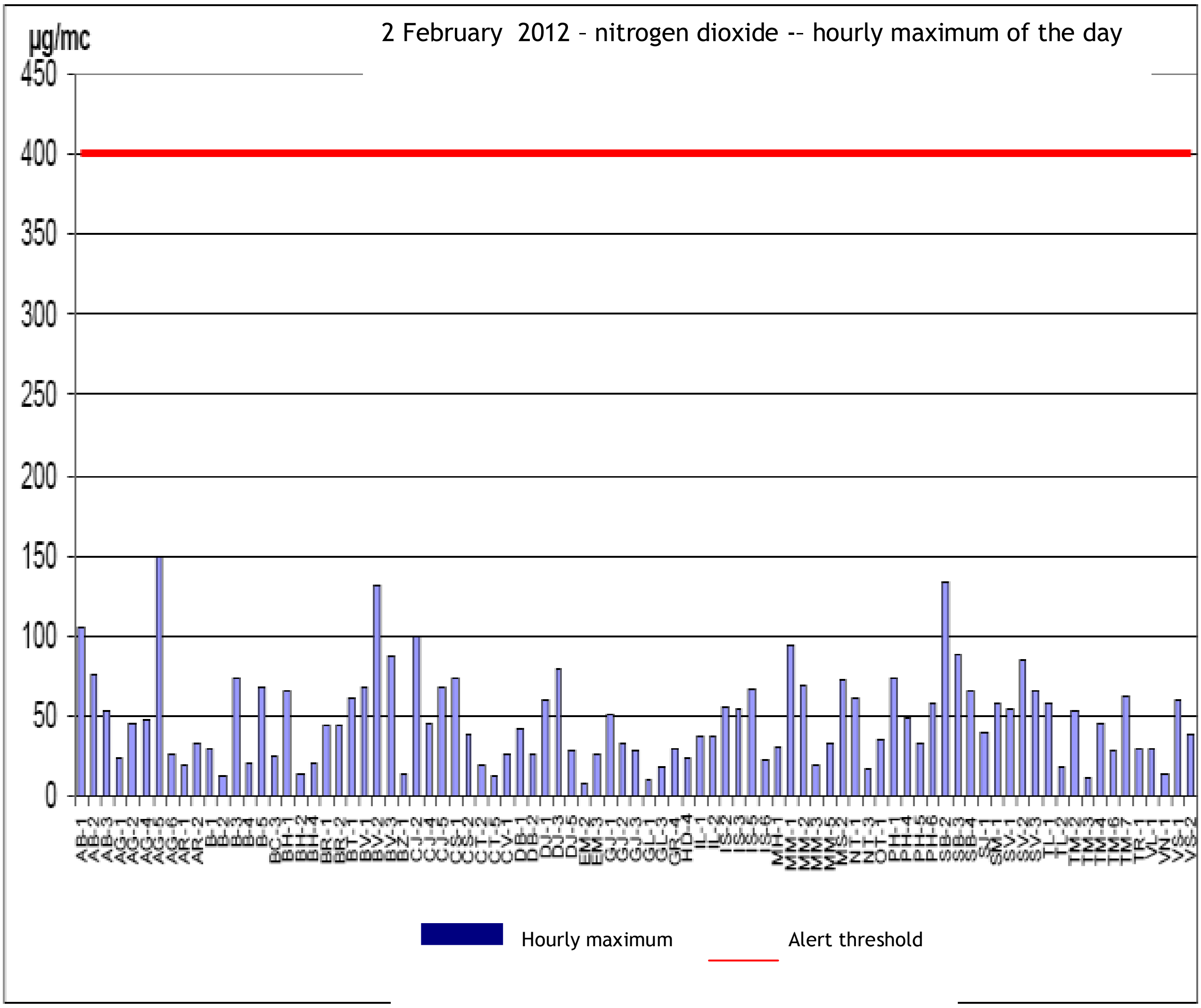


Figure 5.46 - Reporting of the nitrogen dioxide concentration from the automatic stations in Romania, on 2 February 2012

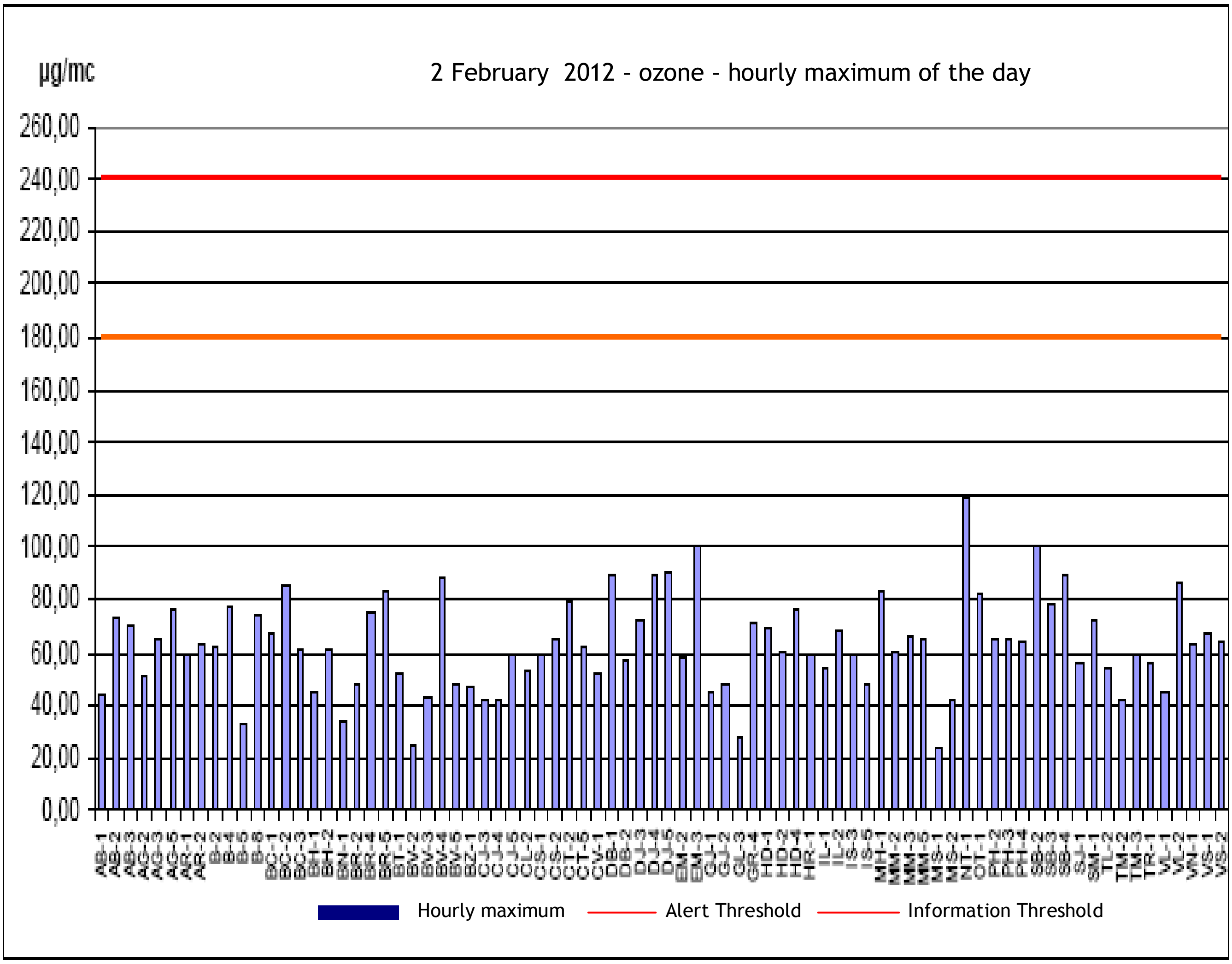


Figure 5.47 - Reporting of the ozone concentration from the automatic stations in Romania, on 2 February 2012

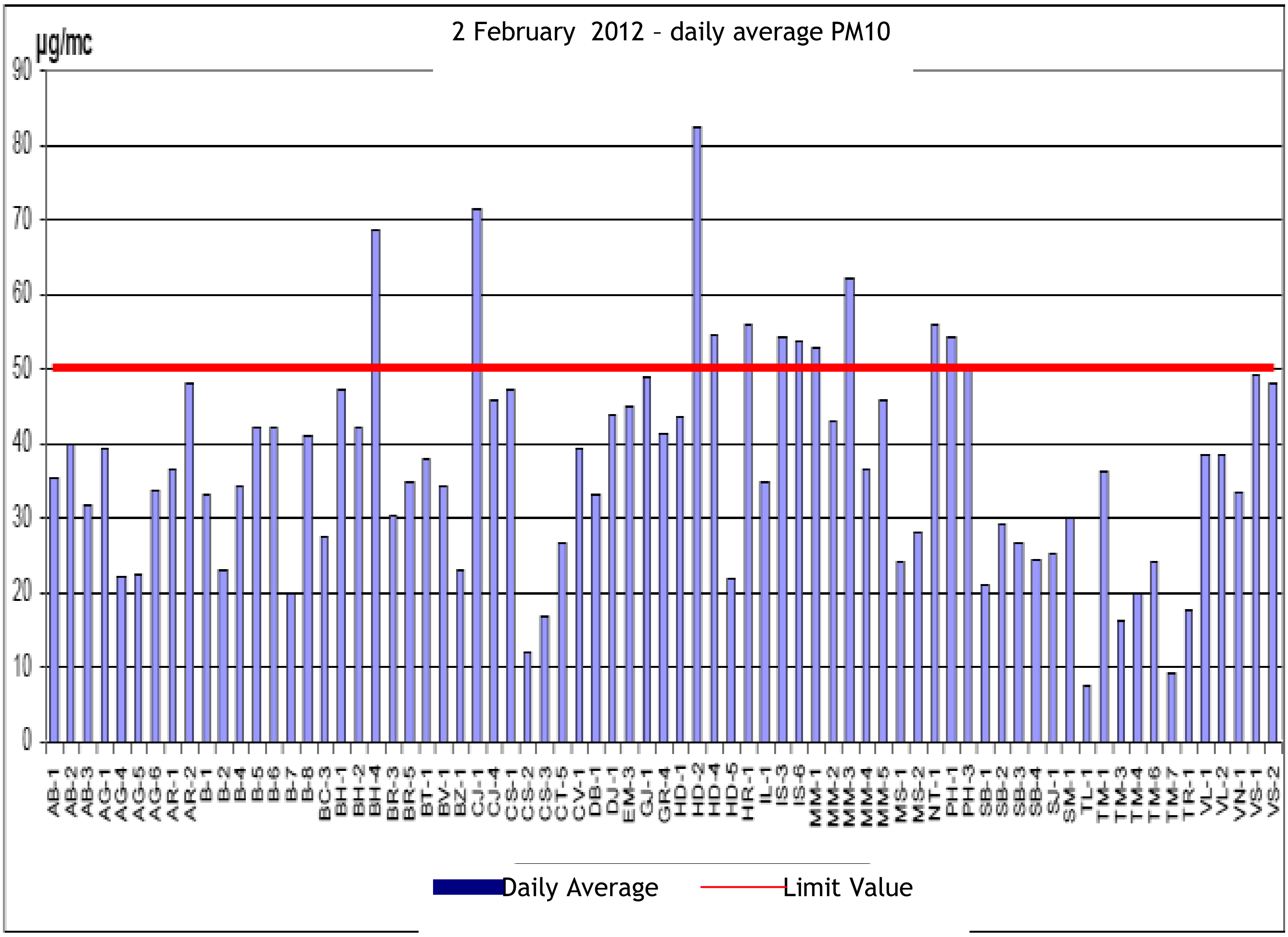


Figure 5.48 - Reporting of the PM10 concentration from the automatic stations in Romania, on 2 February 2012

LEGEND

Pollutant	Exceedance type	Exceedance description
SO2	Alert threshold	500 µg/m^3, hourly average Alert = exceedance of the alert threshold for 3 hours consecutively
	Hourly limit value	350 µg/m^3, hourly average, to be not exceeded more than 24 times per year
NO2	Alert threshold	400 µg/m^3, hourly average Alert = exceedance of the alert threshold for 3 hours consecutively
	Hourly limit value	200 µg/m^3, hourly average, to be not exceeded more than 18 times per year
Ozone	Information threshold	180 µg/m^3, hourly average
	Alert threshold	240 µg/m^3, hourly average Alert = exceedance of the alert threshold for 3 hours consecutively
PM10, automatic method	Daily limit value	50 µg/m^3, average on 24 hours, to be not exceeded more than 35 times per year

*The exceedances automatically measured (by nephelometry method) have an informative purpose and may be confirmed/infirmed subsequently by the result of the analysis that uses the gravimetry reference method

CECA Service-Air Quality Directorate

CHAPTER 6

AIR QUALITY EFFECTS ON HUMAN HEALTH AND ECOSYSTEMS

6.1. General

Short and medium term effects of air pollution are detrimental to human health and bring prejudices to ecosystems and economy. Long term pollution affects the environment by: effect of greenhouse gases, ozone depletion, acid rains, presence of micro-pollutants and suspended particulate matters.

Environment plays a crucial role in people physique, mental and welfare. Complex relationships between environmental factors and human health factors, taking into account the multiple interaction paths, are analyzed in a larger social-economic and cultural context.

Environment degradation by air pollution, noise, chemicals, decrease of air quality and loss of natural zones, combined with changes of the life style may contribute to substantial increases of obesity rates, diabetes, diseases of cardiovascular and nervous systems and cancer – all being major problem of public health for Europe population.

Human health protection is closely related to the biodiversity preservation, which is fundamental for human welfare, and to sustainable supply of natural resources.

“Biodiversity” includes all the living organisms found in atmosphere, land or water. All species have a role and provide the ”living mechanism” we are depending on: from the smallest bacteria in soil to the biggest mammal in ocean. The four basic pillars of building the biodiversity are genes, species, habitats and ecosystems.

A wide range of pollutants – including nutrients in excess, pesticides, microbes, industrial chemicals, metals and pharmaceutical products – reach the soil, ground waters and surface waters. Atmospheric deposits of eutrophication and acidifying substances, including the nitrogen oxide (NO_X), ammonia (NH_X) and sulfur dioxide (SO_2), add to the pollutant cocktail.

The effects on ecosystems are ranging from the forest and lake destruction by acidification to the habitat deterioration because of nutrient enrichment, algae proliferation caused by nutrient enrichment, also neural and endocrine dysfunctions at the species level, caused by pesticides, steroid estrogens and industrial chemicals, like PCBs.

Most European data on pollutant effects on biodiversity and ecosystems are related to acidification and eutrophication.

Environment and health evolution is directed to getting a better understanding of the environmental threats to human health, reducing diseases caused by environmental factors, strengthening the EU capacity to develop policies in this field and identifying and preventing new threats to health [1]. While the EU policy focus is on the pollution reduction and on the disturbances of crucial importance caused by the environment, there is also an increasing recognition of the nature benefits, diversified biological environment for human health and welfare [2].

6.2. Environment, human health and ecosystems

The harmful effects of the ecosystem changes on human health are presented in Table 6.1.

Table 6.1 – Harmful effects of ecosystem changes on human health

Escalating human pressure on environment at global level	**Environmental changes and ecosystem influence**	**Examples of impact on health**
	Climatic changes	**Direct impacts on health:** Floods, heat waves, waster shortages, landslides, increase of exposure to ultraviolet radiation, exposure to pollutants
	Stratospheric ozone depletion	
	Deforestation and land cover change	
	Land degradation and desertification	**"Intermediated by ecosystems" impacts on health :** Infection disease risk change, reduction of food yields, malnutrition, stop of growing, depletion of natural medications, mental, personal, community health, aesthetical impact, cultural poverty
	Loss of wetlands and damages	
	Loss of biodiversity	
	Depletion and contamination of freshwater	**Indirect impacts delayed and transferred to health:** diverse health consequences, loss of livelihoods, population movement, in homes from impoverished neighborhoods, conflicts, inadequate adaptation
	Urbanization and its effects	
	Damage to coastal reefs and ecosystems	

Note: Not all the ecosystem changes are included. Some changes may have positive effects (e.g. food production).

Source: *European environment. State and outlook 2010. Synthesis*

http://www.eea.europa.eu/soer/synthesis/translations/mediul-european-2013-starea-si

6.3. Indoor environment and human health

Most of healthcare policies related to pollution are directed depending on the outdoor environment. A somehow neglected zone in this regard is the indoor environment, taking into account that European citizens spend inside up to 90% of their time.

The indoor environment quality is affected by the ambient air quality, building materials and ventilation, consumer goods, furniture and appliances inclusively, cleaning and household products, inhabitant behavior, smoking inclusively, and building maintenance (e.g. measures for energy saving). Exposure to suspended particulate matter and chemicals, combustion products, also to moisture, moldiness and other biological agents was connected to asthma and allergic symptoms, lung cancer and other respiratory and cardiovascular diseases.

Recent evaluations of the exposure sources and policies related to indoor air pollution have analyzed the benefits of different measures. The highest benefits for health are connected to smoking restrictions. The building and ventilation policies which control the indoor exposure to suspended particulate matter, allergens, ozone, radon and outdoor noise offer high benefits on long term.

6.4. Atmospheric Pollution

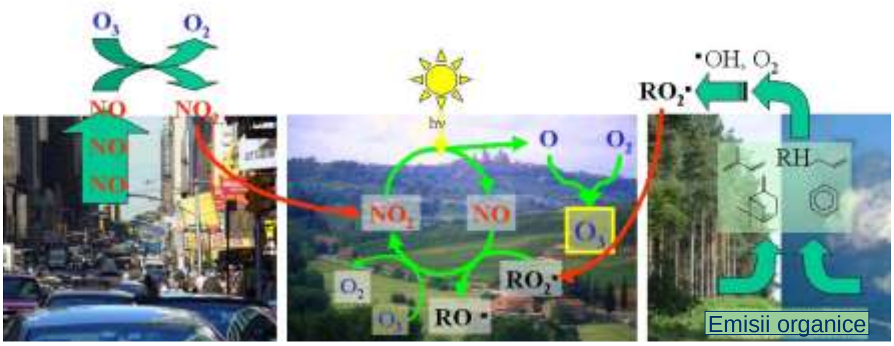
Atmospheric pollution is one of the most serious problems of the present society, both temporally – it has effects both on short and average term and on long term, and spatially – mobility and affected surfaces are high. Atmospheric pollution affects directly human health, agriculture and forestry fund, depending on the pollutant type and concentration, exposure duration and frequency.

Urban pollution of air is known as **„smog”**. In general, smog is a mixture on **carbon monoxide** and organic compounds from the incomplete combustion of fossil fuels, like coals, and **sulfur dioxide** from the impurities from fuels. While smog reacts with **oxygen**, organic and sulfuric acids condense as drops, intensifying the fog. Until the twentieth century, smog already had become a major danger for health.

Source: www.regielive.ro/cursuri/ecologie/poluantii-atmosferici-oxidanti-si-impactul-lor-asupra-ecosistemelor

Figure 6.1- Examples of smog presence

Another type of smog, the photochemical one, started to reduce the air quality above big cities since 1930s. This smog is caused by the fuel combustion in the motors of vehicles and planes, which generates nitrogen oxides and releases hydrocarbons from "unburned" fuels. Sunlight determines the combination of the nitrogen oxides with hydrocarbons and changes oxygen into **ozone,** a chemical agent which attacks rubber, harms plants and irritates lungs. **Ozone** is generated by the photochemical reaction of nitrogen oxides (NOx) and volatile organic compounds (VOC), under sunlight. These pollutants are released by automobiles and industry. The ground level ozone (that one located in the atmosphere layer between 0 and 10 km) is formed as a result of the combined action of nitrogen oxides and aromatic cyclical hydrocarbons. The *ground level ozone* (unlike the stratospheric one, located at a height of 40 km, which is indispensable to life on Earth, retaining the harmful ultraviolet radiations) is a *very harmful compound*, due to its high reactivity (very pronounced oxidant potential).

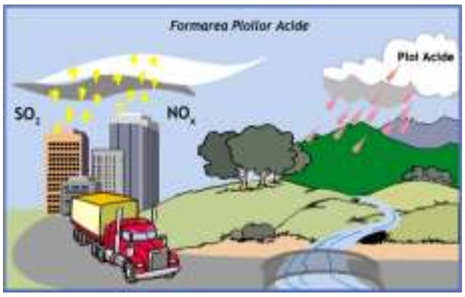


Source: www.regielive.ro/cursuri/ecologie/poluantii-atmosferici-oxidanti-si-impactul-lor-asupra-ecosistemelor

Figure 6.2 - Photochemical reactions in atmosphere which lead to ozone forming

The hydrocarbons are oxidized in substances which condense and form a visible and penetrating fog.

Most pollutants are possibly “washed” by rain, snow or fog, but only after traveling long distances, sometimes even continents. While pollutants gather in atmosphere, sulfur and nitrogen oxides are changed into acids which combine with rain. This **acid rain** falls on lakes and forests, where could lead to the death of fishes or plants and could affect entire ecosystems. Finally, contaminated lakes and forests may become lifeless. Acid rains are determined by the presence of sulfur and nitrogen oxides ($S0_2$ and $N0_2$) in atmosphere; in the presence of water vapors and under the influence of ultraviolet radiations, they change into very toxic acids (sulfuric acid and nitric acid).



Source: www.point.md/nauka/ploi-acide-moartea-care-vine-din-cer

Figure 6.3 - Forming of acid rains

One of the biggest problems caused by air pollution is the **global warming**, an increase of Earth temperature generated by the accumulation of some atmospheric gases like carbon dioxide. With the intensive use of fossil fuels in the twentieth fuels, the concentration of carbon dioxide from atmosphere increased dramatically. Carbon dioxide and other gases, known as greenhouse gases, reduce the heat dissipated by Earth but do not block the Sun radiations.

Atmospheric pollution, long distance cross-border atmospheric pollution inclusively, is unanimously recognized as a serious threat to the environment quality.

Pollutant influence in atmosphere is measured by using a few indicators related to air quality, such as:

- Emissions of Volatile Organic Compounds (VOC);
- Emissions of nitrogen oxides (NOx);
- Emissions of sulfur dioxide (SO_2);
- Emissions of carbon monoxide (CO) and methane (CH_4);
- Emissions of ammonia (NH_3);

- Emissions of sulfur dioxide (SO_2);
- Emissions of acidifying substances;
- Emissions of nitrogen precursors;
- Emissions of particulate matters (PM10 and PM2.5);
- Emissions of heavy metals;
- Daily exceeding of air quality limit values for ozone in urban areas
- Daily exceeding of air quality limit values for particulates;
- Ecosystem exposure to acidification, eutrophication and ozone;

6.4.1. Affected zones and zones with atmospheric pollution risk

The affected zone or the hot zone is that zone on whose territory there are recorded systematic exceeding of the environment quality indicators against the standardized norms, serious deteriorations of environment state being produced, with a lot of consequences on human health, economy and ecosystems.

6.4.2. Background pollution

Background pollution represents the pollution existing in the zones where the influence of pollution sources does not manifest directly itself. The concentrations of the pollutants from air and precipitations, measured in these zones, are precious indicators for assessing the pollution at regional and global level.

6.4.3. Impact pollution

Impact pollution is the pollution produced in the zones located under the direct impact of the pollution sources. In the network for surveying the impact pollution, measurements on sulfur dioxide, nitrogen dioxide, ammonia, suspended particulate matter, sediments are performed.

6.5. Air pollutant effects on human health

6.5.1. Risk factors for human health

Air quality

The most common environmental factor, in close correlation with the health of population, is air pollution. This implies exposure to polluting agents both from air and from inside and outside the home.

Suspended particulate matters and smoke are the most frequent threats to human health, the sulfur dioxide released as a result of burning the fossil fuels that contain sulfur being added to them.

Direct influence of air pollution on human health consists in the changes appearing in the organisms of exposed persons, as a result of their contact with different atmospheric pollutants. Most of times, the direct action of air pollution is the resultant of the simultaneous interaction of many pollutants from atmosphere, and only seldom the action of a single pollutant.

Indirect effects are represented by the changes produced by air pollution on environment and indirectly on human health – climatic changes, global warming and depletion of ozone layer.

6.5.2. Air pollutant effects on human health

They are an important issue, because during many serious events, air pollution may have a significant effect on human health, especially on children, elderly or sick people.

Sulfur dioxide is a colorless, bitter, non-inflammable, sharp odor gas, which irritates eyes and respiratory tracts. Depending on concentration and exposure period, sulfur dioxide may have different effects on human health. Exposure to a high concentration of sulfur dioxide, for a short time, may cause severe shortness of breath. Exposure to a reduced concentration of sulfur dioxide, on long term, may lead to infections of the respiratory tract.

Nitrogen oxides are a group of very reactive gases, which contain nitrogen and oxygen in variable amounts. Most nitrogen oxides are colorless and odorless gases. Population exposed to this kind of pollutants may have shortness of breath, irritations of respiratory tract, dysfunction of lungs. Long term exposure to a reduced concentration may destroy lung tissue, leading to emphysema. The persons most affected by the exposure to this pollutant are the children.

At ambient temperature, **carbon monoxide** is a colorless, odorless, tasteless gas, of both natural and anthropogenic origin. It is a toxic gas, being a lethal one in high concentrations (at concentrations of about 100 mg/m^3), by reducing the transport capacity of oxygen in blood, with consequences on the respiratory and cardiovascular system. At relatively low concentrations, it affects the central nervous system, weakens the heart rate, decreasing so the blood volume distributed in organism, reduces the visual acuity and physical capacity,; short time exposure may cause acute fatigue, shortness of breath and chest pain to the persons with cardiovascular diseases, determines irritability, migraines, lack of coordination, nausea, dizziness, confusion, reduces the ability to concentrate.

Benzene is a very light, volatile and soluble in water, aromatic compound. 90% of benzene quantity from ambient air comes from road traffic. It is a substance belonging to class A1 of toxicity, known as carcinogenic for human being. It produces harmful effects on central nervous system.

Suspended particulate matter is a complex mixture of very small particles and liquid drops. An important problem is represented by the particles with aerodynamic diameter shorter than 10 micrometer, which pass though nose and throat and penetrate in the pulmonary alveoli, producing inflammations and intoxications. The persons with cardiovascular and respiratory diseases, children, elderly and asthmatics are especially affected.

Toxic metals come from the combustion of coal, fuel, household waste etc and from certain industrial processes. Metals accumulate in organism and generate short or/and long term toxic effects. In case of exposure to high concentrations, they may affect the nervous system, the renal, hepatic, respiratory functions.

Polynuclear aromatic hydrocarbons PAH are compounds formed of 4 up to 7 benzene nuclei. These compounds result from the combustion of fossil materials (diesel motors) under gaseous form or as particles. The most studied is benzopyrene. Polynuclear aromatic hydrocarbons are known as carcinogenic for human being.

A high level of **ozone** reduces the functional capacity of lung and causes certain inflammations or swellings of respiratory tracts. If the ozone level is extremely high, symptoms as coughing or irritations at throat level appear, and the chest could hurt when breathing. For those who suffer of asthma, ozone effect on the organism could be a stronger one.

European Union set that population should be warned if the ozone concentration exceeds 180 μg / m^3, and this should be done during weather reports.

6.5.2.1. Total burning at human body level

Human body, like the other biological systems, has an amazing capacity to take all type of chemicals and to use them either for supporting the body functions, either for eliminating these functions. As the analytical capacity has improved, more and more concentrations of chemicals have been noticed in different parts of the body. Some of them enter the body through inhalation.

The concept of total burning at body level refers to the manner in which traces of substances accumulate in the human biological system. The body components that could include these substances are blood, urine, soft tissue, hair, teeth and bones. Blood and urine allow a faster removal of the substance traces than soft tissue, hair and bones do. The accumulation results when the substance traces are stored a time longer than the removal time. This process could be reversed, if the source which produces the substances is removed.

Two examples of air pollutants, which contribute to the total burning at body level: lead and carbon monoxide, are presented below.

Lead may degrade the renal functions, damage hemoglobin synthesis and alter the nervous system. There are two ways of entry of lead in the body: inhalation and ingestion. The importance of each one depends on the conditions in which they occur.

Inhalation is the result of the first exposure to lead contained in air, ingestion being the result of a secondary exposure through contamination with the ingested substances.

When lead is inhaled, a part of it is directly absorbed by the blood flow, and another part by the intestinal tract, through a mechanism of lung purification, as a result of swallowing the mucus.

A second air pollutant, which affects the burning at body level, is carbon monoxide (CO). There are also other sources of inhalation in air; people who smoke have a high CO burning at body level, as compared to the non-smoking ones.

Individuals which are in closed spaces may be exposed to high levels of CO coming from the incomplete burning in heating or cooking stoves. CO enters the human body through inhalation and is directly absorbed by the blood flow: total burning occurs in the bloodstream.

6.6. Air pollutant effects on ecosystems by acidification, eutrophication and ozone

Ecosystem definition: *Any dynamic complex of the communities of plants, animals and microorganisms and their environment, being in a permanent functional interaction.*

Depending on the place where they are, the ecosystems are generally classified in:

- Aquatic ecosystems;
- Terrestrial ecosystems.

The sum of the ecosystems forms the ecosphere or biosphere.

Ecosystems deliver a number of basic services which are essential for the sustainable use of Earth resources. They include:

- *Supply Services* – resources which are directly exploited by man, like food, fibers, water, raw materials, medications;
- *Support Services* – processes which indirectly allow exploiting the natural resources, like primary production, pollination;

- *Regulation Services* – natural mechanisms responsible for climatic regulation, nutrients and water circulation, pest regulation, flood prevention etc.
- *Cultural Services* – benefits gained by people from the natural environment in recreational, cultural and spiritual purposes.

The effects on ecosystems range from the destruction of forests and lakes by acidification to the deterioration of habitats because of nutrient enrichment, algae proliferation caused by nutrient enrichment, also because of neural and endocrine dysfunction at the species level, caused by pesticides, steroid estrogens and industrial chemicals, like PCBs. Most of European data regarding the pollutant effects on biodiversity and ecosystems are related to acidification and eutrophication.

Acidification is specific manner of diffuse pollution generated by releasing in atmosphere some pollutants, like sulfur dioxide (SO_2), nitrogen oxide (NO_x) and ammonia (NH_X).The resulted precipitate may fall thousands km away from the pollution source, having acid nature , and may engage a considerable reduction of the pH of the waters from rivers, natural and artificial lakes. This phenomenon aggresses highly the natural ecosystems and, in extreme cases, may entail the death of those lakes. Acidication may entail also an infiltration of underground waters. Water acidification requires adoption of some clear measures against atmospheric pollution.

Eutrophication represents the progressive increase of the concentration of phosphor, nitrogen and other nutritive substances necessary for plants in an aquatic ecosystem of lake type. The productivity or fertility of such ecosystem increases with the augmentation of the amount of organic matter which changes into nutritive substances. The matter enters the ecosystem circuit by the currents which carry alluvia. Water bloom (excessive developments of algae) occurs often at water surface, preventing the pelagic (submerged) species to capture the light and to assimilate the oxygen necessary to aquatic life.

6.6.1. Acid rains and soil degradation

Acid rains exert their harmful action on the soil in different ways (which are illustrated in Figure 6.4):

- direct actions on leaves (burns, cuticle reduction and increase of water loss) which lead to the decrease of photosynthesis and slowing down of the growth;

- washing of soil nutrients as a result of acidifying;

- blockage of ion exchange as a result of pH decrease;

- reduction of the bioavailability of the water connected to clays;

- solubilization of the toxic elements from soil (Al, Hg);

- reduction of the activity of useful bacteria from soil

- stimulation of the activity of phytopathogenic fungi.

Disequilibria induced by acid rains in ecosystems (especially in forest ecosystems) lead to tree destruction on large surfaces. The phenomenon of acid rains was signaled for the first time in Germany, in the early '70s of the previous century. Forests are the most affected by the phenomena of soil degradation under the action of acid rains because: they are formed of perennials, which integrate in their lifetime the impact of toxics; the soils formed of forests are generally characterized by acidity, and acid rains push the soil pH beyond the value which still allows the optimal development of the biological processes in soil. The phenomenon of soil degradation under the action of acid rains is present also in the case of crops, but in these situations the soil amendments/improvers improve the situation in terms of the pH.

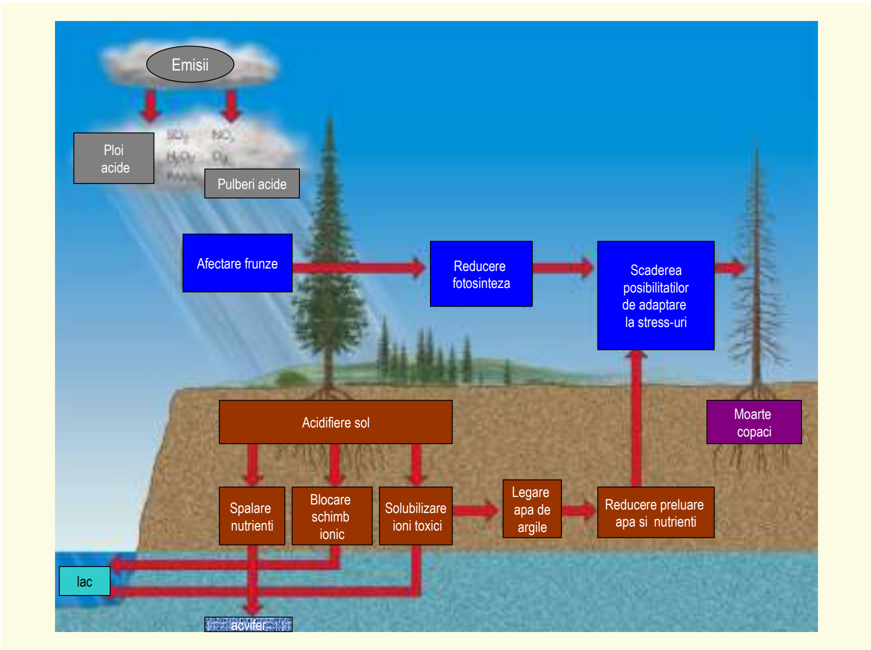


Figure 6.4 - Affecting of soil and plants as a result of acid precipitations and acid deposits

Figure 6.5 - Acid rain effects on leaves

Figure 6.6 - Tomato crop from Dumbrava, Prahova county, affected by acid rain

Figure 6.7 - Acid rain effects on forests

6.6.2. Ground level ozone effects on plants:

For plants, the ground level ozone is one of the most dangerous pollutants. Increase of ozone concentrations close to Earth surface has a strong negative impact on vegetation, deteriorating the leaves and inhibiting their photosyntethic potential. Because of the ozone in excess, the forest vegetation dies, ceases to absorb the carbon dioxide and looses biomass.

- leaves may have small light spots of irregular shapes, less than 1 mm in diameter, small dark pigmented zones of about 2-4 mm diameter, sunburn and redness.

Figure 6.8 - Effects of exposure to ozone on the leaves

6.6.3. Air pollutant effects on vegetations and crops

Vegetation is more sensitive than animals to many air pollutants and that is why methods using the plant reaction for measuring and identifying the pollutants have been developed.

Atmospheric pollution effects on plants have been classified as visible symptoms and insignificant, not visible effects.

Visible symptoms represent deviations from the healthy condition as it can be perceived by direct visualization. For plants with large leaves, a healthy leaf has a beautiful colour, with a normal cellular structure in different layers. Deviations from this healthy appearance include the tissue death and different degrees of colour loss.

Not visible effects of air pollutants include the reduction of plant growth and alteration of physiological and biochemical processes, also changes in the reproductive cycle. This kind of prejudice is also connected to the long term, chronic exposure to low levels of atmospheric pollution.

Reduction of total biomass may lead to economic losses for feed grain or hay crops.

Biochemical or physiological changes have been noticed at the plants exposed to air pollutants, the alterations in net photosynthesis, stomata response and metabolic activity being included here.

6.6.4. Air pollutant effects on living beings

The mechanism through which an animal may be poisoned is in many situations different from that one through which people are affected.

At human beings, inhalation is an important way of exposure to air pollutants. Probably, the most common exposure for herbivorous animals, which are feeding from a polluted area, is the ingestion of nourishment contaminated by air pollutants. In this case, the inhalation has a secondary importance.

In case of animals, there is a process of accumulation of air pollutants in two stages:

- in the vegetation or fodder which is animal nourishment;
- ingestion effects on animals.

Only a few pollutants with negative effects on animals were noticed. Heavy metals, found in vegetation and water content, are a continuous source of toxicity for animals and fishes.

Arsenic and lead coming from foundries, molybdenum from furnaces, mercury from drilling rigs, are severely toxic pollutants.

One of the latest problems in animal rearing is the poisoning by arsenic, through air.

Feeding of cattle by grass containing 25-50 mg/kg (ppm by weight) of lead may have as symptoms: cramps, foaming at the mouth, teeth breakage, paralysis of the larynx muscles. Fluorine emissions from the industry which produce phosphates or their derivatives have caused important damages to cattle throughout the world. Chronic toxicity generated by fluorine, called *fluorosis*, is frequently noticed at cattle. Primary effects of fluorine on animals are remarked at teeth and bones. An excessive dose weakens the enamel of the growing teeth, the just erupted teeth soften, the molars become unequal. Animal tolerance to fluorine varies, the dairy cows are the most sensitive and the birds are the least affected.

6.7. Conclusions

The unfavorable action of atmospheric pollutants on human health and ecosystems led to establishing some maximum allowable limits for the concentrations of these pollutants in air and imposed certain emission standards to the anthropogenic pollutants (industrial installations and transportation means).

Practical application of all those measures for mitigating the air pollutant concentration led to the decrease of atmospheric pollution by certain compounds (sulfur dioxide, suspended particulate matter) or to the limitation of the increase trend (nitrogen oxides, VOCx, ozone). Implicitly, lately the atmospheric pollution impact on soil decreased significantly, being emphasized a slight trend of restoring the soils degraded under the impact of acid rains. The ground level ozone problem remains of present interest, new efforts being necessary for solving it.

In Table 6.2, there are briefly presented the pollutant effects on human health and ecosystems, also the sources of origin for those pollutants.

Table 6.2 - Pollutants, sources and their effects on the human health and ecosystems

Pollutant	Sources	Effects on the human health	Effects on the ecosystems
Sulfur dioxide (SO_2)	*Stationary:* - plants of thermal energy generation; - commercial, institutional and residential firing plants; - industrial firing plants and processes using the firing; - processes not using the firing (e.g. sulfuric acid generation, etc.); - extraction, processing and distribution of fossil fuels; - waste treatment and disposal (e.g. thermal treatment of municipal and industrial waste).	- constriction of breathing ways of asthmatic persons and other sensitive persons (acute exposure); - thickening of humus layer of trachea similarly to chronic bronchitis (chronic exposure); - cough; - breathing intensification; - pulmonary emphysema.	- in the atmosphere the sulfur dioxide is transformed into sulfuric acid what leads to the acidification phenomenon which appears under the form of acid rain and snow and dry acid particles; - the change of atmosphere composition has impact on the regional climates; - impact on the soil (formation and erosion); - it destroys the numerical equilibrium of animal species in biotopes; - it produces corrosion on the steel and other metals.
Nitrogen oxides (Nox)	*Stationary:* - plants of thermal energy generation; - commercial, institutional and residential firing plants; - industrial firing plants and processes using the	- progressive inflammation of lungs arriving to the pulmonary edema (acute exposure); - neurological symptoms (headaches or dizziness); - chronic bronchitis	- the nitrogen oxides in the air are transformed into nitric acid what results in the acidification (one of the effects of this one being the loss of buffer capacity of

	firing; - processes not using the firing (e.g. nitric acid generation, etc.); - extraction, processing and distribution of fossil fuels; - waste treatment and disposal (e.g. thermal treatment of municipal and industrial waste); *Mobile:* - road transport; - other auto-vehicles which are not used for road transport: agricultural machinery, industrial and construction field machinery; - other mobile sources : air, railway, maritime, fluvial transport.	(chronic exposure); - pulmonary emphysema; - increased rates of breathing infections (especially at the children).	running waters); - the stimulation of growing of plants and unwanted organisms; - reduction of fish populations and other aquatic species; - it is detrimental to the commercial value of fishes and shells.
Volatile organic compounds (VOC)	*Stationary:* - the use of solvents; - the oil industry including the manipulation of oil products; - the chemical industry: the production of varnishes, paints, colours, adhesives, etc.; - small combustion sources: the heating of habitations and industrial boilers;	***Benzene***: - the exposure by inhalation, cutaneous or eyes contact can cause the irritation of superior breathing ways, dermatitis or eyes irritation; - inhaled in the lung it can cause pulmonary edema and hemorrhage; - the acute exposure following to the ingestion or excessive inhalation depresses the	***Benzene***: - contaminant on long term of waters in the ground-water table; - it is not a significant contaminant of surface waters because it rapidly evaporates in the atmosphere; - it is adsorbed in great measure on the

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<td>- food industry;

- metallurgic industry;

- pharmaceutical industry;

- the waste management and treatment;

- agriculture.

Mobile:

- road transport</td>
<td>central nervous system (headaches, dizziness, nausea, convulsions, coma, possibly death);

- carcinogenic (according to the International Agency for Cancer Research).

Toluene:

- the toluene vapours are irritant, especially for eyes and mucous membranes;

- it depresses the central nervous system;

- it affects the liver and kidneys;

- carcinogenic.</td>
<td>soil;

- it is classified as a dangerous atmospheric pollutant.

Toluene:

- it contributes to the ozone and photochemical smog formation;

- being volatile, a big part of the substance delivered in the water passes in the atmosphere;

- it has impact on the aquatic life because of the adsorption on the deposits.</td>
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<td>Ammonia (NH_3)</td>
<td>The ammonia sources come from the agriculture.</td>
<td>- irritant affecting the skin, eyes and the breathing ways;

- the ingestion can cause corrosive effects at the level of mouth, esophagus and stomach;

- pulmonary edema;

- pneumonia;

- alkaline burns of skin.</td>
<td>- it brings nitrogen (N) in the environment, phenomenon which has toxic effects on the plants, fishes and animals;

- it changes the balance of species;

- it stimulates the growing of unwanted species;

- it acidifies the soil by its rapid conversion into</td>
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			nitrate (NO_3).
Particulates (PM_{10} and $PM_{2,5}$)	The sources of particulates are both in the urban zones and in the rural zones, the main sources including: the transport, wood heating, construction dust, the waste ramps, in the agriculture – the un-surveyed fires and waste burning, industrial sources, the dust gone by the wind in open fields.	- the bronchitis aggravation at the persons with pre-existing breathing diseases; - the asthmatic persons and other persons with allergies can react especially to the sulfur particles; - the exposure on long term can cause prejudice of pulmonary tissue what contribute to chronic breathing diseases and premature death; - symptoms of chronic obstructive pulmonary disease (COPD) - breast ache;	- ones of the most severe ecological effects of atmospheric pollution derive from the conversion of emissions of sulfur gaseous dioxide and nitrogen monoxide into acid particles; - these acids change the chemical composition of running waters, dissolving also the metals in the soil; - in combination with the ozone, it contributes to the forests destruction; - it can alter the climate because it obstructs the sun light.
The ground level ozone	The transport and the industrial activities, as well as the chemical solvents are major anthropogenic sources of ground level ozone.	- cough; - wheezing; - nasal and lugs congestion; - heavy breathing, accelerated breathing; - irritation of eyes and nose; - nausea.	- while the stratospheric ozone is a shield against ultraviolet radiation, the ground level ozone has impact on the cultures and forests; - it has destructive effects on some products fabricated by the human being (rubber, nylon, etc.);

			- it contributes to the climatic changes being a gas with greenhouse effect; - negative impact on the flora, retarding the photosynthesis and contributing to the cell destruction.
The organic persistent pollutants: - Polychlorinated dibenzo-p-dioxins/ furans (PCCD/PCDF) - Perchlorobenzene (PCB) - Polycyclic aromatic hydrocarbons (PAHs)	PCDD/PCDF are released in the thermal processes involving organic material and chlorides, as result of incomplete burning or chemical reactions: - waste incineration, including the co-incineration; - the metallurgical thermal processes, e.g. the aluminum and other unferrous product production, the iron and steel production; - energy generating firing plants; - residential heating; - certain processes for obtaining the chemical substances releasing intermediary products and by-products. The major fixed sources of PAHs (polycyclic aromatic hydrocarbons) releasing are: - the wood and coal heating of habitations;	**Dioxins /Furans:** - chlorine-acne (an eruption on the skin similar to the acne); - headaches, generalized aches; - digestive diseases; - carcinogenic for human being. **Benzopyrene -** Hazardous Air Pollutant (HAP): - it can cause injuries of skin; - the inhalation can lead to the bronchitis.	**Dioxins/Furans:** - toxic pollutants, the Seveso dioxin is considered the most toxic compound produced by the human being; - low water soluble, lipophilic with high stability in the environment (the halving period in the soil was detected after 10-12 years from the first exposure); - their chemical properties favour the transport on long distances; - impact on the wild life (e.g. the exposure to the dioxins leads to the fertility reduction, genetic defaults and the embryo mortality). **Benzopyrene -** Hazardous Air Pollutant (HAP):

	- outdoor fires as fire for rubbish burning, fires in the forests, the land cleaning by stubble burning after harvesting; - the carbonization and the fabrication of anodes; - the aluminum production (by Soederberg proceeding); - the plants for wood preservation. The PCB (perchlorobenzene) releases have, at the origin, the same thermal and chemical processes as the PCDD (dibenzo-p-dioxine policlorurate) /PCDF (furans) releases and the formation mechanism is analogue. The major sources of PCB releases are : - the waste incineration plants, the co-incineration plants; - the metallurgical industry; - the burning of fuels containing chlorine in the furnaces;		- the contamination of surface water and the ground-water table; - soil contaminant; - it bioconcentrates in the trophic chains.
Heavy metals: Cadmium (Cd), Lead (Pb), Mercury (Hg)	*Fixed sources of heavy metals :* - firing, roasting and agglomeration of ore plants;	**Mercury - Hg:** - effects on the nervous system: memory losses, trembles, emotional instability (anxiety, irritability), insomnia,	**Mercury - Hg:** - toxic for fishes and other aquatic organisms (the methylmercury is stored in the muscle

	- foundries and steel works; - copper, lead and zinc production plants beginning with the ores, concentrated ores or raw recovery materials; - plants for cement clinker production in rotary furnaces; - plants for chlorine and caustic soda production; - plants for dangerous waste and municipal waste incineration;	loss of appetite; - it affects kidneys and lungs; - muscle diseases. **Lead - Pb:** - lead is particularly toxic, affecting the nervous system of human being; - anaemia and other diseases of the blood; - kidney diseases; - affectation of reproductive apparatus of men (impotence and sterility) and women (low fertility, abnormal menstrual cycles, miscarriages). **Cadmium - Cd:** - it is associated with pulmonary cancer in the case of occupational exposure (The American Agency for Environment Protection classifies it as a possible human carcinogenic factor); - cardiovascular diseases; - anemia; - it lowers the answer of immunity system; - diseases of kidneys and liver;	tissue of fishes); - acid rains; - high acidification of surface waters. **Lead - Pb:** - the lead can remain in the environment for an indefinite time under the form of dust; - the lead from the petrol contributes to the atmospheric pollution, especially of urban zones; - the lead exposed plants absorb the dust with metal content at the leaves level; - impact on the fauna. **Cadmium - Cd:** - strongly assimilated by the organisms; - it has the potential to concentrate in the trophic chains (bioconcentration).

Source: Brochure: The air quality in the Low Danube Zone
http://ebookbrowse.com/annex-6-brochure-rom-pdf-d68008294

CHAPTER 7

TRENDS AND OUTLOOKS ON AIR QUALITY IMPROVEMENT

7.1. Introducere

Air pollution is a great challenge of the last decades, due to its aggressiveness on human health, on all the environmental components (air, water, soil, vegetation), generally on the natural or man-made environment.

Therefore, the atmosphere protection becomes a field of high importance in assuring human health and environmental protection, in the spirit of sustainable development concept. So, the environmental authorities have the difficult task to generate the legislative framework necessary for maintaining the air quality at a satisfactory level, which brings no prejudice to human health or different environmental components.

Having in view the provisions of the European legislation in force, the continuously achievement of the air quality assessment is necessary, on the basis of limit values and threshold values, in accordance with national standards and European Union standards.

The main objective of European directives and national legislation, which transposes them entirely, is to assess and manage the air quality in a comparable manner and based on the same criteria at the level of the whole European Union.

More than this, the public shall be informed on the air quality in the same manner.

Air quality assessment represents the quintessence of the ways of implementing the requirements of European directives.

During the last years, more and more citizens have been aware of the importance that the environmental protection may have in everyone's life, within the context of sustainable development.

Setting a balance between the necessity of improving the living standards by economic progress, quality of environmental factors and human health are determinant for integrating all the nations into the European system.

For the modern society, the environmental protection is of high importance, taking into account that economic development takes place within the environment in which we live and in which we perform our activity.

Environment importance is determined by the fact that environmental policy has become the horizontal policy of European Union, the environmental protection aspects being considered compulsory for the other community policies. By adopting the sustainable development strategy as main element of its action field – i.e. by the concern for nature as inheritance and resource of the future generations – the environmental policy is permanently connected to the global trends for environmental protection.

The environmental policy, one of the most complex community policies, especially due to its trans-sectoral character and to direct interference with the economic growth, is confronted with a set of specific problems. Frequently, they arise from the attempt to balance the economic and environmental interests and to transform them from contradictory interests into complementary interests. So, situations in which false problems appear, but which are actually beneficial effects of the environmental community policy, are created.

Such example is given even by the economic growth- environmental factor quality decrease / natural resource decrease relationship, which creates tensions and resistance in applying or adopting the environmental protection methods. This happens just because of the fear to support the environment with the cost of economic downturn and social crisis creation – taking into account the maximal character of the consumer production. It seems to be a vicious circle, but the solution is a change of perspective: those measures that restrict the industry development because of environmental considerations stimulate at the same time the development of mechanisms and systems that make possible the cohabitation of the two ones– like advanced and non polluting technologies, alternative sources of green energy (solar energy, wind energy) leading to the development of a specialized market and implicitly to economic development.

Another false problem was connected to the previous one and refers to European Union enlargement and to the high cost of it, when environmental aspects are involved. This because, as shown in Commission documents, environmental protection in the Central and Easter Europe is very little developed compared with the previous enlargements, and the cost of aligning to community standards seems to be very high. What are not equally obvious are the advantages which resulted from here, both in environmental terms and in economic terms. So, in environmental terms one must mention that raising the environmental protection standards in those countries can only have beneficial effects at European and global level, and will lead to the improvement of the general environmental situation, with visible effects on long term. Economically, the alignment of the industries of those countries to the environmental community standards is the factor which implies the massive refurbishment of the factories and plants and contributes to the development of the community production market for such technologies and equipment – from here, it results the support of economic growth at community level.

7.2. Description of the existing situation

Emissions of atmospheric pollutants come from all the economic and social activities. These emissions lead to obvious risks to human health and ecosystems. In Europe, the policies and actions at all levels have significantly reduced the anthropogenic and exposure emissions, but some atmospheric pollutants continue to affect human health. Similarly, emissions of acidifying pollutants have been reduced, the situation for European rivers and lakes has been improved, but the excess of atmospheric ozone still threatens the biodiversities in the sensitive terrestrial and aqueous ecosystems. The movement of atmospheric pollution between continents entails the increase of political attention. Also, better international cooperation focused on the relations between climate and policies for air pollution control is more than ever necessary to combat air pollution.

Emissions of the main air pollutants in Europe have declined significantly in recent decades, greatly reducing exposure to substances such as sulphur dioxide (SO_2) and lead (Pb). However, complex links between emissions and ambient air quality mean that lower emissions have not always produced a corresponding drop in atmospheric concentrations. Many EU Member States do not comply with legally binding air quality limits protecting human health. Exposure of crops and other vegetation to ground level ozone (O_3) will continue to exceed long-term EU objectives. In terms of controlling emissions, only 14 European countries expect to comply with all four pollutant-specific emission ceilings set under EU and international legislation for 2010. The upper limit for nitrogen oxides (NO_X) is the most challenging — 12 countries expect to exceed it, some by as much as 50 %.

Points of interest

The energy sector remains a large source of air pollution, accounting for around 70 % of Europe's sulphur oxides (SO_X) emissions and 21 % of NO_X output despite significant reductions since 1990. Road transport is another important source of pollution. Heavy-duty vehicles are an important emitter of NO_X, while passenger cars are among the top sources of carbon monoxide (CO), NOX, PM2.5 and non-methane volatile organic compounds (NMVOCs). Meanwhile, energy use by households — burning fuels such as wood and coal — is an important source of directly emitted PM2.5 (primary PM2.5). 94 % of Europe's NH_3 emissions come from agriculture.

Air pollutant emissions have fallen since 1990. In 2008, SO_X emissions were 72 % below 1990 levels. Emissions of the main pollutants that cause ground-level O3 also declined and emissions of primary PM2.5 and PM10 have both decreased by 13 % since 2000. Nevertheless, Europe still contributes significantly to global emissions of air pollutants.

Stationary sources (industry and residential sources)

Industrial development remains the main means for raising the standard of living, but it is based on the increase of energy consumptions. Though energy saving should be achieved less by restricting the needs and more by improving the efficiency of its use, the economic constraints and non-judicious management – contrary to sustainability principles – determine delays in applying this principle. Industrial burning is the basic stage in converting the chemical energy of fuels into heat, mechanical work and electricity, i.e. superior forms, usable for meeting the human needs. From the analyses performed by international organizations it results that increases above its absolute total value are foreseen, although the action for energy saving will be intensified. As regards the pollution, the *thermal power plants and thermal plants,* heating systems for homes, which consume especially fossil fuels, release mainly sulphur oxides SOx, nitrogen oxides NOx, soot and coke flying. One could also remind the waste incinerators, from which, although unconventional fuels are burnt, emissions characterized by the additional presence of some specific pollutants like dioxins, polycyclic aromatic organic compounds etc. are released. Besides the mentioned sources, considered as a whole either energy sources or purely industrial sources, not at all negligible are the *individual local heating plants*, not centrally fueled (district heating system) and burning especially in winter fossil fuels mainly. If in the case of the polluting systems from industrial or energy fields, either state owned or private ones, one could legally intervene and control, the limitations of the effects coming from individual plants cannot be regulated equally easy. Although as thermal power they are small, apparently their control is not justified; but one should take into account their large number, also the fact that frequently they have no system for removing the polluting effluents by adequate systems, like chimneys fitted out with rigorously calculated and located purifying systems. In the same vein, one could remind that the emitting height is reduced and make difficult to achieve the dispersion of harmful emissions into environment, especially under calm atmospheric conditions.

European transport sector

Emissions of different pollutants in transport field decreased in 2009. However, this mitigation could be just a temporary effect of the economic recession, according to the latest report of European Environment Agency (EEA) regarding the emissions from transportation. The transport and environment reporting mechanism (TERM) analyzes the transport impact on environment. For the first time, the report analyzed a comprehensive set of quantitative objectives proposed in the roadmap of European Commission regarding the transport for 2011. Emissions of greenhouse gas coming from transports are still a major obstacle — although not inevitable – in EU fulfillment of the Kyoto objectives regarding climatic changes.

The European Environment Agency (EEA) report on transport and environment shows that some improvements of efficiency have been recorded. For instance, new vehicles have been approximately by one fifth more efficiency in 2010 as compared to 2000. However, these relatively modest improvements are many times counteracted by the demand increase, even if the recession led to slowing down the rhythm of activity in certain fields. Between 1990 and 2009, the demand in transport field raised by about one third, leading to an increase of the greenhouse gases (GHG) from transport by 27 % , for the same period.

The new objectives proposed in the European Commission roadmap will represent a framework for developing policies at European, national and municipal levels, in order to approach the environmental aspects related to transport. The report shows there are significant opportunities for consistently solving these problems by the decision makers, e.g. by approaching concomitantly the air quality and climatic changes.

For the first time, EEA developed a reference system for assessing the progress towards the environmental objectives from transport sector. They include objectives regarding greenhouse gas emissions energy consumption and noise. A main set of 12 indicators, focused on a wide range of political fields, was developed.

Main findings

- Transport generated 24 % of the total GHG emissions from EU in 2009. According to the roadmap, EU Member States should reduce by 60% the GHG from transport until 2050, as compared to the levels from 1990. Since actually the emissions increased by 27 % between 1990 and 2009, the overall reduction from EU between 2009 and 2050 should be 68 %.
- Annual energy consumption from transport increased continuously between 1990 and 2007 in EU Member States. Although the total energy demand from transport decreased by 4 % during 2007-2009, the upward trend will probably resume with the economic growth.
- Objectives related to air quality were exceeded in many fields. As regards nitrogen dioxide (NO_2), which may cause asthma and other respiratory problems, annual limit values were exceeded at 41 % of the stations for traffic monitoring in 2009.
- Particulate matters (PM10) from transport also cause serious health problems. In 2009, the limit daily value for PM10 was exceeded in 30 % of EU traffic zones.
- Approximately, 100 millions of persons were exposed on long term to some average harmful limits of the noise generated by vehicles on major roads.

- The share of the running vehicles which use alternative fuels increased constantly, these vehicles representing more than 5 % from the fleet in 2009. Most of them used Liquefied Petroleum Gas (LPG), while the electric vehicles represented 0.02 % of the total fleet.
- Road, railways and highways divide the European landscape in sections more and more smaller, leading to serious consequences on biodiversity. Approximately 30 % of EU terrestrial surface is more or less fragmented, this limiting the circulation and reproduction of a high number of different species.

7.3. Statistical data on air quality

Many air pollutants, such as NO_X and SO_2, are directly emitted into the air following for example fuel combustion or releases from industrial processes. In contrast, O3 and the major part of PM, form in the atmosphere following emissions of various precursor species, and their concentrations depend strongly on (changes in) meteorological conditions. To assess significant trends and to discern the effects of reduced anthropogenic precursor emissions, long time-series of measurements are needed.

Recent decades have seen significant declines in emissions of the main air pollutants in Europe. However, despite these reductions, measured concentrations of health-relevant pollutants such as PM and O_3 have not shown a corresponding improvement.

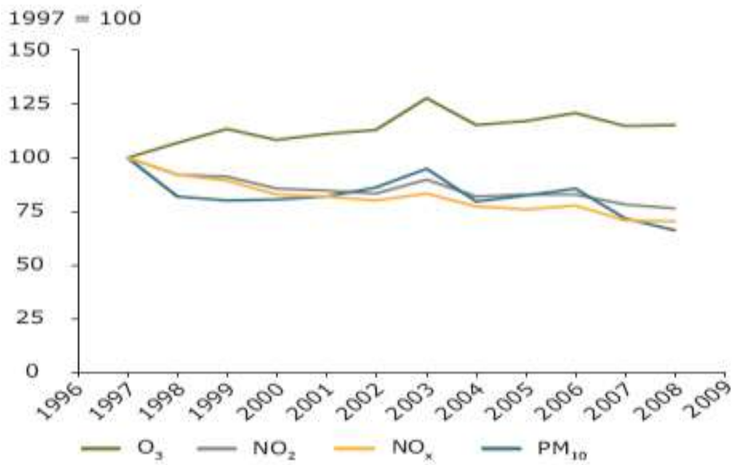


Figure 7.1 - Indexed trends in air quality

Similarly, urban population exposure to atmospheric pollutant concentrations above the limits allowed for air quality did not change significantly.

Excepting the emissions of SO_2 and carbon monoxide (CO), atmospheric pollution emissions remain a concern for urban population health. The main motivations for these general observations are analyzed in the following sections, the presentation of the evolution of atmospheric pollutant concentrations within Romania-Bulgaria cross-border area being emphasized.

7.3.1. Particulate matter PM10/PM2.5

They are liquid and solid particles with a diameter shorter than 10 microns.

Natural sources: volcanic eruptions, erosion of rocks and pollen dispersal.

Anthropogenic sources: industrial activity, systems for heating the population, thermal power plants. Road traffic also contributes by the dust produced by car tires when braking and due to incomplete combustion.

On the other side, vehicles release other irritating gases, toxic elements (Cd, Pb, As etc.) and carcinogens (polycyclic aromatic hydrocarbons, aldehydes, nitrogen compounds etc.).

The new parameters to be surveyed, PM2.5 (particulate matter with aerodynamic diameter of 2.5 µm), was imposed by the European legislation, due to the fact that the WHO studies guarantee that it is the fraction of particles that affect health the most and on which, besides the photochemical pollution (ground level ozone), the efforts must be coordinated.

Over the past decade, 20–50 % of the urban population was exposed to PM10 concentrations in excess of the EU daily limit values set for the protection of human health, a daily mean of 50 µg/m3 that should not be exceeded on more than 35 days in a calendar year.

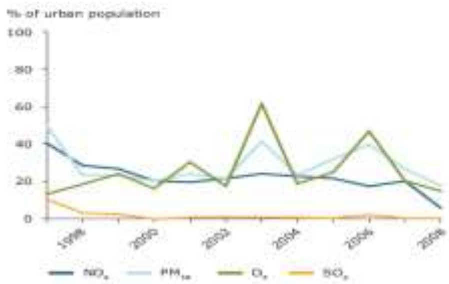


Figure 7.2 - Percentage of the resident urban population from the areas where the pollutant concentrations are higher than the target values, in EEA member states, 1997-2008

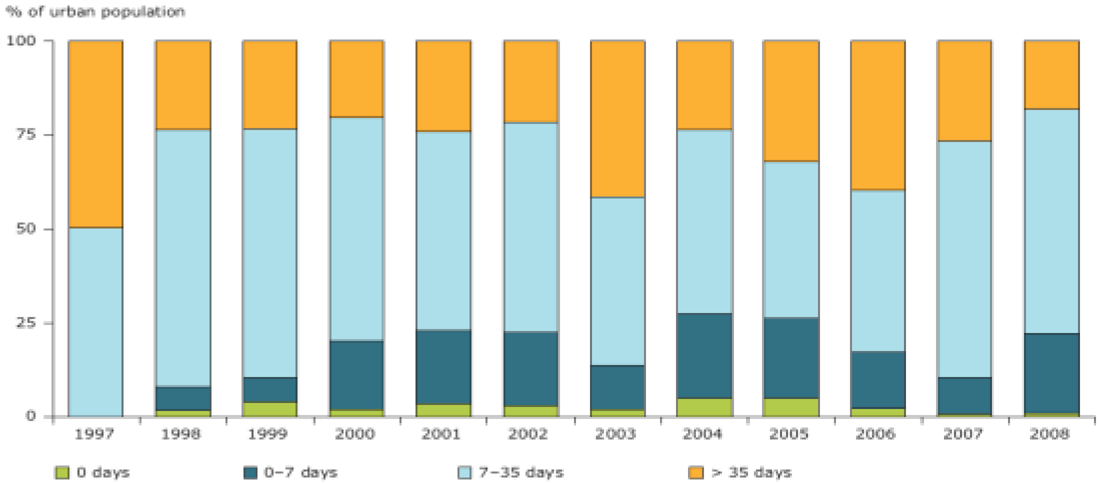


Figure 7.3 - Percentage of the resident urban population exposed potentially to levels of PM10 concentration which exceed the daily limit value in EU Member States, 1997-2008

The number of monitoring stations in some areas of Europe is relatively small and therefore the data may not be representative for all of Europe for the analyzed period (1997–2008). Measurements indicate a downward trend in the highest daily mean PM10 values. However, for the majority of stations, the observed change is not statistically significant. For a subset of stations operational for at least eight years over the period 1999–2008 and where annual mean values show a statistically significant downward trend, annual mean concentrations decreased by about 4 %.

While the annual average limit value of 40 µg/m3 is regularly exceeded at several urban background and traffic stations, there are hardly any exceedances at rural background locations. However, the Air Quality Guideline (AQG) level for PM10 set by the World Health Organisation (WHO) is 20 µg/m3. Exceedances of this level can be observed all over Europe, also in rural background environments.

The EU Air Quality Directive of 2008 includes standards for fine PM (PM2.5): a yearly limit value that has to be attained in two stages, by 1 January 2015 (25 µg/m3) and by 1 January 2020 (20 µg/m3). Further, the directive defines an average exposure indicator (AEI) for each Member State, based on measurements at urban background stations. The required and absolute reduction targets for the AEI have to be attained by 2020. For 2008, only 331 of the PM2.5 measurement stations reporting to the European air quality database, AirBase, fulfilled the minimum data coverage criterion of at least 75 % coverage per year. This number of stations is expected to increase over the coming years, due to the requirements of the directive.

The measurement results reported by EU Member States from the airbase have been used for calculating the PM10 and O_3 average concentrations weighted by the number of inhabitants, for urban agglomerations with more than 250 000 inhabitants (ETC / ACC, 2010b). The calculation result is used in the structural indicator of EU for tracking the changes in population exposure to PM and O_3.

Table 7.1 – Summary with the limit values from air quality directives, target-values, alert thresholds, long-term objectives, information thresholds and values of alert threshold for human health protection

Human health	Limit or target (#) value				Time extension (***)	Long-term objective		Information (**) and alert thresholds	
Pollutant	**Averaging period**	**Value**	**Maximum number of allowed occurrences**	**Date applic-able**	**New date applicable**	**Value**	**Date**	**Period**	**Threshold value**
SO_2	Hour Day	350 $\mu g/m^3$ 125 $\mu g/m^3$	24 3	2005 2005				3 hours	500 $\mu g/m^3$
NO_2	Hour Year	200 $\mu g/m^3$ 40 $\mu g/m^3$	18 0	2010 2010	2015			3 hours	400 $\mu g/m^3$
Benzene (C_6H_6)	Year	5 $\mu g/m^3$	0	2010	2015				
CO	Maximum daily 8-hour mean	10 mg/m^3	0	2005					
PM_{10}	Day Year	50 $\mu g/m^3$ 40 $\mu g/m^3$	35 0	2005 2005 *	2011 2011				
$PM_{2.5}$	Year	25 $\mu g/m^3$ (#) 20 $\mu g/m^3$ (ECO)	0	2010 2015		8.5 to 18 $\mu g/m^3$	2020		
Pb	Year	0.5 mg/m^3 (#)	0	2005					
As	Year	6 ng/m^3 (#)	0	2013					
Cd	Year	5 ng/m^3 (#)	0	2013					
Ni	Year	20 ng/m^3 (#)	0	2013					
BaP	Year	1 ng/m^3 (#)	0	2013					
O_3	Maximum daily 8-hour mean averaged over 3 years	120 $\mu g/m^3$ (#)	25	2010		120 $\mu g/m^3$	Not defined	1 hour 3 hours	180 $\mu g/m^3$ (**) 240 $\mu g/m^3$

Current chemical transport models underestimate PM10 and PM2.5 concentrations, mainly because not all PM components are included in the models and because of higher uncertainties in PM emission inventories compared to other pollutants. However, by interpolating PM10 measurements, using assumptions on PM10/PM2.5 ratios and modelling results, PM2.5 concentration maps for Europe can be compiled and used to assess population-weighted concentrations as well as health impacts. The results indicate that PM2.5 pollution in UE countries may be associated with approximately 500 000 premature deaths in 2005. This corresponds to about 5 million years of life lost (YOLL).

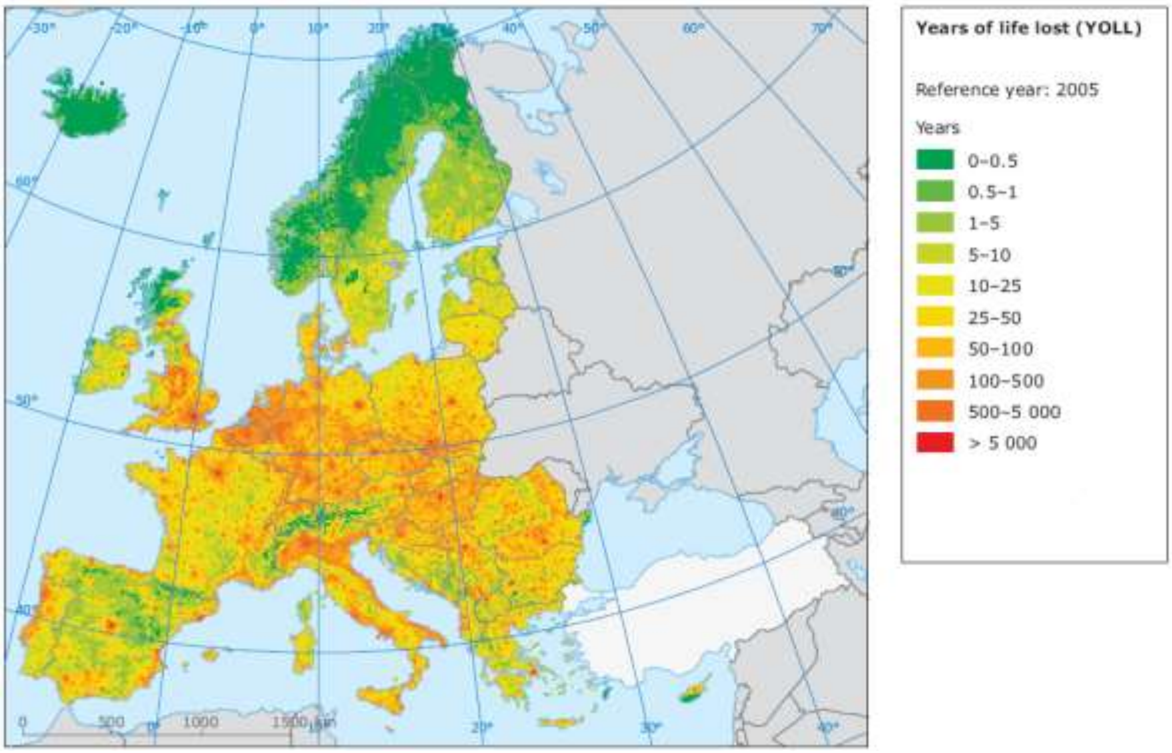


Figure 7.4- Number of years of life lost (YOLL) in EEA countries, corresponding to the pollution by PM 2.5

These numbers support the previous model-based estimates made for the EU during the Clean Air for Europe (CAFE) Programme which found largely similar impacts.

Focusing on PM mass concentration limit values and exposure indicators does not address the complex physical and chemical characteristics of PM. While mass concentrations can be similar, people may be exposed to PM cocktails of very different chemical composition.

Situation in the cross-border area

According to European legislation, EU developed an analysis of the PM10 emission sources distribution, which shows that in Bulgaria the PM10 direct emissions are approximately 6% of the total emissions, and 94% as a result of the PM10 secondary emissions. In the reports published yearly by the Ministry for 2008 and

2009, and in the indicators report, the influences of secondary emissions are reflected.

At national level, Directive 2008/50/CE of European Parliament is transposed by the Ordinance № 12/2010 on the standards for sulphur dioxide, nitrogen dioxide, particulate matter, lead, benzene, carbon monoxide and ozone from environmental air.

Table 7.2 presents the standard for PM10, valid for those years.

Table 7.2. - Amendment to the law for PM10, from 2004 up to the present

Year	Average daily rate (SDN) for human health protection	Maximum allowable average daily rate	Number of allowed exceedances	Average annual rate (SGN)) for human health protection	Maximum allowable average annual rate
	µg/m3	µg/m3	number/ year	µg/m3	µg/m3
2004	50	75	35	30	45
2005	50	70	35	30	42
2006	50	65	35	40	44.8
2007	50	60	35	40	43.2
2008	50	55	35	40	41.6
2009	50	50	35	40	40
2010 as basis	50	75	35	40	48
2011	50	75	35	40	48

Veliko Tarnovo

Figure 7.5 - Average annual concentrations for PM10 at RIEW V. Tarnovo

Dispersion modeling for 2007 and 2010 shows that:

1. transport has the highest visible impact on air pollution, with a maximum annual sum of concentrations of 64.86 µg/m^3 (2010);
2. residential heating is one of the sources of PM10 local emissions, with significant influence – maximum annual concentration of PM10 coming from the heating systems being up to 34.10 µg/m^3, as a result of using the fossil fuels and of the small height of the exhaust chimney;
3. total maximum annual concentration is 83.67 µg/m^3.
4. PM10 concentrations which exceed SGN = 40 µg/m^3 are situated in west side of the city and affect about 41 600 inhabitants, (approx. 60% of the population from Veliko Tarnovo).

Ruse

The level of particulate matter (PM10) remains relatively high, especially during winter. The analysis shows that PM10 concentration exceedances appear mainly because of using the fuels for heating the households (Fig.7.6). From the set of measures for reducing significantly the pollution by particulate matter, one should mention the transition to natural gas heating in the districts Ruse and Silistra.

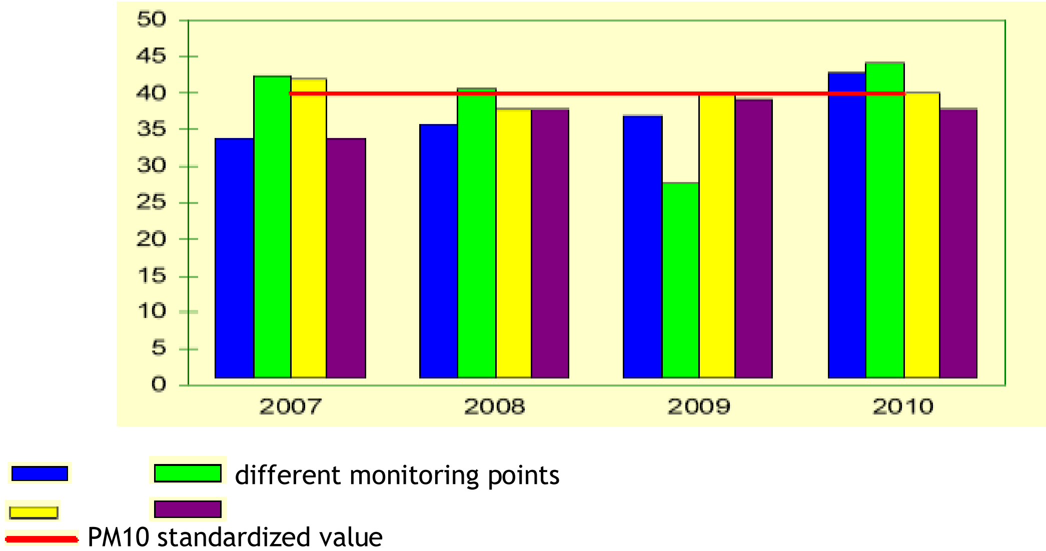


Figure 7.6 - PM10 average concentration recorded at the monitoring stations from Ruse, during 2007-2010

Varna

Air pollution by PM10 is a problem for air quality during winter, in Varna, Beloslav Provadia Devnya and Dobrich cities. A significant contribution to this is the widespread use of solid fuels for heating the households. It is difficult to distinguish the contribution of the major sources – transport, buildings, lack of utilities and landscape characteristics – to pollution. An essential role in air pollution is played by the dust from the roads, caused by road transport. Dust pollution remains a major source for the controlled territory.

Pleven

Assessment of environmental air quality, based on an analysis of the monitoring data, indicates the exccedance of the limits for PM10 in the last three years (2008, 2009, 2010), like in Fig. 7.7.

The most significant excesses are in 2009 - 40%. In this year, the biggest number of exceedances (134 pcs. - 99 pcs., 35 times more than the limit in a calendar year) was recorded. The analysis shows that the recorded exceedances are seasonal (in the cold period of the year, while the rest are isolated cases) and mainly appear when the average daily wind speed is lower, and equal to 1.5m/s.

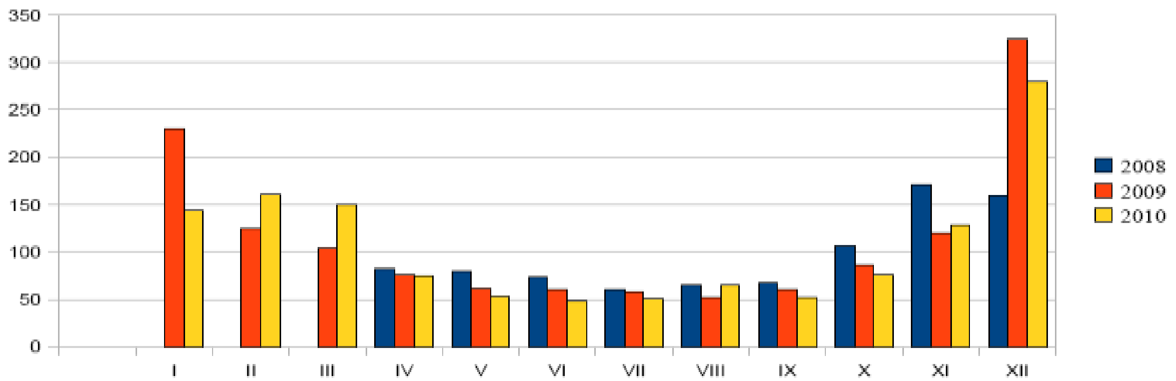


Figure 7.7 - PM10 maximum monthly levels in Pleven during 2008-2010

Based on these estimations, measures for reducing the level of dust particles are formulated in the Action plan discussed by Council of Plevna municipal town. The measures are firstly intended to reduce the emissions coming from transport and household heating. The predictive modeling is achieved for assessing the impact of implementing them (after the correction by the Program Council). The results show there is a real possibility that in the second half of 2012, in August, the PM10 levels reach the SGN threshold.

South West Oltenia Region 4

In 2010, at the level of South West Oltenia region 4, surveillance of air quality was achieved by means of an automatic system for air quality monitoring, composed of 12 automatic stations located in the 5 counties according to the criteria provided in Government Ordinance no. 592/2002, and also by means of the manual stations for sampling the sediments (Table 7.3).

Nature of particulates is much diversified. They contain iron oxides, in case of the particulates around the steel mills, heavy metals in case of non ferrous metal enterprises.

Atmosphere pollution by particulate matter has many causes: metallurgy and ferrous metallurgy industries which release in atmosphere significant amounts of such particulates, thermal plants which use solid fuels and road traffic.

Table 7.3 - PM10 (t/year) emissions at the level of South-West Oltenia region 4, within the cross-border area, in 2010

County	2010
Dolj	839
Olt	999
Mehedinti	948
S W Oltenia region 4	2786

Teleorman

The limit values for suspended particulate matter, fraction PM10, are provided in the Order 592/2002. The exceedance of the limit value for average daily samples - 50 µg/mc is found in all the 4 control points: Alexandria, Zimnicea, Turnu 1, Turnu 2.

The number of limit value exceedances for the particulate matter indicator PM10 was more than 35 times higher during 2005, in the control points from Alexandria and Zimnicea.

Giurgiu

Air quality in Gurgiu was maintained constant in the last years, very high variations from one year to another were not recorded; however, an improving trend existed in the last years.

In 2009, lower values of PM10 were recorded, as a result of road modernization and rehabilitation and as a result of infrastructure improvement.

7.3.2 Ozone

It is a highly oxidizing, very reactive gas, with stifling odor. It concentrates in stratosphere and provides protection against UV radiation, harmful to life. The ozone present at ground level behaves like a component of “photochemical smog”. It is formed by means of a reaction involving in particular nitrogen oxides and volatile organic compounds.

O_3 photochemical formation mainly depends on weather factors, and NOx and volatile organic compounds (VOC) concentrations. Ozone concentrations in urban zones with high level of NOx emissions are in general lower than in rural areas. This is due to the fact that O_3 depletion is done by a reaction with nitrogen monoxide (NO), a pollutant released especially in traffic – titration effect. So it is explained why, in rural zones, where the traffic level and consequently the NO concentrations are usually lower, the ozone level is in general higher; nevertheless, fewer people are exposed.

In 2008, the health-related O_3 target (120 µg/m^3, not to be exceeded on more than 25 days every year) was exceeded at 35 % of all rural background measurement stations reporting to AirBase. In urban areas about 20 % of the stations recorded readings above the target value to be attained in 2010. The WHO air quality guideline recommends a lower level than that set in the EU legislation, an average concentration of 100 µg/m^3 (WHO, 2005; WHO, 2006; WHO, 2008). In the framework of the National Emission Ceilings Directive (EC, 2001a) impact assessment it was estimated that exposure to O_3 concentrations exceeding critical health levels is associated with more than 20 000 premature (3) deaths in the EU 25 annually.

Differences in chemical composition of the air and climatic conditions along the north-south gradient in Europe result in considerable regional differences in summer O_3 concentrations: daily maximum temperatures averaged for the period April to

September 1998–2009 show a clear correlation with O_3 concentrations. In 2009, measurements during summer at single or several monitoring stations in Bulgaria, France, the former Yugoslav Republic of Macedonia, Greece, Italy, Portugal, Romania, Spain and the United Kingdom occasionally showed O_3 concentrations above the alert threshold of 240 g/m^3.

The strong dependence of O_3 levels on atmospheric conditions suggests that the projected changes in climate leading to warmer temperatures could also result in increased ground-level O_3 concentrations in many regions of Europe. Over the past two decades, a warmer climate is thought to have already contributed to an increase of 1–2 % in average O_3 concentrations per decade in central and southern Europe.

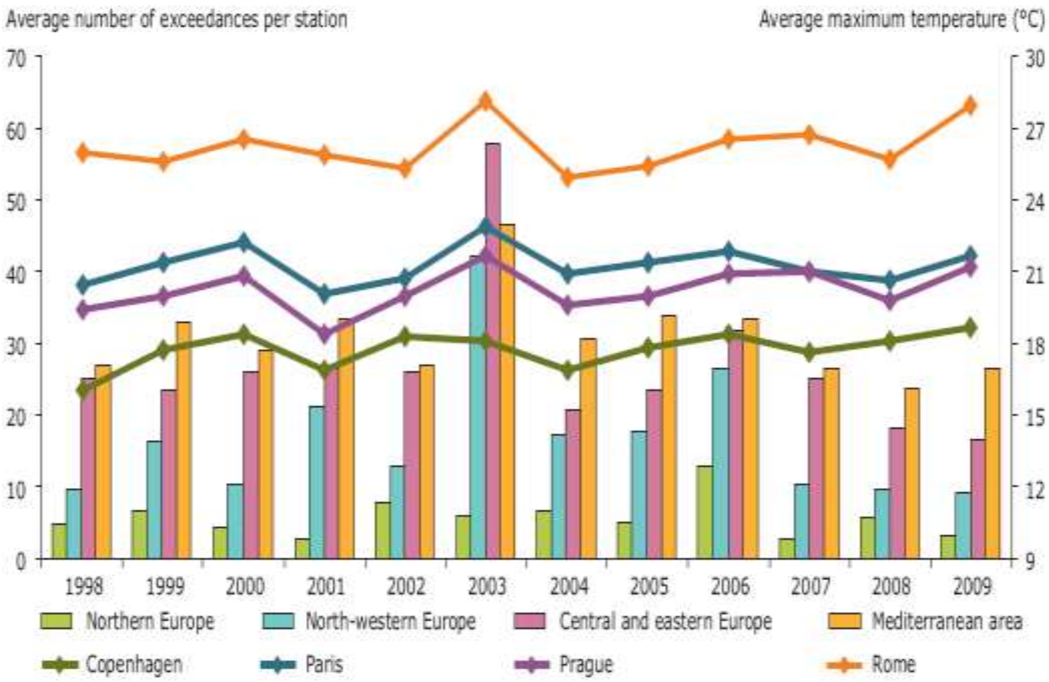


Figure 7.8 – Average number of exceedances in EU region, for the long term objective for ozone (120 µg/m^3) per station during summer, at points which reported at least one exceedance

The measurement stations, with sufficiently long time allotted to measurements, allow significant statistical trend analyses. The German measurements which fulfill these conditions show that both the number and the absolute levels of O_3 maximum concentrations decreased considerably during 1995 - 2007. The measurements in United Kingdom indicate also the fact that the episodic maximum levels of ozone highly decreased between 1990 and 2007. So, the measures for reducing the "summer smog", which imply VOC and NOx (ozone precursors) reduction in the emission from Europe have been - at least partially – successful.

Pollution by O_3, as a global or hemispheric problem, is also taken into consideration by the *Task Force on Hemispheric Transport of Air Pollution (HTAP)*, within the United Nations Economic Commission for Europe (UNECE), Convention on Long - Range Transboundary Air Pollution (CLRTAP) (EEC-UN, 1979). Besides, considering the long distance transport of atmospheric pollutants, other factors hide the positive effects of European measures for reducing the emissions of O_3 precursors from anthropogenic sources:

- biogenic NMVOC, mainly isoprene (C_8H_8) emissions from forests may have important contributions in O_3 forming. These emissions are extremely variable - spatially and temporally - and depend on the changes in climatic conditions, like temperature. The magnitude of biogenic emissions is difficult to quantify;
- emissions from the forest fires based on biomass and of other nature, some of them being inter-continental transported, may also contribute significantly to O_3 forming.

Situation in the cross-border area

Ruse

For ozone, the short term target rate (8h) for human health protection (KTSN = 120 μg/m^3) is regulated; it should not be exceeded in more than 25 days in a calendar year. Ozone KTSN came into force in the country in 2010. On the basis of the reported data, no exceedances of ozone KTSN are recorded.

Vratsa

No exceedances of the information threshold of the population regarding the ozone KTSN indicator were recorded.

Giurgiu

As compared to 2003, a decrease of ozone concentrations at both stations (Figure 7.9) is noticed. However, the values are still high, especially because of urban traffic and because of the increased number of cars in the municipal town of Giurgiu.

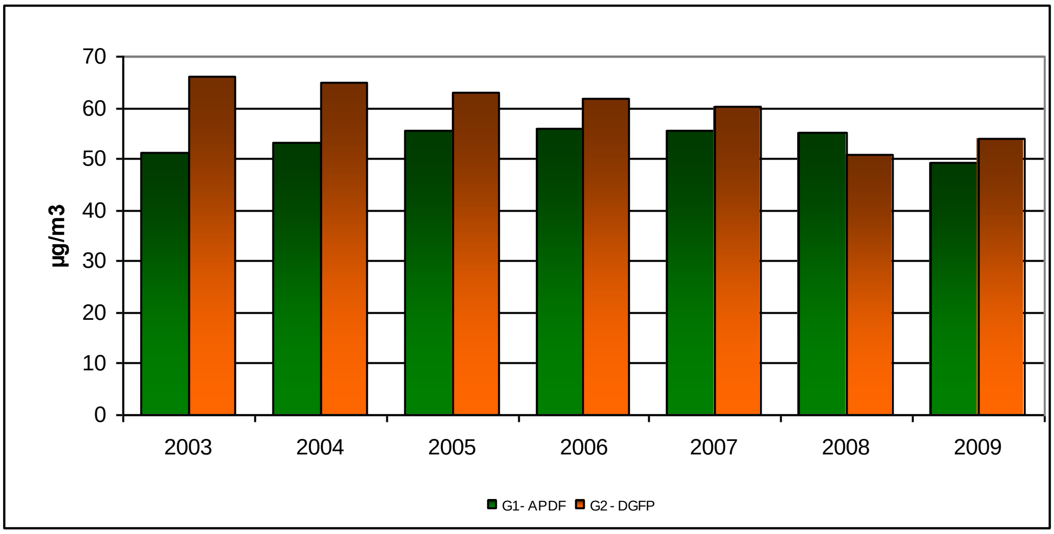


Figure 7.9 – Evolution of O_3 annual concentration in Giurgiu

7.3.3 Nitrogen dioxide and other air pollutants

Air pollutants such as NO_2, heavy metals, and organic compounds can also result in significant adverse impacts on human health (WHO, 2005). The current EU annual and hourly limit values for NO_2 have to be attained in 2010. Since NO_2 pollution is especially a problem in urban areas, exposure to NO_2 is discussed in more detail in the SOER 2010 urban environment assessment.

2008 was the first year for which reporting on heavy metals and polycyclic aromatic hydrocarbon (PAH), the components covered by the so-called fourth daughter directive (EC, 2004), was mandatory; target values are applicable in 2013. Benzo(a)pyrene (BaP) is one of the most potent carcinogens in the PAH group. It is emitted mainly from the burning of organic material such as wood and from car exhaust fumes especially from diesel vehicles. Ambient air measurements from 483 stations are available for 2008, but sufficient data coverage remains a problem. High levels of BaP occur in some regions of Europe, including parts of the Czech Republic and in Poland, exceeding the target value defined in the Air Quality Directive. Measurements of Pb, As, Cd and Ni concentrations were reported for 637 stations in 2008. Exceedances of the target values are mainly restricted to industrial hot-spot areas.

7.3.4 Nitrogen oxides - NOx (NO/NO_2)

At environmental temperature, they are present under gaseous form. NO is colorless and odorless; NO_2 has a reddish brown color and a strong, stifling smell.

Natural sources: main source – bacteria action at ground level.

Anthropogenic sources: residential heating and exhaust gas evacuations from the vehicle motors in the acceleration stage or at high speeds. NO produces a higher amount of NO_2 in the combustion process and in the presence of free oxygen.

Situation in the cross-border area

Nikopol

Table 7.4 - Average levels of nitrogen dioxide (2007 - 2010)

Point	Number of recorded data	Maximum average daily concentration **[µg/m^3]**	Average concentration / year **[µg/m^3]**
2007			
Nikopol "DOAS”	280	111.8	21.2
2008			
Nikopol "DOAS	288	54.1	12.4
2009			
Nikopol "DOAS	34	46,9	12
2010			
Nikopol "DOAS	**365**	**62.4**	**3.9**

South-West Oltenia region 4

In Figure 7.10 there are presented the annual emissions of NO_X at the level of South-West Oltenia region 4.

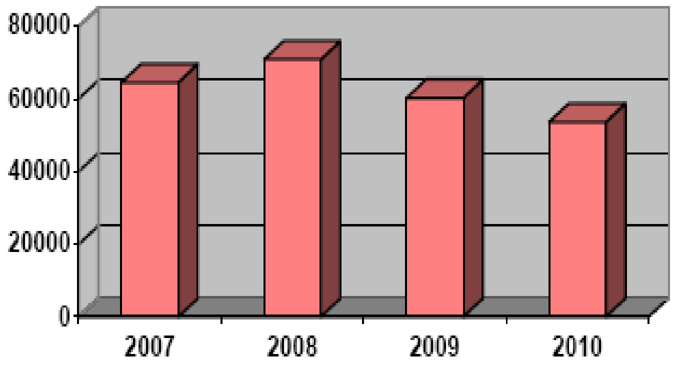


Figure 7.10 – Annual emissions of NO_X at the level of South-West Oltenia region 4

Giurgiu

Annual emissions of nitrogen monoxide and dioxide (NO_x)

The annual emissions of nitrogen oxides with acidifying effect from Giurgiu County are shown in Table 7.5 and represented in the graphic from Figure 7.11.

Table 7.5 - Annual emissions of NOx

Giurgiu County	2003	2004	2005	2006	2007	2008	2009
Annual emissions of NOx (t/year)	9613.148	2464.844	1448.312	1777.575	1644.988	2107.5	2753.406

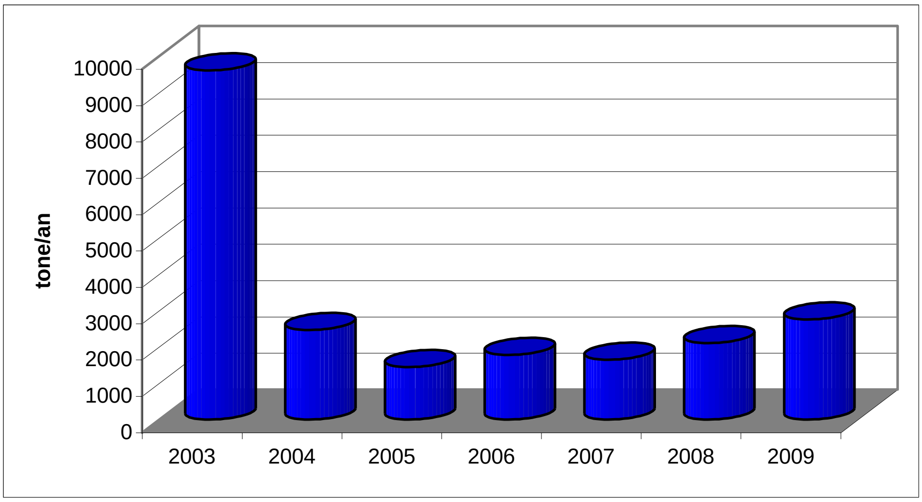


Figure 7.11 - Annual emissions of nitrogen oxides

7.3.5 Sulphur dioxide - SO_2

Colorless gas with bitter, pungent odor, generated as a result of burning the materials containing sulphur.

Natural sources: volcanic eruptions, marine phytoplankton, bacterial fermentation in swampy areas, oxidation of gas with sulphur content resulted from biomass decomposition.

Anthropogenic sources: people heating systems which do not use marsh gas, thermal power plants and industrial processes (siderurgy, refinery, sulphuric acid production) and in a lesser extent the emissions coming from diesel engines.

Situation in the cross-border area

Vratsa

Sulphur dioxide – main sources are the chemical industry and the processes of burning the solid and liquid fuels with high content of sulphur, of up to 3.9%. Sulphur dioxide and nitrogen oxides are major components of acid rain. There are no exceedances recorded for this indicator in 2010, from AIS-Vratza.

Nikopol

În table 7.6 there are presented the average daily sulphur dioxide levels.

Table 7.6 - Average daily sulphur dioxide levels * TEB - upper assessment threshold

Point	Number of recorded data	Number of exceedance of the average daily rate **[125 μg/m^3]**	Number of exceedances of * TEB **[75 μg/m^3]**	Maximum average daily concentration measured **[μg/m^3]**	Average concentration / year **[μg/m^3]**
			2007		
Nikopol "DOAS"	296	0	2	81.7	16.9
			2008		
Nikopol "DOAS"	288	0	□	10.1	13.8
			2009		
Nikopol "DOAS"	346	0	1	83.7	12.8
			2010		
Nikopol "DOAS"	**365**	**0**	**0**	**68.1**	**10.3**

* TEB – upper assessment threshold

South-West Oltenia region 4

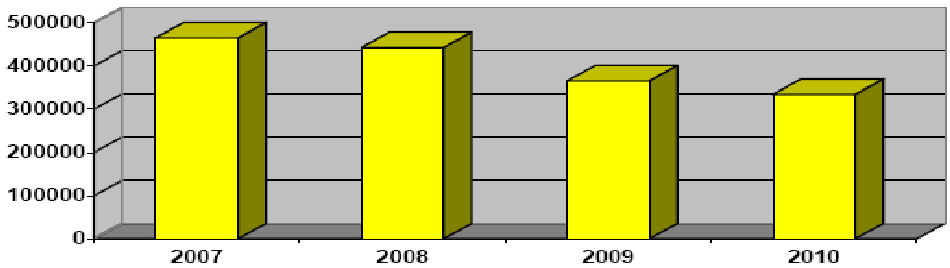


Figure 7.12 - Annual emissions of SO_2 at the level of South-West Oltenia region 4

Giurgiu

Annual emissions of sulphur dioxide (SO_2)

Annual emissions of sulphur dioxide in Giurgiu County are shown in Table 7.7. and represented in the graphic from Figure 7.13.

Table 7.7 - Annual emissions of SO_2

Giurgiu County	2003	2004	2005	2006	2007	2008	2009
Yearly emissions of SO2 (t/year)	5686.403	4531.590	3417.472	2998.907	3020.8685	2171.11477	2340.63

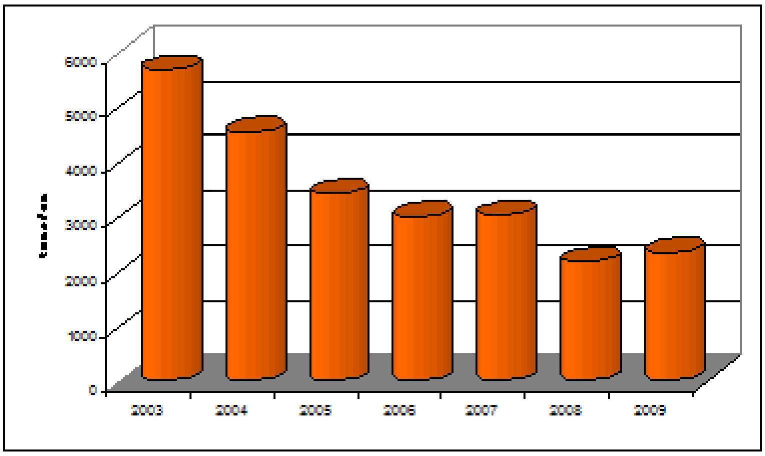


Figure 7.13 - Annual emissions of sulphur dioxide

7.3.6 Lead - Pb

Anthropogenic sources: main pollution source is represented by the engines running on gasoline and by the metalworking industry, a particular case being the foundries. Effects on health: toxic effects at people, in case of exposure to high concentrations influencing the synthesis of hemoglobin - which affect the kidneys, reproductive organs, gastrointestinal mechanism, joints, cardiovascular and nervous systems.

Situation in the cross-border area

Lead concentrations decreased from year to year, mainly because of releasing the leaded gasoline used by cars (Figure 7.14).

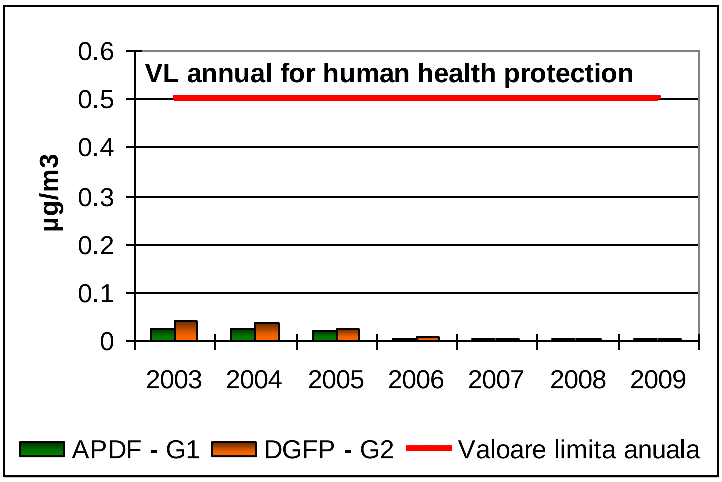


Figure 7.14 – Average annual concentrations of Pb

7.3.7 Benzene - C_6H_6

Benzene (C_6H_6) is a carcinogenetic aromatic hydrocarbon. EU limit value for C_6H_6 should be reached until 2010. In 2008, exceedances at a few traffic and industrial stations, e.g. in Italy and Poland, were recorded.

It is a very light, volatile aromatic compound, water soluble. 90% of the benzene amount in environmental air comes from road traffic. The rest of 10% comes from fuel evaporation when storing and distributing it.

Situation in the cross-border area

Ruse

Benzene levels are controlled in three points located on Ruse territory, by DOAS systems. The average value for human health protection - 5µg/m^3, is expressed as the average concentration of this pollutant for the last 12 months and is updated once at every three months and, if possible, monthly. In Figure 7.15 there are presented the average concentrations of benzene, measured by the three DOAS systems in Ruse, monthly updated. During the mentioned years, no annual exceedances of the standard for benzene are recorded.

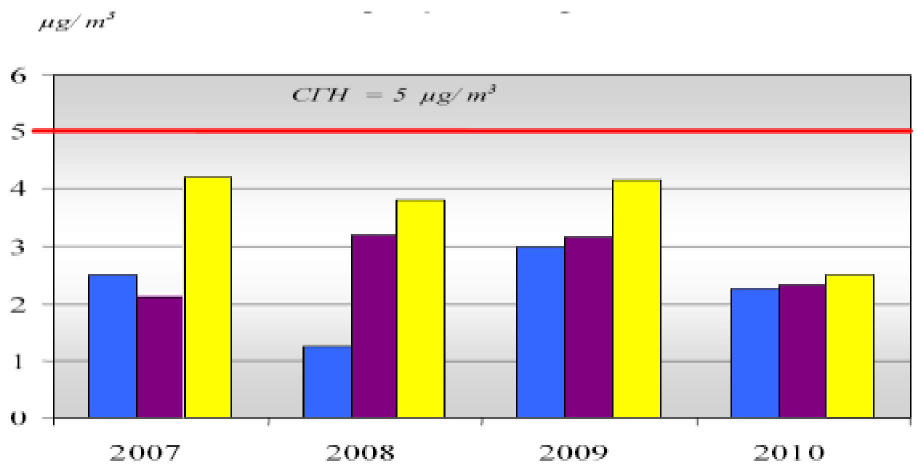


Figure 7.15 - Average annual concentrations of benzene in three points from Ruse, during 2007-2010

Giurgiu

In the last 2 years, no exceedances of the annual limit values were recorded for benzene (Fig. 7.16); in spite of all imposed measures, like mounting the systems for recovering the volatile organic compounds at the fuel distribution stations and at the storage tanks, the values are still high. We mention that on the territory of Giurgiu there is no potential source for pollution by benzene.

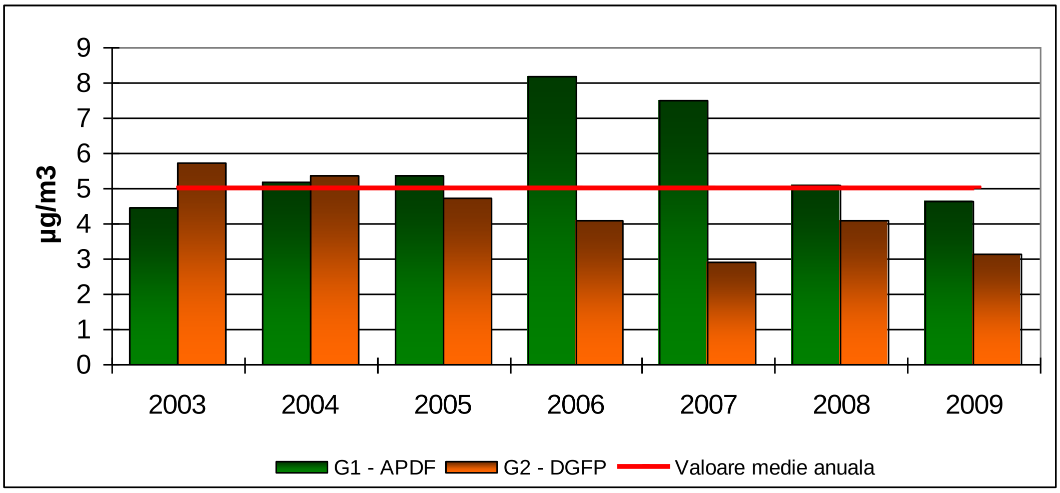


Figure 7.16 - Evolution of C_6H_6 annual concentration

7.3.8 Carbon monoxide – CO

At the environmental temperature, it is an odorless and colorless gas, of both natural and anthropogenic origin. It appears as a product in all the processes of incomplete combustion of fossil fuels.

Natural sources: forest burning, volcanic emissions and lightnings.

Anthropogenic sources: steel and iron production, oil refining, thermoelectric system and urban environment, mainly the vehicles with gasoline during running at low speed.

Situation in the cross-border area

Vratsa

The biggest source of CO is the road transport – more than 65% of the total emissions from the country. Other sources: internal processes of solid fuels combustion for heating in industry and forest fires. There are no recorded SDN exceedances per indicator in 2010 at AIS-Vratsa.

Giurgiu

Carbon monoxide concentrations decreased visibly in Giurgiu as a result of improving the technologies used in the combustion processes (Figure 7.17).

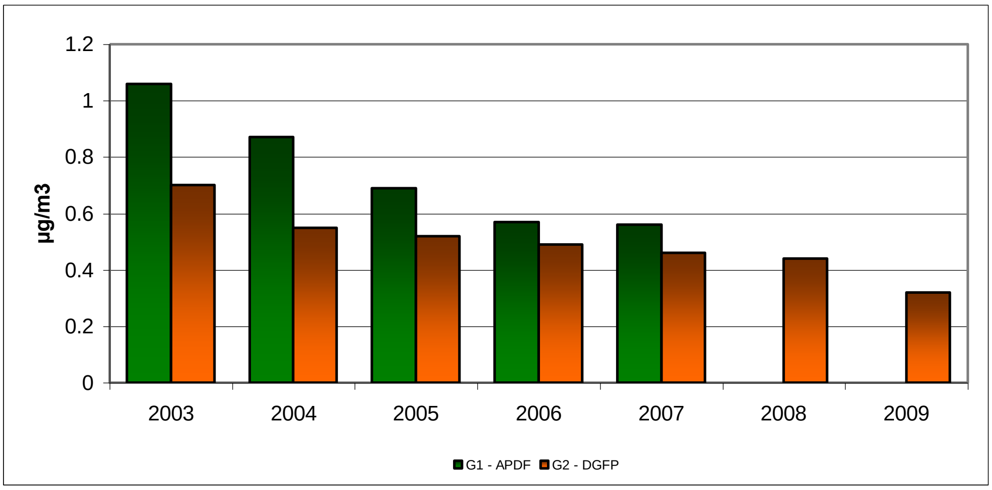


Figure 7.17 – Average annual concentrations of CO

7.3.9 Greenhouse gases

EU reduced its greenhouse gas emissions and will fulfill its obligations related to Kyoto protocol.

Reaching the target of limiting the global increases of temperature to less than 2°C will require a global concerted effort – including further on significant decreases of GHG emissions in Europe. In 2008, UE was responsible for 11 - 12% of the global GHG emissions – at the same time being the home for 8% of world population.

According to the present projections, taking into account the population increase and economic development at world level, Europe percentage contribution will diminish, because the emissions in emergent economies will continue to increase. The annual emissions of GHG in EU in 2008 corresponded to an amount of about 10 tons of CO_2 equivalent per person. As regards the total emissions, EU is on the third position, after China and USA.

Meanwhile, EU trends in GHG emissions, related to EU economic development – measured as gross domestic product (GDP) – indicate a total decoupling of the emissions coming from the economic development over time. Between 1990 and 2007, the emissions per GDP unit decreased in EU by more than a third.

Nevertheless, one should notice that these figures on emissions only represent what is emitted in EU territory, calculated according to the orientations agreed at international level within UNFCCC. Europe contribution to global emissions could be higher if the European imports of goods and services, having their "embedded carbon" correspondent, are taken into consideration.

The present data on the emissions confirm the fact that EU countries are going to reach their common target, to reduce them by 8% against the basic annual levels - 1990, for most countries – in the first commitment period according to Kyoto Protocol: from 2008 until 2012. Between 1990 and 2008, internal emissions of GHG decreased by about 11%. It is noticeable that UNFCCC and Kyoto Protocol do not cover all GHGs. Many substances controlled according to the provisions of Montreal Protocol, like chlorofluorocarbons (CFC) are also strong GHG.

On the other side, the emissions had a *downward* trend in the same period, determined by factors like:

• improvements of energy efficiency, especially by end users from industry and energy industries;

• improvements of the efficiency of fuels used by vehicles;

• better management of waste and recovery of the gases from the spoil banks (the waste sector achieved to highest relative reduction);

• decreases of emissions from agriculture (by more than 20% since 1990);

• transition from coal to less polluting fuels, especially natural gas and biomass, for the production of electric and thermal energy;

• and partially because of economic restructuring in Member States from east, at the beginning of 1990s.

UE trends of GHG emissions between 1990 and 2008 were dominated by the two countries which had the highest amounts of emissions, Germany and Great Britain, which together were responsible for more than a half of the total reduction in EU. Significant reductions were also achieved by some EU countries, like Bulgaria, Czech Republic, Poland and Romania. This global decrease was partially compensated by increased emissions in Spain and, to a lesser extent, in Italy, Greece and Portugal.

The general trends are influenced by the fact that, in many cases, emissions from large punctual sources were reduced while, at the same time, the emissions from some mobile and/or diffuse sources, especially those ones related to transport, increased significantly.

In a special way, transport is still a problematic sector. GHG emissions generated by transport have increased by 24% between 1990 and 2008 in EU, excluding the emissions coming from international aviation and maritime transport. While the railway freight and the inner waterways recorded a decrease of the market share, the number of motor vehicles in EU – level of motor vehicle owners – increased by 22%, i.e. by 52 de millions of cars, between 1995 and 2006.

7.3.10 Inter-continental transport of air pollution

Having in view that air pollution does not take into consideration the national borders, the problem should be approached at international level. Concluded in 1979, United States Convention on Long-Range Transboundary Air Pollution (CLRTAP) was signed by 51 countries and constitutes the basis of the international fight against air pollution.

In their 2010 assessment of the inter-continental transport of air pollution, the UNECE LRTAP Convention's Task Force on Hemispheric Transport of Air Pollution (HTAP) finds that ozone, particulate matter, mercury, and persistent organic pollutants are significant environmental problems in many regions of the world. For each of these pollutants, the level of pollution at any given location depends not only on local and regional sources, but also on sources from other continents and, for all except some persistent organic pollutants, natural sources. In most cases, mitigating local or regional emission sources is the most efficient approach to mitigating local and regional impacts of air pollutants.

For all of the pollutants studied, however, there is a significant contribution of inter-continental transport of air pollution. This contribution is particularly large for ozone, persistent organic pollutants, and mercury, and for particulate matter during episodes. Furthermore, reductions of methane emissions are as important as emission reductions of the 'classical' ozone precursors (NO_X, NMVOCs, CO) to reduce intercontinental transport of ozone.

Without international cooperation, for attenuating the inter-continental air pollution flows, Task Force HTAP concluded that many nations are not able to fulfill their own objectives of public health protection and environment quality. With the global change of the future emissions, it is likely that in the next 20 - 40 years it will become even more difficult for individual nations or regions to fulfill their environmental objectives, without an inter-regional cooperation policy. The cooperation in reducing the emissions, which contributes to the inter-continental transport of air pollution, has significant benefits for the source and receiver countries.

7.4. Outlook for 2020 on the air quality Outlook for 2020 on the air quality

The 2020 baseline outlooks are consistent with existing EU policies and include estimated impacts from the recent economic downturn.

It shows that, under the current policy scenario, emissions of the main air pollutants, excepting NH_3, are all projected to decline by 2020 for the EEA-32 and Western Balkan countries. Compared with 2008 emission levels, the largest decreases in percentage terms are projected for emissions of NO_X and SO, a reduction of around 45 % by 2020 in the absence of additional measures to further reduce emissions. For PM and NH_3 for which 2020 emissions are projected to be similar or slightly higher than in 2008, substantial reductions are technically possible, as shown by the maximum reduction scenarios for the EU.

For emphasizing the efforts of the European states for reducing the effects of atmosphere pollution in the next period, the implementation of the following quantitative objectives was proposed, having 2000 as reference, which implies the following mitigations:

- 49% in loss of life years due to particulate matter;
- 10% in mortality caused by ozone;
- 75% in the surface of forest ecosystems where the acidity is exceeded;
- 45% in the surface of freshwater ecosystems due to acidity;
- 15% in the surface of forest areas where the ozone concentration is exceeded.

Figure 7.19 presents the emissions estimated for 2010, emissions reported by EU Member States, and estimates the limits for 2020 for EU countries. The main prospects for 2020 are in accordance with the EU existent policies and include the impact estimated from the recent economic recession.

Figure 7.19 shows that, in accordance with the present policy scenario, the main emissions of atmospheric pollutants, excepting NH_3, are all designed to decrease until 2020 for EU countries. As compared to 2008, the emission levels with the highest percentage decreases are projected to be NOx and SO_2 emissions: a reduction of about 45% until 2020, in the absence of some additional measures for reducing the emissions. For PM2.5 and NH_3 for 2020, the emissions are projected to be similar or slightly higher than in 2008; significant reductions are technically possible, as shows the scenario for EU, for a maximum reduction of emissions (MRR).

Convention and the delayed revision of the EU NECD (EC, 2001a) are both expected to introduce stricter emission ceilings for 2020 for relevant countries and for the first time national limits on the emission of PM2.5.

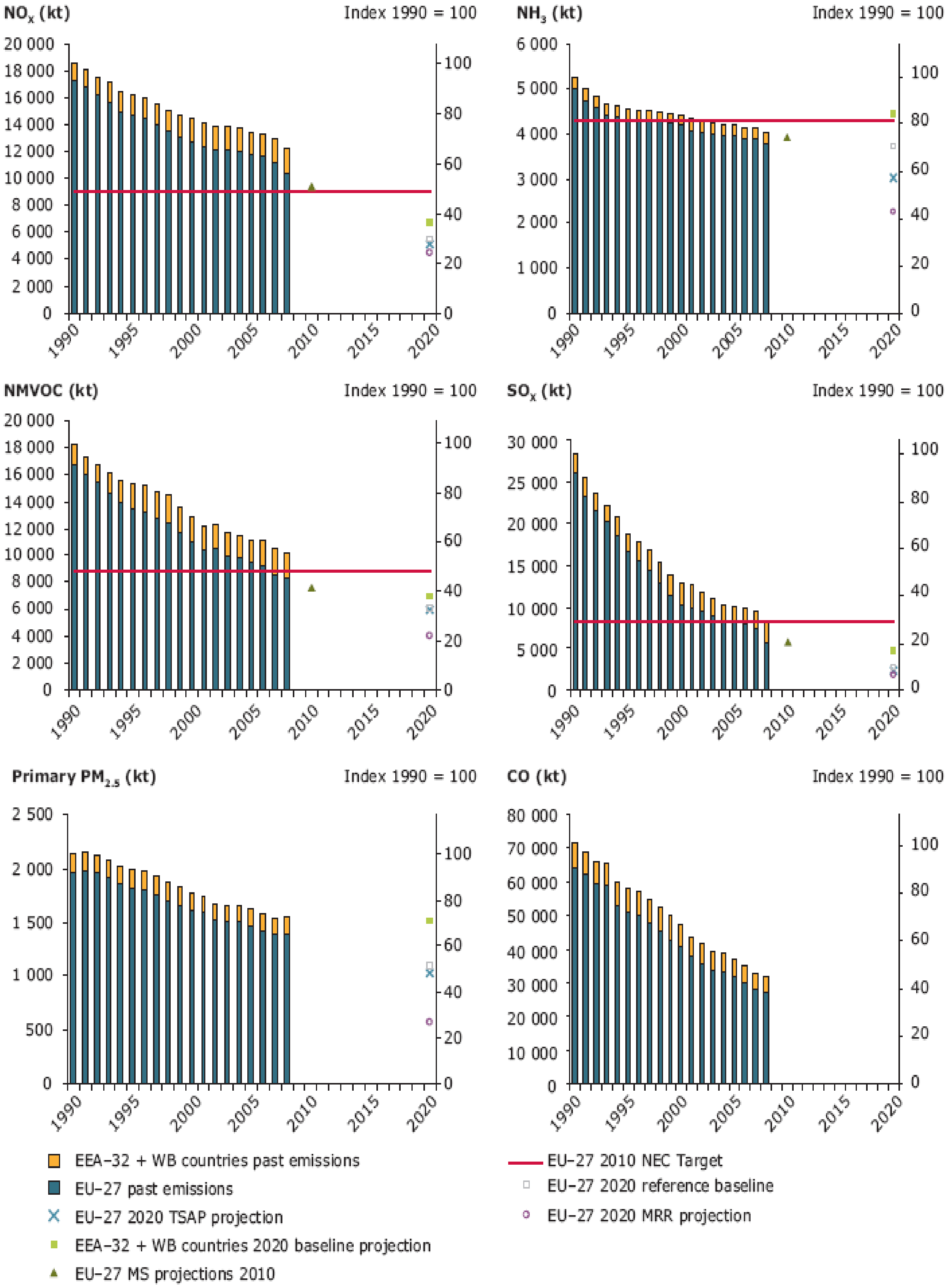


Figure 7.18 - Emissions recorded and estimated for the main atmospheric pollutants and primary particulate matter

Emission reduction in 2020 as compared to 2000 in EU:

Table 7.8 - Reducing emissions in 2020 compared to 2000 in EU

SO2	NOx	VOC	NH3	PM 2.5
80%	60%	50%	30%	60%

Depending upon the ambition level to be agreed, the 2020 emission ceilings will require further emission reductions between those projected under the current baseline scenario and the level of a maximum reduction scenario. A time horizon of 2050 has been suggested as an aspirational target year by which Europe's long-term objectives of achieving levels of air pollution that do not lead to unacceptable harm to human health and the environment should be met. Preliminary assessments indicate that in order to meet these objectives, for SO_2 there should be an emissions reduction in the range 40–60 % compared with 2010, especially in northern and central Europe. For NO_X and NH_3 the required reductions are in the range of 70–90 % and for O_3 precursors 70–80 %, in particular in southern, western and central Europe. In urban areas a 40–60 % emission reduction of PM would be needed.

7.5. Priority measures for improving air quality. Future trends

7.5.1 Priority measures

The possible measures for improving the air quality are:

1. Legislative – Simplification and improvement of the existent legislation; Revision of the National Emission Ceilings Directive;

2. Identification of new measures for reducing both the community emissions and the national emissions (small vehicles, modernized combustion plants, reduced emissions from ships, etc.);

3. Air quality integration in other sectoral policies: energy, transport, agricultural and structural funds are specified;

Looking ahead in 2020 and beyond, EU will make some progresses.

In the Climate and Energy Package, EU has pledged to reduce even more the emissions, by (at least) 20% compared to 1990, until 2020. Moreover, EU will commit to reduce the emissions by 30% until 2020, provided that other developed countries pledge themselves also to mitigate comparably the emissions and the developing countries contribute adequately in accordance with their responsibilities and possibilities.

Switzerland and Liechtenstein (both with reduction from 20 up to 30%), also Norway (from 30 up to 40%) have assumed similar commitments.

The present trends show that EU is in process of making progress towards its target for 2020, of emission mitigation. Projections achieved by European Commission indicate that EU emissions would be by 14% below the levels from 1990 until 2020, taking into consideration the implementation of national laws in force at the beginning of 1990. Admitting that the package regarding the climate and energy is entirely implemented, EU expects to reach its target of reducing by 20 % the greenhouse gas emissions. It is noticeable the fact that the part of the additional reduction could be achieved by using some flexible mechanisms, both in commercial sectors and the non-commercial ones.

The efforts considered as key efforts include extending and strengthening the System for commercializing the global emissions of EU and also setting some compulsory legal targets for increasing the share of renewable energy to 20% of the total energy consumption, including a share of 10% in transport sector, as compared to a total share of less than 9% in 2005. Promisingly, the share of renewable sources in energy production increased, and the energy production using biomass, wind turbines and especially photovoltaic panels increased significantly.

Limiting the global average temperature increase to less than 2°C on long term and reducing by 50% or more the global emissions of GHG as compared to 1990, until 2050, is generally considered a target beyond what is achievable with the additional reductions of emissions. Besides, systemic changes in the way in which we generate and use the energy, also in the way in which we produce and consume products that are intensely energy consumers are probably necessary. Thus, subsequent improvements both in the field of energy efficiency and in the field of using the resources shall continue as a key component.

In EU, significant improvements in the field of energy efficiency took place in all sectors, as a result of the technological developments in industrial processes, vehicle engines, space heating and electrical apparatus. Energy efficiency of the buildings from Europe has a significant potential for long term improvements. On a

larger scale, the smart apparatus and smart networks may also improve the global efficiency of electric power systems, allowing the inefficient generation to be used less frequently, by reducing the load peaks.
For certain pollutants, the environmental air quality has improved, but major threats on human health still remain.

In Europe, successful reduction of sulphur dioxide (SO_2) and carbon monoxide (CO) levels in environmental air, also significant reductions of NO_X occurred. Besides, the lead concentrations decreased considerably with the introduction of unleaded gasoline. However, exposure to particulate matter (PM) and ozone (O_3) remains a major problem of health related to environment, to loss of life expectancy, to acute and chronic respiratory and cardiovascular effects, to affected pulmonary development at children and to reduced birth weight.

In the last decade, ozone concentrations exceeded frequently and widely the target values connected to health and ecosystems. The Clean Air for Europe programme (CAFÉ) estimated that at the present levels of ground ozone, exposure to concentrations exceeding the target values connected to health is associated with more than 20000 yearly premature deaths in EU.

During 1997-2008, 13-62% of the urban population from Europe was exposed to concentrations of fine and coarse particulate matter (PM10) in environmental air, which exceeded the EU limit value established for human health protection. Nevertheless, the particulate matter has no thresholds concentration, so the adverse effects on health may also appear below the limit values.

The fraction of fine particulate matter (PM2.5) represents a special health problem, due to the fact that it may penetrate profoundly the respiratory system and may be absorbed by blood. An assessment of the impact of exposure to PM2.5 in 32 EEA countries in 2005 indicated that almost 5 millions years of life loss could be attributed to this pollutant. PM10 and PM2.5 concentrations are indicators of complex compounds of pollutants and are used as representations for the effects of characteristic particulate matter, responsible for the produced impact. Other indicators like black smoke, elementary carbon and particulates number could offer a better connection with the pollution sources needed to be attenuated, as a response to the specific effects on health. This could be beneficial for the strategies of reducing the focused emissions and for establishing the air quality standards. The proof that chemical properties and chemical composition of particulates, together with their mass, are important for the impact on health, is more and more obvious. For instance, benzo(a)pyrene (BaP), a marker of carcinogenic polycyclic aromatic hydrocarbon, is released mainly by the burning of organic materials and mobile sources. The high levels of BaP appear in certain regions, like Czech Republic and Poland. Increase of wood burning in homes, in some parts of Europe, may become a more prominent source of such dangerous pollutants.

The strategy for attenuating the climatic changes may also play a role; by stimulating the use of wood and biomass as internal energy sources, long term objectives in reaching the air quality levels, which should not create unacceptable influences and risks to human health and environment, are established. Thematic strategy on air pollution establishes subsequently intermediate objectives, by improving air quality until 2020. The Directive on air quality has established compulsory limits for PM2.5 and for organic compounds like benzene. This introduced also additional objectives for PM2.5, on the basis of the average exposure indicator (AEI), for determining the percentage of reduction that should be reached in 2020.
Moreover, many international bodies discuss to set objectives for 2050, in relation with the long term objectives of European environmental policies and international protocols.

In the transport field, the following measures need to be taken in the future:

• establish low-emission zones that restrict access for more polluting vehicles;

• improve transport planning to encourage a shift of transport to less polluting modes including walking, cycling, and public transport;

• encourage cleaner fuels and vehicles including use of economic incentives;

• renew municipal vehicle fleets to introduce newer, cleaner vehicles;

• introduce retrofit programmes for road vehicles:

- particle filters to reduce PM emissions, and modern de-NOX technologies;

- shift to compressed natural gas vehicles;

• introduce congestion charging, differentiated parking fees or a city toll;

• introduce speed limits and traffic calming measures, for example imposing lower speed limits on main roads;

• implement short-term actions such as traffic bans during high pollution episodes;

• introduce measures to reduce emissions from non-road vehicles used for example in construction activities.

Households, commercial and institutional buildings:

• encourage fuel switching from more polluting to cleaner fuels, for example from coal to gas or electricity including use of financial incentives to achieve this;

• establish district heating schemes — heat and power cogeneration;

• implement rebate schemes that improve the insulation and energy efficiency of buildings;

• ensure industrial and commercial combustion sources (including for biomass) are fitted with emission control equipment or replaced.

• raise the awareness of citizens; provide easy-to-understand information on air quality and health effects of air pollutants;

• use air quality forecast and scenario tools to warn the general public and sensitive population groups about episodes of high air pollution.

7.5.2 Future trends. Challenges

In parallel, EU developed policies for limiting the total emissions allowed to any Member State, by fixing some legally compulsory limits. „National Emission Ceilings directive" (NECD) is one of the EU key policies. The Directive establishes „the ceilings" or the upper limits for four pollutants: sulfur dioxide (SO_2), nitrogen oxides (NO_X), non methane volatile organic compounds (NMVOCs) and ammonia (NH_3).

EEA considers that new reductions of emissions are required, for assuring a real protection of environment and health. An EEA analysis achieved on the basis of the latest NECD data indicates that 15 of the Member States will be not able probably to reach the ceiling for at least one of the agreed substances. Among these, 13 states will be not able to reduce to the agreed ceiling the emissions of the two pollutants which have NO_X and NH_3 in their composition.

According to the scenario that assumes that current policies and measures are fully implemented, the loss of statistical life expectancy attributable to the exposure to PM2.5 will be 4.1 months in the EU in 2020, compared to 8.0 months in 2000. The predicted loss when assuming a maximum reduction (MRR) scenario is 2.9 months for the EU in 2020. The environmental objective of the Thematic Strategy on Air Pollution (TSAP; EC, 2005) is 3.8 months.

For ozone pollution, the present policy scenario foresees about 17100 premature deaths in 2020, as compared to 22700 in 2000. The numbers for MRR scenario and TSAP are of about 15300 and 16900 (Thematic Strategy on Air Pollution)

The objectives of the TSAP states that the number of years of life lost (YOLLs) due to PM2.5 impacts should decline by 47 % between 2000 and 2020. The number of premature deaths attributable to the exposure to ground level ozone should decline by at least 10 %. According to the TSAP, the area of sensitive ecosystems that is not protected against excess nitrogen deposition threatening biodiversity should be reduced by 43 % in comparison to 2000 and the forest area receiving unsustainable levels of acid deposition should shrink by 74 %.

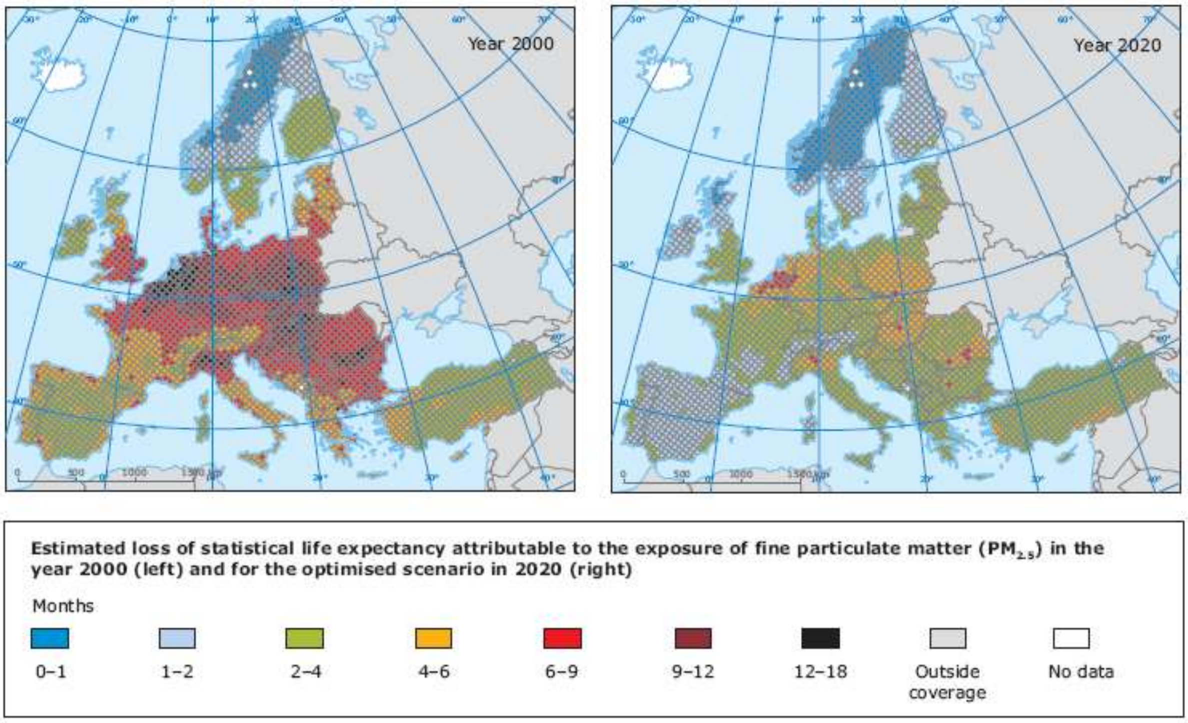


Figure 7.19 – Loss of statistical life expectancy (months) attributed to exposure to fine particulate matter (PM2.5) in 2000 (left), and for the optimized scenario in 2020 (right)

Distance-to-target analyses show to which extent the environmental objectives are predicted to be met in 2020, assuming the current policy and maximum reduction scenarios (IIASA, 2010a). The results indicate that none of the TSAP objectives set for the protection of human health and ecosystems will be reached by current policies alone.

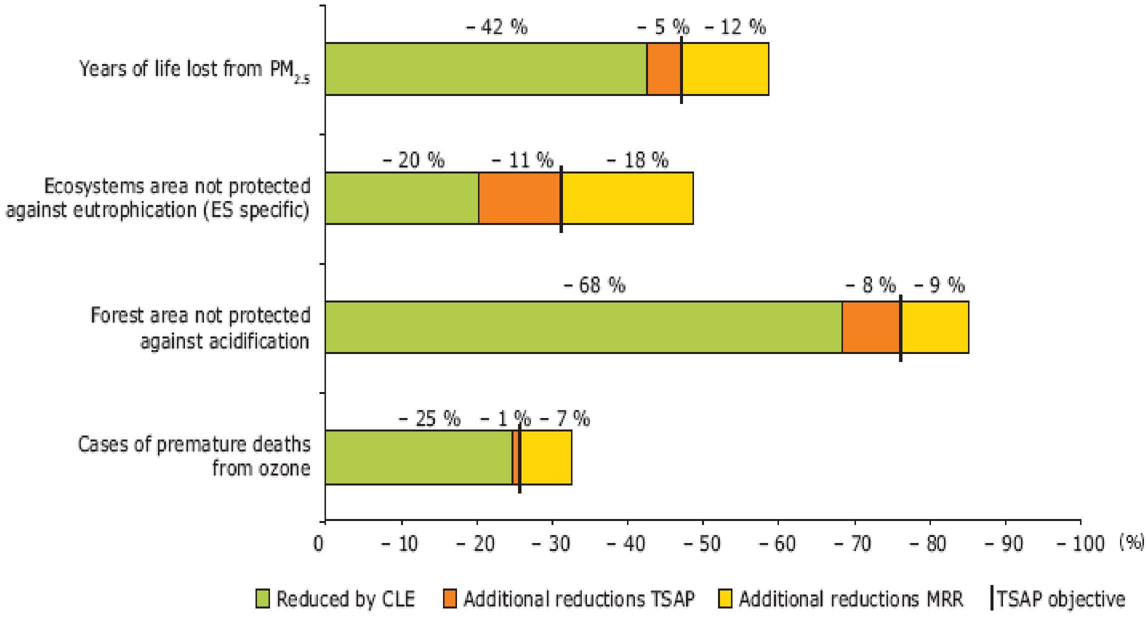


Figure 7.20 - Relative changes of the impact indicators on EU environment which result from the present laws (IJC), in 2020, also additional reductions, according to TSAP, and maximum reduction rate (MRR) of emissions, as compared to 2000

For years of life lost (YOLL) due to PM2.5 pollution, the achieved reductions will be approximately 5 % below the target. For O_3 (premature deaths) the difference is very small: only 1 %. The highest absolute reductions predicted under the scenario are found for the acidification of forest soils, although a further reduction of about 8 % is still needed to obtain the TSAP objective. Concerning ecosystem eutrophication, the distance-to-target is estimated to be as high as 11% in 2020.

NECD is reflected in the directives referring to air quality, which establish limits and target values for the main air pollutants. In April 2008, a new framework directive named "Clean Air for Europe" (CAFÉ) was adopted. For the first time, it establishes legally compulsory limits for PM2.5 (fine particulate matter) concentrations which shall be reached in 2015. European Commission also calls the countries which did not comply with the previous limits to account, and when the measures necessary for improving the performances were not taken, initiated measures for sanction, according to the Community right.

The climatic changes represent one of the most obvious effects of the past evolutions: failing the target of 2°C is probably the most concrete example of risk which passes beyond the planet boundaries. Long term ambition to reach 80-95% reductions of CO_2 until 2050 in Europe for remaining aligned to the above mentioned target argues strongly for a fundamental transformation of present economy in Europe, for energy with low carbon emissions and transport system representing the central platforms of the new economy – and there are not only these ones.

Like in the past, the future impacts of the climatic changes are also expected to affect disproportionately the must vulnerable categories in the society: children, elderly and poor people. As a positive aspect, a larger access to green spaces, biodiversity, clean water and air is useful for human health. However, it raises also the question regarding how we should divide the access and benefits, because many times the territorial planning and decisions on investments favor the rich at the expense of the poor.

Well maintained ecosystems and ecosystem services are essential for supporting the mitigation of climatic changes and the adaptation objectives, also the biodiversity conservation as a prerequisite for assuring this. The balance between the buffer role which the ecosystems may play against unexpected impacts and the possible increased demands for new human settlements on water and ground brings new challenges, e.g. for urban planners, architects and ecologists.

The race for replacing the energy and materials having intensive carbon emissions, which is in progress, is expected to intensify further on the demands for ecosystems and terrestrial, aqueous and marine services (bio-fuels of the first and second generation offer an example here). Because these demands are increasing, an example being that one for chemical substitutes, probably there will increase the conflicts related to the existent uses for food products, transport and recreation.

Many of the environmental challenges assessed in this report have been emphasized in the EEA previous reports. Today, different is the rate with which the interconnections spread risks and raise the uncertainties throughout the world. Unexpected collapses, in a zone or geographical region, may transmit failures at a large scale by the entire network of economies, by means of contagion, feedback and other extensions. The episodes with the recent collapse of the global financial market and the eruption of Island volcano have demonstrated this.

Such crises show also how difficult is for the society to face the risks. The early warnings, well indicated and numerous, are seldom widely ignored. At the same time, the recent period offer many experiences, good and bad, from which we may learn and respond faster and more systematically to the challenges we are confronted with (e.g. by multiple managements of crises, negotiations regarding the climate changes, eco-innovations, information technologies or global knowledge developments).

In this final paragraph, some future priorities regarding the environment are presented as follows:

• Better implementation and strengthening of the present environmental priorities regarding climatic changes, nature and biodiversity; use of natural resources and waste, environment, health and life quality. While these remain important priorities, the management of the links between them will be essential.

Improvement of monitoring and implementation of sectoral and environmental policies will assure the fact that the results in the environment field are reached, give stability in the regulating field and support more efficiently the government.

• Dedicated management of natural capital and ecosystem services. Increase of resource efficiency and resilience seem to be key integration concepts regarding the way of approaching the environmental priorities, also for the multiple sectoral interests which depend on them.

• The coherent integration of the environmental considerations within many fields of sectoral policies may contribute to the increase of efficiency with which the natural resources are used, and so it helps in greening the economy, by reducing the common pressures on environment, which come from multiple sources and economic activities. The coherence will also lead to general progress measures, rather than just against individual targets.

• Transformation towards a green economy addressing to the long term viability of natural capital in Europe and a reduced dependence on that one from outside of Europe.

CHAPTER 8

AIR QUALITY AND CLIMATE CHANGES

8.1. General

Climate changes are a direct or indirect result of human activities, which determine the change of the global atmosphere composition and are added to the natural variability of the climate, observed over a comparable time period.

The greenhouse effect is due to the selective absorption, by the greenhouse gas molecules (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride), of thermal radiation emitted by Earth and its isotropic re-emission in the extra-atmospheric space also towards Earth. By increasing the gas concentrations, the greenhouse effect intensifies, the energy and humidity transport in the system is disturbed, fact which determines imbalance in the climate system.

The direct effects of climate changes are: increase of average temperature with significant variations at regional level, decrease of the volumes of ice sheets and increase of ocean levels, change of the hydrologic cycle, increase of arid areas, changes in the course of seasons, increase of extreme climate phenomena frequency and intensity, decrease of biodiversity, etc.

Air pollution and greenhouse gas have many times the same emission source: combustion plants, exhaust of motor vehicles also waste management.

Figure 8.1 offers a summary of some of the key interactions.

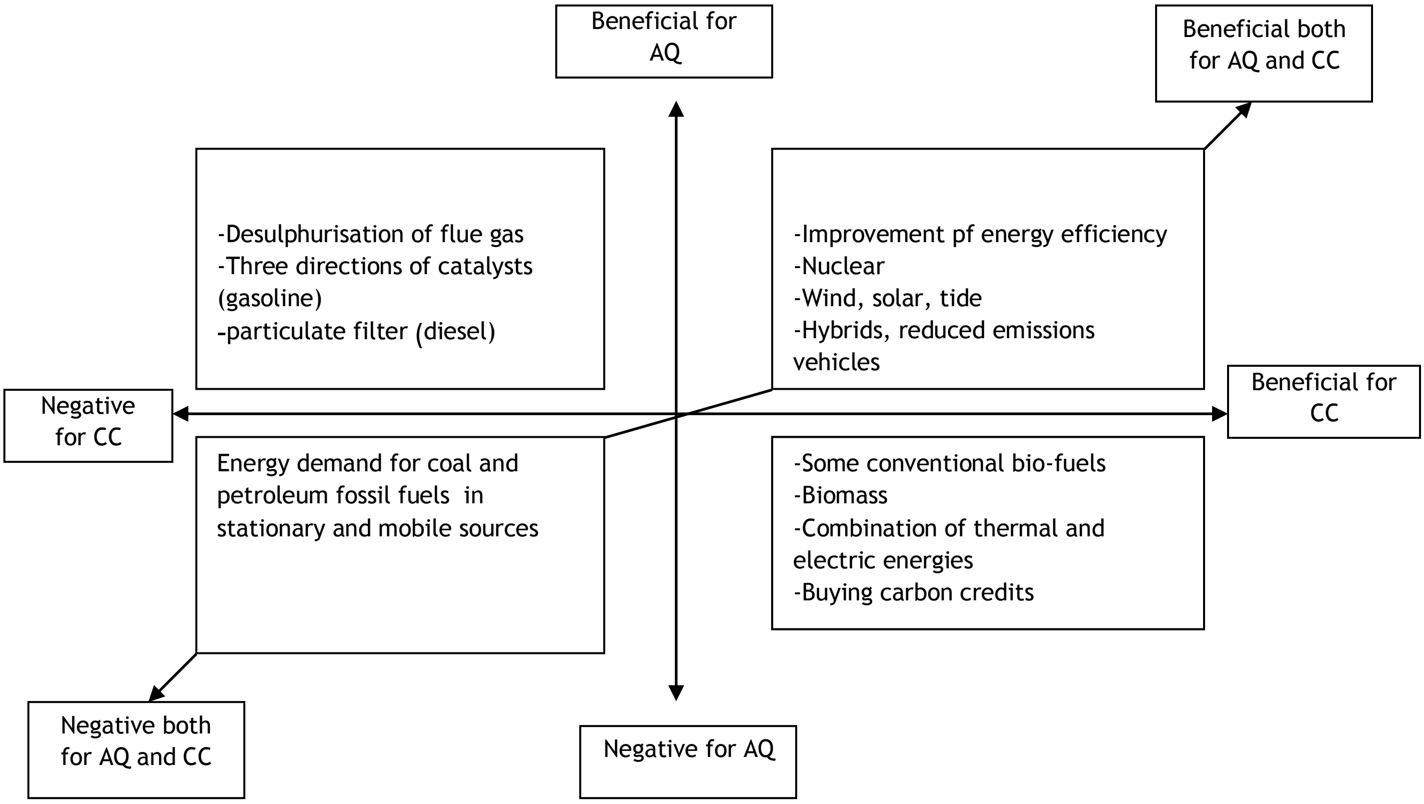


Figure 8.1 – Air quality (AQ) and climate changes (CC), synergies and compromises

Policies on climate changes already reduce the global cost of pollution mitigation to accomplish the objectives of EU Thematic Strategy on Air Pollution [1]. Including the air pollution effects on climate changes within the framework of air quality strategies offers significant gains of efficiency, by reducing the particulate matter and ozone precursors, in addition to the norms for CO_2 and other GHG with long life [2].

The Intergovernmental Panel on Climate Change (IPCC) presented in the first part of 2007 the contributions of the three Working Groups to the Forth Global Assessment Report (available on the web-site: www.ipcc.ch/), which presents the results of scientific results, observations on climate changes at global level, also the forecasts achieved on the basis of using the climate models.

The report recommends that, for limiting the average global warming to 2^{o} Celsius above the pre-industrial value, a reduction of the emissions of greenhouse gas by at least 50% as compared to the present value is needed until 2050.

8.2. Climate changes and human health

Almost all the environmental and social effects of climate changes may affect eventually the human health by changing the weather and by changing the quality and quantity of water, air, ecosystems, agriculture, livelihood and infrastructure.

Climate changes may multiply the existent risks and health problems: potential effects on health depend to a great extent on the people vulnerability, also on their capacity to adapt to them.

The heat wave in Europe from the summer of 2003, with more than 70 000 deaths, outlined the need of adaptation to climate changes. Older people and people with special diseases, with high risk, and the disadvantaged population groups are more vulnerable.

For EU populations, the mortality was estimated to increase from 1 up to 4% for each temperature increase of one degree. In 2020, the estimated increase of mortality related to heat, which results from the foreseen climate changes, could exceed 25 000 per year, mainly in the central and southern regions of Europe.

An anticipated impact of climate changes on the spread of diseases through water, aliments and vectors in Europe emphasizes the need of some tools for approaching such threats to public health. The patterns of transmitting the diseases are also influenced by ecological, social and economic factors, like the change of the models for using the lands, decline of biological diversity, changes in human mobility and outdoor activities, also the access to healthcare and population immunity. This could be exemplified by the movement of the ticks, vectors of Lyme disease and encephalitis. Other examples include the European extended range of the Asian tiger mosquito, a vector with a lot of viruses, with potential of further transmission and dispersion under changeable climate conditions.

Climate changes may also exacerbate the existent environmental issues, like the particulate matter emissions and high ozone concentrations, and are additional challenges to the sustainable supply of water and assurance of sanitation systems. Climate changes related to air quality and pollen distribution are expected to affect different respiratory diseases.

The climate changes are also responsible for the increase of the risks to health, e.g. because of the heat waves and weather connected diseases. This outlines the necessity for preparing, the increase of the awareness and adaptation degree. The associated risks are very dependent on human behavior and on the quality of healthcare services. In addition, a series of diseases carried by vectors, also some outbreaks of diseases carried by water and food may become more frequent with the temperature increase and many frequent extreme events.

8.3. Climate changes and ecosystems

Climate changes play a substantial role in the loss of biodiversity and subject the ecosystem functions to risks. The changes of climate conditions are responsible, by example, for the changes observed in the distribution of many species of European plants towards the north and upper side of the hills. It is estimated they need to move some hundreds of kilometers to north for survival, in the course of 21 century – fact which will be not always possible. A combination of the rate of climate changes and habitat fragmentation, which results because of some obstacles, like roads and other categories of infrastructure, is likely to prevent the migration of many species of plants and animals and could lead to changes in species composition, accompanied by a continuous decrease of European biodiversity.

The calendar of seasonal events, the phenology (branch of biology that deals with the study of climate condition action on living organisms) for plants and the life cycles of the groups of animals, both terrestrial and marine, are changing with the climate changes [4].

Similarly, climate changes are likely to affect the aquatic ecosystems. Warming of the surface water may have some effects on water quality and, consequently, on its use by people. They include a higher probability for a development of algae and a movement of the freshwater species to north, also changes in phenology. Also, within the marine ecosystems, climate changes are likely to affect the geographic distribution of plankton and fishes.

A major potential impact subsequent to climate changes, combined with the changes in the land use and practices for water management, is the intensification of the hydrological cycle; due to temperature changes, it modifies the precipitations, the glaciers and snow coverage. In general, the annual flow rate of rivers are increasing in north and decreasing in south, trend which is estimated to rise with the future global warming. As a consequence, the drought and lack of water are expected to increase, especially in the south of Europe and particularly in summer.

While the information on the impact of climate changes on soil and the different related feedbacks are very limited, changes in the bio-physical nature of soil are generated, most probably, by the increasing temperatures, changes of precipitation intensity and frequency and by more severe droughts. Such changes may lead to a decline of the stocks of organic carbon in soil – and a substantial increase of CO2 emissions. The forecasts show significant reductions of soil humidity during summer in Mediterranean region, and increases in the north-east of Europe [4]. Moreover, the prolonged periods of drought due to climate changes may contribute to soil degradation and to increase of the risk of desertification in certain parts of the Mediterranean region and Eastern Europe.

8.4. Europe and climate changes

The main consequences of the climate changes expected in Europe include a high risks of coastal flooding , also river flooding, drought, loss of biodiversity, threats to the address of human health, also deterioration of economic sectors like energy, forestry, agriculture and tourism [4].

The consequences of climate changes are likely to vary considerably on European territory with pronounced effects expected in Mediterranean Sea basin, north-west of Europe, Arctic and mountain regions. Meanwhile, in the north-west of Europe, the coastal lowlands are confronted with the challenge of a sea level increase and with a high risk of large waves caused by the associated storms. The temperature rises are forecasted to be higher than the average in Arctic, putting a particular pressure on its very fragile ecosystems. Additional pressure on the environment may result from an easier access to petroleum and gas reserves, also from new shipping routes, consequence of decreasing the ice cover [5].

The mountain zones are confronted with important challenges, including reduced snow coverage, negative potential impacts on winter tourism and extended loss of species. Besides, the degradation of glaciers in mountain regions may create infrastructure problems, because roads and bridges cannot cope with them. Already, at present, most of the glaciers from Europe Mountains are retiring – fact affecting also the management of water resources in the downstream areas [6]. Similarly, the coastal areas and the river flood zones from the whole Europe are particularly vulnerable to climate changes, because cities and rural areas are there.

European Union had an intense diplomatic activity at international level (”green diplomacy”) in combating the climate changes, playing a decisive role in the fulfillment of the two major treaties in this field, United Nations Framework Convention on Climate Change and Kyoto Protocol.

In March 2000, The Commission launched the European Climate Change Programme, which led to adopting a series of new regulations and measures, among which there are the emissions trading schemes, which became operative since 1 January 2005 (the enterprises that will exceed the allotted share of emissions will have to options: either to reduce their emissions or to buy a higher share from the emission market), when the Directive 2003/87/CE on the trading scheme for emissions of greenhouse gases entered into force. For facilitating the participation in this system, each Member State is obliged to present the national allocation plans. According to the national allocation plans, each EU Member State must decide the allowed emission level for the enterprises contained in the “Trading Scheme” for 2005 – 2007. Since 1 January 2008, the second allocation period started, for which the Commission already endorsed for most of Member States the National Allocation Plan for 2008 – 2012.

For preparing the second commitment period (post-Kyoto period), the European Commission adopted the communication referring to the future policies in the field of climate changes.

For completing the laws in the field, the Regulation on certain greenhouse effect gases (fluorinated gases – F- gases) – Regulation (EC) no. 842/2006 and Directive relating to emissions from air-conditioning systems in motor vehicles , amending Council Directive 70/156/EEC – Directive 2006/40/EC were adopted.

Starting from 1 January 2012, the aviation sector will enter also under the incidence of the trading scheme. So, at EU level, the aviation certificates will be allotted for free in 85% of cases, the rest of 15% going to be sold by auction.

Aviation activities include also the flights performed by air operators from non EU countries, landing or taking off from an airport located on EU territory and the certificates are valid only inside the aviation sector. The number of certificates allotted to the aviation sector is equal to 97% of the average of the emissions generated by this sector 2004-2006, which represents about 210 million EUA (EU Allowance Unit of one tonne of CO_2) yearly.

Another legislative initiative related to the reduction of greenhouse gas emissions is referring to the reduction of the emissions of CO_2 coming from motor vehicles.

On 7 January 2007, the Commission adopted a communication on the results of reviewing the Community Strategy for reducing the CO_2 emissions coming from motor vehicles. About 12% of the total CO_2 emissions at EU level come from the fuels consumption by the passenger motor vehicles.

The Commission presented the legislative proposal referring to the reduction of CO_2 emissions from motor vehicles on 19 December 2007. The proposal will implement the political orientations formulated by the Member States by reaching, until 2012, an emission level of 130 g CO_2/km, from improvements of motor performance, or of 120 g/km cummulated with other technical requirements (fuel, tires etc.).

White Paper on adaptation to climate changes presents a statement on the policies and measures which assure the adaptation to climate changes in different sectors of European life (e.g.: in industry, agriculture, energy, fishing, forestry, tourism, social policy). The objective of this Paper is to avoid significant effects on human health, biodiversity and habitats and on the life quality of European Union citizens.

8.5. Romania and climate changes

Romania ratified the United Nations Framework Convention on Climate Change (UNFCCC) by the Law no. 24/1994, committing to achieve its objective: “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable to proceed in a sustainable manner”.

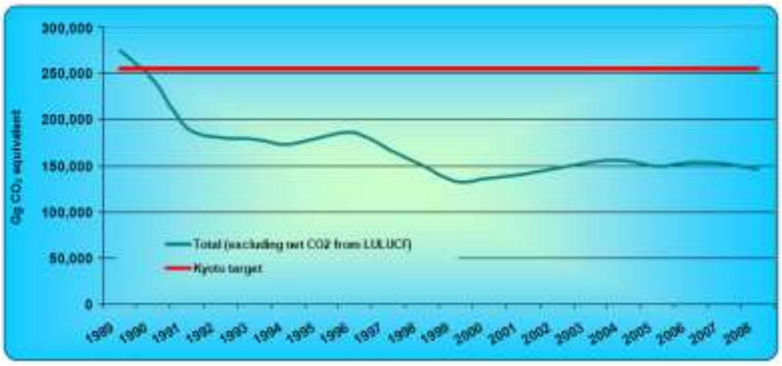
Romania also ratified the Kyoto protocol by the Law no. 3/2001, assuming its commitment on taking some clear measures, targets and periods of reducing the emissions of greenhouse gases, and reduction of greenhouse gas emissions for 2008 - 2012 by 8 % as compared to the basic year 1989.

By the Government Decision no. 645/2005, the Romanian National Strategy on Climate Changes, which is the framework for implementing the policies in the field and which sets the environmental and economic benefits regarding the participation in implementing the mechanisms established through the Kyoto protocol, was approved.

By the Government Decision no. 1877/2005, the National Action Plan for Climate Changes (NAPCC) for the period 2005 – 2007 was approved; it forecasts the necessary actions, their financing sources and responsible institutions. Starting from 2002, Romania sends yearly to UNFCCC Secretariat the national inventory of greenhouse gas emissions, achieved according to the IPCC methodology and using a reporting format common to all countries. The latest national inventory of Romania was transmitted in 2010 and contains the greenhouse gas emissions for 1989-2008.

According to Kyoto protocol, Romania committed itself to reduce the greenhouse gas emissions by 8 % during 2008-2012, as compared to the reference year 1989. The total greenhouse gas emissions (without forest absorption) decreased by 46.89 % in 2008 as compared to the basic year 1989, while the net greenhouse gas emissions (taking into account the CO_2 emissions) decreased by 54.81%.

For analyzing the trends, the GHG emissions coming from each sector were converted into CO_2 equivalent, depending on the global warming potential (GWP) of IIPCC. The evolution from the total GHG emissions is presented in the following graphic.



Source: [9]

Figure 8.2 – Total GHG emissions in CO_2 equivalent during 1989-2008

By analyzing the graphic from above, one can notice there is a high probability for Romania to fulfill its commitments of reducing the GHG emissions in its first commitment, 2008-2012. In 2008, GHG emissions without LULUCF (Land Use, Land Use Change and Forestry) diminished by 46.89 % as compared to the basic year 1989.

The more important factor contributing to the total GHG emissions at national level is CO_2, followed by CH_4 and N_2O.

For reducing the costs of the actions of for limiting and diminishing the greenhouse gas emissions, the Kyoto protocol forecasts the use of three flexible and voluntary mechanisms of international cooperation: Joint Implementation (JI), Clean Development Mechanism (CDM), and International Emissions Trading (IET).

Romania involved successfully in achieving some investment projects of Joint Implementation type. Thus, 10 Memoranda of Understanding have been concluded with Switzerland, Netherlands, Norway, Denmark, Austria, Sweden, France, Italy and Finland, and also with the World Bank within the Prototype Carbon Fund. The list of projects of Joint Implementation type is available on the site of the Ministry of Environment and Sustainable Development (www.mmediu.ro).

The trading scheme for greenhouse gas emissions certificates, regulated by Directive 87/2003/EC (EU-ETS scheme), is applied in Romania since 1 January 2007 (date of accession to European Union) and is regulated by Government Decision no. 780/2006 followed by other subsequent normative documents (Minister Orders no. 1008/2006, no. 1175/2006 and no. 85/2007).

EU-ETS scheme is applied only to CO_2 emissions and is a mechanism having as aim to limit, technically and economically, the greenhouse gas emissions. The scheme operation is based on the trading of greenhouse gas emission certificates, which were allotted to the operators which have installations where activities regulated by Government Decision no. 780/2006 are performed, to the extent that they comply with the provisions on the limits for CO_2 emissions. A certificate of greenhouse gas emissions is the title which confers to an installation the right to emit one ton of carbon dioxide equivalent within a defined period, valid for fulfilling the purpose of Government Decision no. 780/2006.

The provisions referring to including the aviation activities in the EU-ETS scheme have been taken over in the national legislation by Government Decision no. 780/2006 regarding the establishment of the trading scheme for greenhouse gas emission certificates, with its subsequent changes and completions (**HG 780/2006**).

For implementing the Government Decision no. 780/2006, the ***National Allocation Plan*** was developed (available on www.eu-ets.ro), through which the Romanian Government establishes the number of certificates of greenhouse gas emissions it intends to allot at national level for 2007-2012, including their repartition for the installations in which one or many activities provided in Government Decision no. 780/2006 are performed. So, 247 installations which operate in the following sectors: energy, refined petroleum products, ferrous metals, cement, lime, ceramics, pulp and paper production and treatment, have been identified.

The National Allocation Plan becomes operational only after a notification from the European Commission referring to its approval and, subsequently, after its approval by a Decision of Romanian Government.

In Romania, there is already the **National Register** regarding Climate Changes, in accordance with the commitments from Kyoto. The National register is an electronic, standardized and secured database which records and follows the operations with certificates for greenhouse gas emissions (EUAs) and with units of greenhouse gas emission regulated by the Kyoto protocol (AAUs, ERUs, CERs, RMUs).

8.5.1. Background information on the climate changes in Romania

In Romania, the climate variability will have direct effects on certain sectors, like agriculture, forestry, water management, residential and infrastructure; it will lead to changes in the vegetation cycles and to the movement of the dividing lines between forests and meadows, will determine the increase of frequency and intensity of extreme meteorological events (storms, floods and droughts).

The changes in the climate regime from Romania are within the global context, having in view the regional conditions: more pronounced increase of temperature in summer, while in the North-Western Europe a more pronounced increase of temperature is expected to happen in winter.

Taking into consideration the estimates presented in the fourth Assessment Report of IPCC, an increase of the annual average temperature is expected in Romania, as compared to the similar one from 1980-1990 specified for the entire Europe, with low differences between those one resulted for the first decades of 21 century and with higher differences for the end of that century:

- between 0.5 ° C and 1.5 ° C, for 2020-2029;
- between 2.0 ° C and 5.0 ° C, for 2090-2099, depending on the scenario (e.g. between 2.0 ° C and 2.5 ° C, for the scenario which forecasts the lowest increase of the global average temperature and between 4.0 ° C and 5.0 ° C in case of the scenario with the most pronounced temperature increase).

In terms of rainfall, more than 90% of the climate forecasts announce for 2090-2099 pronounced droughts during summer in Romania, especially in south and south-east (with negative deviations by less than 20%, as compared to 1980-1990). Taking into account the precipitations in winter, the deviations are lower while the uncertainty is higher.

8.5.2. Inventory of greenhouse gas emissions

As a part of UNFCCC and Kyoto protocol, Romania has the obligation to issue and update periodically the national inventory of GHG. According COP (Conference of the Parties of the United Nations Framework Conference on Climate Change - UNFCCC)) decision, the parties shall present a National Inventory Report (NIR), which contains detailed and complete information on GHG emissions.

The inventories shall cover all the sectors and most of the categories of greenhouse gases according to IPCC. The direct groups of greenhouse gases included in the national inventory are:

- Carbon dioxide (CO_2);
- Methane (CH_4);

- Nitrogen oxide (N_2O);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons(PFCs);
- Sulphur hexafluoride (SF_6).

In inventory there are also included data on the calculation of indirect greenhouse gas emissions: NOx, NMVOC, CO and SO2. Some categories of minor sources, like emissions from asphalt, roofs and road paving with asphalt are not estimated, because of the lack of activity data.

The inventories of GHG emissions are transmitted using CRF (Common Reporting Format) Reporter: software, emitted by UNFCCC secretariat.

GHG inventories presented yearly by all the parties are subjected to some assessments by the Expert Teams coordinated by UNFCCC secretariat.

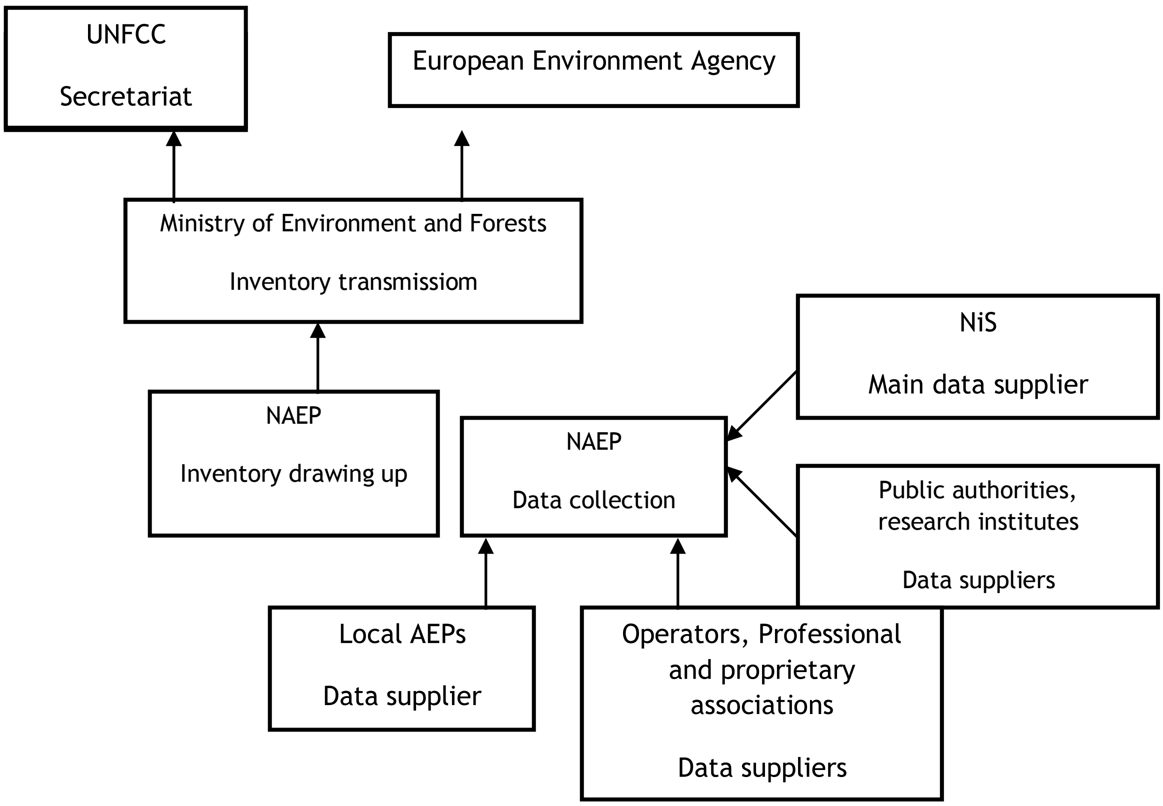
The National Inventory Report (NIR) includes additional information required in accordance with Article 7, paragraph 1 of Kyoto protocol, as follows:

- Information on Kyoto units (Emission Reducing Units (ERU), Certified Emission Reduction (CER), Temporary Certified Emission Reduction (tCER), Long-Term Certified Emission Reduction (lCER), Assigned Amount Units (AAU), absorption and (RMU) units), as it is provided in the section IE of the Annex to Decision 15/CMP. 1;
- Changes of national systems, according to Article 5, paragraph 1 from Kyoto protocol, as it is provided in Section IF of the Annex to Decision 15/CMP. 1;
- Minimization of the adverse effects, according to Article 3, point 14 from Kyoto protocol, as it is provided in Section IH of the Annex to Decision 15/CMP. 1.

At present, in Romania, the elements characterizing the activities performed according to Article 3, paragraphs 3 and 4, from Kyoto protocol are in course of development.

8.5.2.1. Legal institutions involved in completing, emitting and transmitting the inventories of GHG emissions in Romania

The system for inventory of greenhouse gas emissions used in Romania is presented in the next figure:



Source: [9]

Figure 8.3 - National System for GHG Emission Inventory in Romania

The competent authority, which is responsible for managing the inventory system, is the National agency for Environment protection (NAEP), under the subordination of the Minister of Environment and Forests.

NAEP has the obligation to lead and prepare the inventory of GHG emissions. In this respect, the Government Decision no.1570/2007, also the subsequent relevant procedures supports NAEP by defining the legislative, institutional and procedural framework for involving actively all the responsible public authorities, research institutes, economic operators, professional associations.

The central public authorities and institutions under their authority, research institutes and economic operators have the responsibility of transmitting the data got from their activity, necessary for calculating the GHG emissions.

The main data supplier is the National Institute of Statistics (NIS) through the annually published documents, like the National Statistic Yearbook and Energy Balance. In 2002, the Ministry of Environment and Forests and NIS signed a cooperation protocol. According to this protocol, NIS agreed to offer, besides the annual publication, additional data necessary for preparing the inventory.

The Ministry of Environment and Forests transmits officially the National Inventory of GHG (NIGHG) to UNFCCC secretariat, European Commission and European Environment agency taking into account the specific deadlines.

8.6. Bulgaria and climate changes

Bulgaria ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and the Kyoto protocol in 2002. Bulgaria committed itself to reduce the greenhouse gas emissions by 8% during 2008-2012, as compared to the reference year 1998.

Bulgaria also involved itself successfully in achieving some investment projects of Joint Implementation-type by cooperating with different states, like Denmark, Switzerland, Netherlands, Austria and recently Sweden.

Starting from 1 January 2007, Bulgaria has implemented the Directive 2003/87/EC and modified Directive 2004/101/EC related to the introduction of ***the trading scheme for greenhouse gas emissions certificate*** (EU-ETS - The European Union Emissions Trading Scheme), as EU mechanism for fulfilling the obligations of Kyoto protocol for reducing the GHG emissions. Introduction of EU-ETS in Bulgaria required preparing the following documents:

1. National Allocation Plan
2. Monitoring guides and mechanisms
3. Legislative framework
4. Administrative implementation structure
5. Establishment of a register of emissions

By the ***National Allocation Plan*****,** Bulgarian Government establishes the number of greenhouse gas emission certificates it intends to allot at national level, including their repartition for the installations where one or many activities provided for the following sectors: energy activities, ferrous metal production and treatment, mineral industry; other activities (pulp and paper production activities) are performed. So, 95 installations performing their activity in these sectors have been identified. The National Allocation Plan becomes operational only after the notification from the European Commission regarding its approval and subsequently, its approval by a Decision of Bulgarian Government.

For facilitating the real trade, an **Emission Register** must be established.

In Bulgaria there is also the National Register on Climate Changes, according to Kyoto commitments. The major task is to record the greenhouse gas emissions and to trace the variations of these emissions.

For fulfilling the Kyoto commitments, Bulgaria developed the **National Action Plan regarding the Climate Changes**, up-dated and extended. The Plan indicates the adequate measures referring to the reduction of greenhouse gas emissions and to implementing them. The first National Action Plan regarding the climate changes was developed during 1996-1997 and approved in 2000.

The economic increase of Bulgaria after 2000, together with the changes from internal and international policy, imposed the need to update the original NAPCC.

The new version will be developed related to the project "**Updating and extending the National Action Plan regarding the Climate Changes**".

The main purpose of the project is to support the Ministry of Environment and Water Management in developing and implementing an updated and extended National Action Plan regarding the Climate Changes (NAPCC), which should be in accordance with the European Climate Change Protocol (ECCP) and Kyoto protocol. Updating and extending the NAPCC may serve as a case of integrating the policies in other relevant fields of sectoral policies and of involving the industry and civil society in identifying new policies. The project is funded by Senter International.

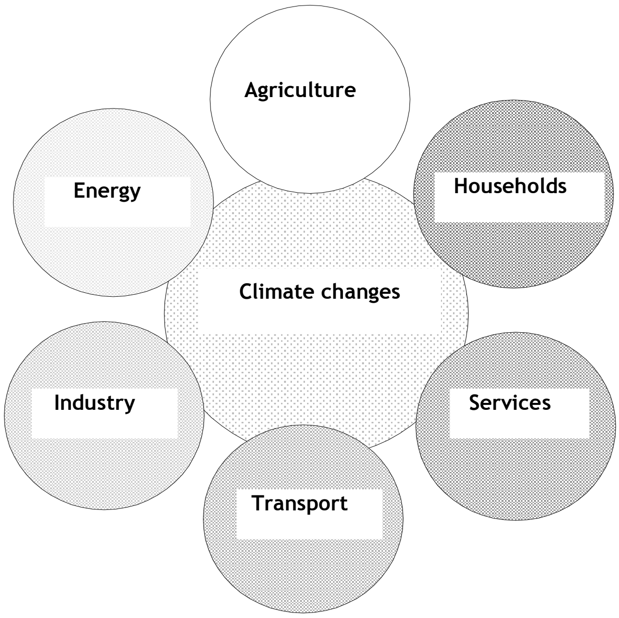
Institutional framework for updating the NAPCC

The Ministry of Environment and water Management (MoEW) is the governmental institution authorized to develop and make the state policy referring to environmental protection and climate changes. The Ministry has an important role in updating and implementing the National Action Plan regarding the Climate Changes.

The inter-ministerial committee on Climate Changes (IMCCC) was set up in 2000, for facilitating the communication between ministries and other institutions and for assuring the control and coordination of their activities related to climate changes.

The process of updating the NAPCC was sustained by the Government of Netherlands by OSP Pre- accession Programme (2003-2004). The consortium is formed of three consultancy companies: DHV –Environment and Transport, Center of Energy Research (ECN) and CAP SD – and the Bulgarian Institute for Energy JSCo.

The policies and measures from this action plan will be implemented in all the sectors of Bulgarian economy, i.e. in energy, industry, transport, agriculture, households and services sectors. This because the climate changes affects all these sectors (see the Figure from below). This fact implies that the action plan should take into consideration other policies of programmes and strategies for the sectors. They include, for instance, the Environmental National Strategy, National Development, Policy for National Transport and Policies in Energy sector, like Energy law and Law for Energy Efficiency (Official Gazette no.71/23.07.2002).



Source: [7]

Figure 8.4 - Connection between climate changes and economy sectors

The strong interaction of these policy fields with the policy for climatic changes requires the active involvement of the ministries responsible for these policy fields in developing and implementing the NAPCC.

8.6.1. Policy for reducing the greenhouse gas emissions

This sub-chapter offers an overall image of the trends of GHG emissions in Bulgaria, and also the policies which contributed to the reduction of GHG emissions. Besides, the basic scenario for emissions (trend for future with the existent policies and measures) is presented together with the analysis regarding Bulgaria vulnerability to climatic changes.

History of GHG emissions

The inventory of GHG emissions in 2002 showed that global GHG emissions expressed in CO_2 rose to 62.4 million tons. The net emissions of CO_2 amount to 54.1 million tons. In the Table from below there are presented the levels of GHG emissions, total GHG emissions and relative share of the global GHG emissions as compared to the basic year 1988.

Table 8.1 – Global GHG emissions (in Mton CO_2 Eq.)[1]

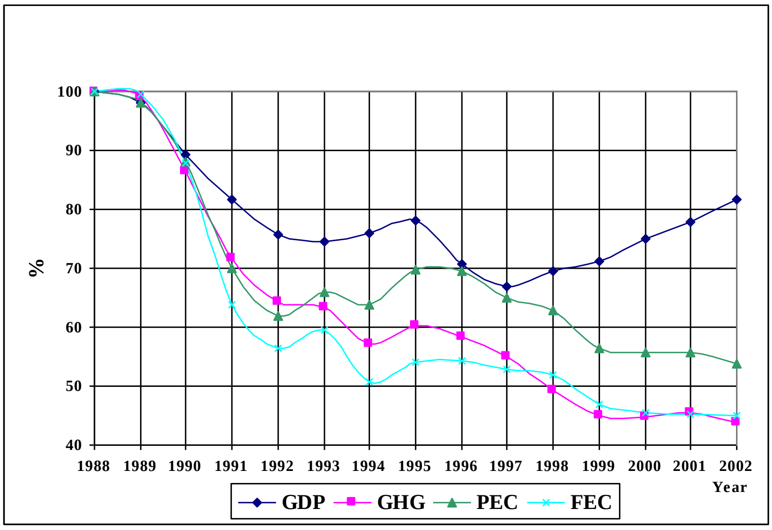
GES/ year	1988	1990	1992	1994	1996	1998	2000	2002
CO_2	102.5	82.8	58.7	58.3	59.7	51.6	46.7	46.8
CH_4	24.4	25.6	23.6	15.4	15.0	11.8	10.2	9.4
N_2O	14.9	13.7	9.2	7.7	8.2	6.6	6.7	6.3
HFCs/PFCs/SF_6	n.a.	n.a.	n.a.	n.a.	>0	0.1	>0	>0
TOTAL	141 .8	122 .1	91.6	81.4	83.0	70.0	63.6	62.4
Compared to 1988, %	100	86.1	64.6	57.41	58.5	49.4	44.9	44.0

source: [7]

The trends in GHG emissions in Bulgaria for 1988 - 2002 reflect the mainstream in the economic development of the country. The period is characterized by a process of transition to the market economy (liberalization), industry restructuring (privatization), elimination of subsidies and stable reduction of the production of highly energy consumer to the detriment of the intensive non-energy ones.

As a result of the structural changes, the share of the industry in the gross domestic product (GDP) decreased from 61% in 1987 to 29% in 2002, while the services share increased from 22% to 50%. The trends in GDP, GHG emissions, primary energy (PFC) and final energy consumption (HFC), are presented in the figure from below:

[1] The total GHG emissions indicated in the Table from above are calculated in CO_2 echivalent, with the following coefficients of the Global Warming Potential for main GHG: CO2 = 1, CH_4=21 și N_2O = 310.



Source: [7]

Figure8.5 - Stable reduction of a HFC and PFC, also of GHG emissions during 1988 - 2002, % (1988=100%)

In the figure, a stable decrease of HFC and PFC, also of GHG emissions during 1988 – 2002 is observed. In opposition to the decreasing trend of GHG emissions, HFC and PFC, a significant increase of GDP could be noticed after 1997, when its levels reached 67 % of the value from the basic year.

The structural changes of economy led to a drastic decrease of the final energy consumption by about 55 %, while in the same period, the demand of primary energy decreased by only 45 % .The final energy consumption per GDP unit decreased by 42 %, as compared to 28 % for the consumption of primary energy per GDP unit.

The main reason for the lower decrease of the consumption of primary energy is the fact that in 1988, Bulgaria was a net importer of electric energy (4.2 TWh import of electric energy from the former Soviet Union), while in 2001 it was a net exporter (about 7 TWh export of electricity to the neighboring countries), the difference of 11.2 TWh of electric energy of production is equivalent to more than 12 million tons of CO_2.

8.6.2 Inventory of greenhouse gas emissions

The National Bulgarian System for Inventory of GHG Emissions (BGNIS) is developed as a result of the requirements from the provisions of the Decision 19/CMP.1 Guidelines on the national systems under the Article 5, paragraph 1 from Kyoto protocol.

For recovering the eligibility under the Kyoto protocol, a compliance Action Plan was developed and implemented in 2010, for assuring the efficient and timely operation of BGNIS, according to the requirements from Article 5.1 from Kyoto protocol and Decision 19/CMP.1.

In accordance with COP Decision (Conference of the Parties of United Nations Framework Convention on Climate Change (UNFCCC)) Bulgaria shall present a National Inventory Report (NIR), which contains detailed and complete information on GHG emissions.

This Report (NIR) from Bulgaria includes data on anthropogenic emissions from sources and absorptions through absorbents of all the greenhouse gases (GHG), which are not controlled by the Montreal protocol, namely carbon dioxide (CO_2), methane (CH_4), nitrogen oxides (N_2O), perfluorocarbons (PFC), hydrofluorocarbons(HFC) and sulphur hexafluoride (SF_6).

Indirect emissions of CO_2 resulting from atmospheric oxidation of CH_4 and NMVOC emissions from non-biogenic sources are also included in inventory. They were separately estimated for the fugitive emissions in energy sector and emissions from the sources from the processes in industrial sectors of using the solvents and other products, by utilizing the methodology of IPCC orientations for the greenhouse gas national inventories (IPCC 2006). For burning the fossil fuels, indirect emissions are included in the methodology for estimating the CO_2 emissions. Estimation and reporting of indirect emissions of CO_2 are also approached in the 1996 revised version of IPCC orientations for the national inventories of greenhouse gas emissions (IPCC 1997), also the UNFCCC orientations for reporting the annual inventories (UNFCCC 2006).

The report (NIR) includes also the estimates of the so-called indirect greenhouse gases (carbon monoxide (CO), nitrogen oxides (NOx), non methane volatile organic compounds (NMVOCs) and sulphur dioxide (SO_2 sulphur oxides and other sulphur emissions calculated as SO_2).

The main greenhouse gas effects which are reported according to UNFCCC are as follows:

- Carbon dioxide - CO_2;
- Methane - CH_4;

- Nitrogen oxide - N_2O;
- Hydrofluorocarbons - HFC;
- Perfluorocarburi - PFC;
- Hexafluorură de sulf - SF_6

Each of these gases has a different warming effect. As an example, HFC, PFC and SF_6 gases have a much stronger warming effects, in some cases more than one hundred times as compared to methane, nitrogen oxide and carbon dioxide.

Other gases have the effect of warming indirectly the atmosphere (e.g. NOx, CO and NMVOCs) or have a cooling effect like SOx. These gases are precursors of greenhouse gases - ground level ozone and are the object of some regional control protocols. They have no effect at world level on climate changes. That is why only the total emissions of GHG – precursors and the total emissions of SOx have been reported.

Inventories are prepared according to the UNFCCC guidelines and in compliance with IPCC guidelines revised in 1996 and with IPCC Good Practice Guide (for national GHG inventories) in 2000.

Starting from 2008, the Executive Environmental Agency (ExEA) is responsible for the entire inventory process: planning, preparation and management.

The obligations of reporting to UNFCCC, ECC-UN and EC are managed by MoEW. All the activities for preparing the GHG emission inventory in Bulgaria are coordinated and managed at state level, by MoEW. The National Focal Point is the Directorate on Climate Change.

The Bulgarian government, by MoEW (Ministry of Environment and Water Management –Directorate of Policy for Climate Changes) has the political responsibility for fulfilling the commitments assumed under UNFCCC and Kyoto protocol, inclusively for the operation of BGNIS (Bulgarian National Inventory System), in accordance with the requirements provided in Decision 19/CMP.1 Article 5, paragraph 1 of Kyoto protocol.

The general objective of the Bulgarian National Inventory System (BGNIS) is to produce a high quality inventory, in accordance with its commitment from Kyoto, and to submit it until the established term.

8.7. Conclusions

Two hundreds of scientists, experts and decision makers from more than 30 countries met in Gothenburg, Sweden, at the end of 2009, under the Swedish EU presidency. The participants discussed on the interactions between air pollution and climate change and took into consideration the way in which the future well-conceived policies of air pollution could help also to the attenuation of climatic change. A key theme was the need to continue building a relationship between the existent regional agreements and the air pollution networks and climate changes.

A joint strategy for meeting both the objectives on air quality and objectives on climate change would have as aim finding an optimum cost-efficiency connection, taking into account the technological evolutions and the atmospheric processes through which the atmospheric pollutants may affect the climate change and vice-versa.

The developing countries shall reduce the greenhouse gas emissions, collectively by 30% until 2020, as compared to 1990. One should take into account that they shall reduce the emissions, collectively by 60% - 80% until 2050, as compared to 1990.

Within the European Council, the fact that European Union committed itself to transform Europe into an economically efficient economy, with low emissions of greenhouse gases, was also emphasized. It was decided that until concluding a global agreement post-2012 and without prejudicing its position in international negotiations, European Union takes a firm and independent commitment to reduce the greenhouse gas emissions by at least 20% until 2020, as compared to 1990.

CHAPTER 9

SHARED ENVIRONMENTAL INFORMATION SYSTEM (SEIS)

9.1. Introduction

Public authorities of EU Member States have many obligations related to reporting environment data and information. In Europe, these are analyzed, exchanged and used for multiple purposes. One use is that of supporting the policy makers from EU, Brussels, for developing and applying the environment policies and then to assess if these ones generate effects or not. Another use is to support the national authorities in getting ready for emergencies, like accident management. Environment information is also necessary for allowing the citizens to influence the environment policy. The Shared Environmental Information System (SEIS) is aimed at creating throughout Europe a decentralized, integrated and web-active system, based on a network of public information suppliers which exchange environment data and information. SEIS is an initiative for modernizing and simplifying the collection, exchange and use of the data and information necessary to develop and apply the environment policy. For making SEIS possible, one key condition is passing from information ”control” to information ”exchange”, as free as possible.

The nowadays challenges related to environment, like adaptation to climatic changes, management of ecosystems and natural resources in a sustainable manner, protection of biodiversity, prevention and management of environment crises like floods, forest fires and water scarcity depend on the assessment of the data coming from a variety of sectors and sources.

That is why it is absolutely vital for European Union to have an information system based on the latest information and communication technology (ICT) which will provide real time data on the environment to decision makers at all levels (from the local one to the European one) , thus allowing them to make immediate decisions.

Today, the emerging challenge is to use ICT technologies to improve collaboration between organisations and to facilitate interaction with civil society at large. Without improved collaboration between European public sector organisations, growth and security, jobs and freedom or health and a safe environment will be more difficult to achieve.

The communication of European Commission [1] proposes an approach for modernizing and simplifying the collection, exchange and use of information and data necessary for developing and implementing the environment policy, according to which the present reporting systems, most of them centralized, are progressively replaced by other systems based on access, sharing and interoperability.

The overall aim is to maintain and improve the quality and availability of information required for environmental policy, in line with better regulation, while keeping the associated administrative burdens to a minimum.

Firstly, communication proposes a series of principles on the basis of which the collection, exchange and use of information on environment should be organized in the future. A key step in the implementation of this approach will be to modernise the way in which information required in various pieces of environmental legislation is made available, through a legislative instrument.

Such revision will also allow the immediate abrogation of a small number of obsolete reporting requirements and will lead to simplification and modernization:

- it will help to stimulate further streamlining of information requirements in thematic environmental legislation by providing a coherence and up-to-date overall framework;

- it is likely to stimulate similar developments in international conventions, which according to estimates are responsible for around 70% of environmental reporting requirements to which EU Member States are subject;

- it will encourage improvements in the way that data collection and exchange within Member States is organised.

This Communication also describes other accompanying measures, to be taken at European, national and local level that will be necessary to implement the principles set out below.

Shared Environmental Information System (SEIS) [2], [3], [4] is a cooperation initiative of European Commission and European Environment Agency (EEA) for setting, together with the Member States, an integrated and shared environmental information system at EU level. This system will better connect the collection of existent data to the information flows related to EU policies and environment legislation. This will be based on technologies like internet and satellite systems, and makes the environmental information more accessible and easier to understand for the political and public decision makers.

The basic goal of SEIS is also to move the reporting far away from paper, based on reporting to an information system, where the information is managed as close as possible to the source and made available to the users in an open and transparent way. According to SEIS concept, information will be stored in electronic databases throughout European Union.

9.2. SEIS Need

The Sixth Environment Action Programme (6EAP) confirmed that sound information on the state of the environment and on the key trends, pressures and drivers for environmental change is essential for the development of effective policy, its implementation, and the empowerment of citizens more generally. As the environment is a public good that belongs to everyone, it is equally essential for this information to be widely shared and available.

The SEIS is needed:

- Because EU Policy makers at all levels (local to European) are convinced that better decisions need better and more timely information.
- Because EU Member States deserves a modern, efficient and user friendly e-Reporting System to fulfill their reporting obligations related to European Union environmental policies and legislation, avoiding duplication of efforts, overlapping and redundancies.

In Europe, sharing of environmental information has an old history. The environmental information systems have been used with good results for supporting the process of reporting, by the Member States, the implementation degree of the Community legislation on the environment and, more recently, for supporting different processes of determining the environment indicators based on the political orientations set by EU and Member States. Although, today we must face the new challenges regarding the priorities of the 6th PAM – more precisely, adapting to climatic changes, stopping the biodiversity loss and managing the natural resources – which will require an even more efficient use of the existent information by us. The recent experience regarding the climatic changes confirms the need of reliable information on environment, which should be rapidly and easily available.

Alongside the new challenges there are also new opportunities. In particular, technology is now making it possible to provide real-time data, allowing immediate decisions to be taken and, in some instances, to save lives. Provided that certain technical requirements are met—relating, for example, to harmonisation of formats and interoperability of data systems—data can increasingly be combined to perform the kind of integrated analyses on which good policy depends.

The timely, reliable and relevant information related to the environment condition is essential for developing a "healthy" policy. The policy makers and the public need to know early the way in which the climate changes, whether Europe waters become cleaner or more polluted, the way in which nature reacts to pollution and soil use change, and whether policies are efficient. This information should be made available to all, in a manner in which everybody could understand the changes on environment and their impact.

The need for sharing environmental information

More than 70 from a few hundreds of articles from the environmental legislation in force in European Union require Member States to report specific aspects of the environment from their territory. A large amount of environmental data is thus collected by various levels of public authorities throughout the EU.

This information is used to analyse trends and pressures on the environment and is vital when drawing up policy or assessing whether policy is effective or being properly implemented. At present, this wealth of information is not available in a timely manner, and not found in a format that policy makers and public could easily understand and use (Figure 9.1). This is due to a range of obstacles of a legal, financial, technical or procedural nature.

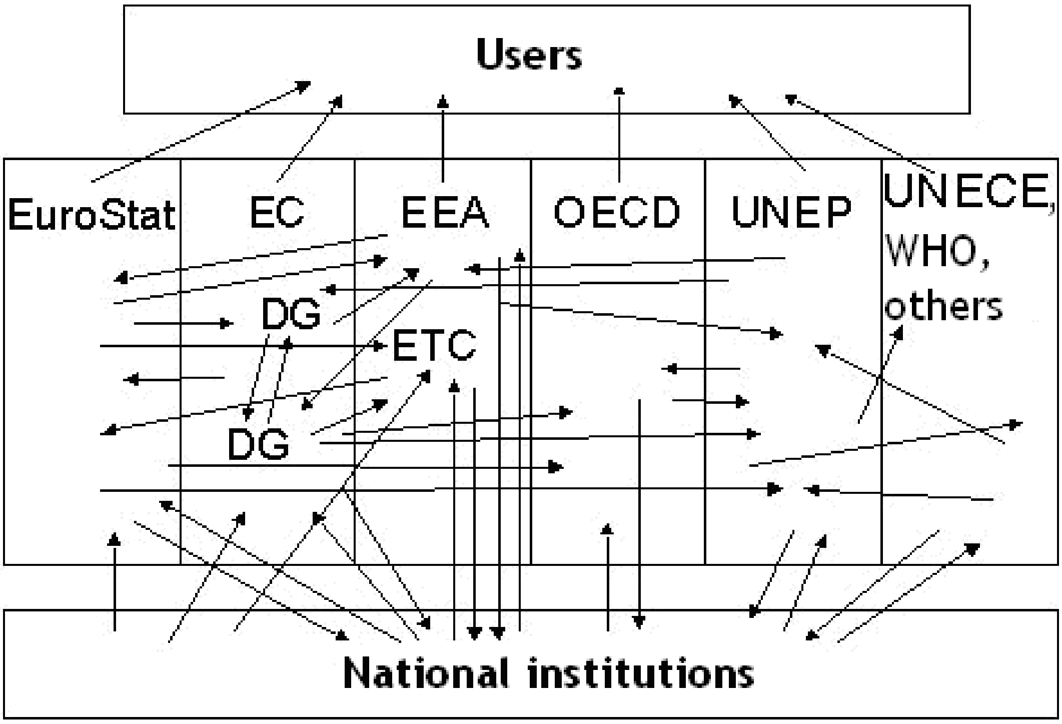


Figure 9.1 - Present fragmented reporting system

Legend:
Eurostat - Statistical Office of the European Communities
EC - European Commission
DG - Directorate General
EEA - European Environmental Agency
OECD - Organization for Economic Cooperation and Development
UNEP - United Nations Environment Program
UNECE - United Nations Economic Commission for Europe
WHO - World Health Organisation
ETC - European Topic Centre

For better managing and communicating the abundance of the collected environmental information, European Commission proposes to create a Shared Environmental Information System (SEIS) (Figure 9.2).

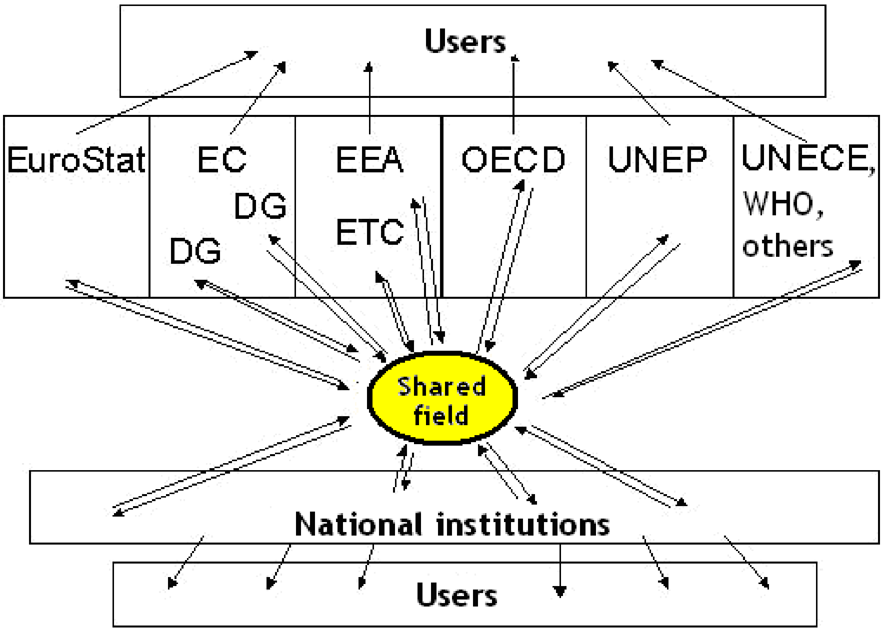


Figure 9.2- Information sharing in the Shared Environmental Information System

Once there is a Shared Environmental Information System, all the interested parties may efficiently benefit from the information from the shared field.

9.3. Principles which are SEIS base

The basic principles of the shared environmental information system are the following:

- information must be managed as close as possible to its source;
- information must be collected only once and shared between interested parties for being used in different purposes;
- information must be rapidly accessible to public authorities for allowing them to fulfill easily the reporting obligations provided by law;
- information must be rapidly accessible to final users, firstly to public authorities at all levels, from local to European level, for allowing them to evaluate in time the environment state and the efficiency of their policies, also to develop a new policy;
- information must also be accessible for giving the possibility to the final users, public authorities and citizens, to make comparisons at appropriate geographical

scale (for example, at the level of countries, cities, basins) and to significantly participate in developing and implementing the environmental policy;

- information must be entirely available to general public, at national level and in the corresponding language(s), after carefully examining the adequate level of data compilation and subject to constraints related to confidentiality;
- information sharing and processing must be done by means of the programs „open-source”.

These principles are the result of a lot of experts’ studies and analyses along many years.

Their purpose is to guarantee that the information regarding the environment is organized as efficient as possible and to guarantee that investments in progress related to the surveillance and other processes of information collection are as efficient as possible as regards the use of the got data. They recognise that, while there is a vast amount of data collected by public authorities across the EU (whether at local, regional, national or European level), this data is not always used efficiently, either because of the existence of such data is not widely known or because of a range of obstacles of a legal, financial, technical and procedural nature.

9.4. Advantages of SEIS implementation

9.4.1. Simplification and efficiency

While the benefits of a political commitment in favor of SEIS principles are beyond the simplification itself, they assure the conceptual frame necessary for simplifying the present reporting and monitoring obligations.

An essential step in implementing the SEIS approach will be the modernization of the legal provisions regarding the way in which the information necessary to Community legislation is made available. By suppressing the reporting on paper, the process of making available the information will be simpler, more flexible and more efficient.

If there is also a political commitment in favor of SEIS principles, such proposal will lead to additional advantages related to simplification, as regards:

- content of exigencies regarding the information necessary in the environmental thematic laws;

- reporting content and procedure at international level;
- more efficient organization of the activity of data collection in the Member States.

By allowing the more efficient use of available data, SEIS will facilitate the rationalization and prioritization of the requirements related the information, provided at present in the environmental thematic legislation. Probably this will have effects also on international agreements. Finally, as regards the costs, the analysis indicates the fact that some of the biggest savings could be done by efficiently improving the activities of data collection in the Member States. A more pronounced harmonization and prioritization of the monitoring activities organized at national and regional level would have, no doubt, a higher usefulness in improving the efficiency of present investments.

9.4.2. Better regulation, better policy

Reduction of the administrative burden should be planned so as to lead indeed to an improvement and not to a deterioration of the public policy and regulation quality.

Political commitment in favor of SEIS principles will help to reaching this goal, allowing the efficient exploitation of the available data. Taking into account that environmental data and information are likely to be used by a high number of actors, in many purposes, we may expect that the improvement of the mechanism of data collection, exchange and use leads to a significant increase of using the environmental data, together with an important diminution of the costs for the users. This will improve the efficiency of environmental policy during the whole program, including for instance the adaptation to climatic changes, biodiversity protection, water resource management, crisis prevention and management.

9.4.3. Citizen involvement

Besides the advantages related to the administrative simplification and better regulation, the commitment in favor of the principles previously stated will help also to the implication of European citizens, putting at their disposal, in time, relevant information, giving them the possibility to make informed decisions on the environment in which they live, inclusively to act correspondingly in emergencies and to influence the public policies. Supply of the information the citizens need, presented in their language, will stimulate also their re-employment in the European project.

9.4.4. Benefits from technology

SEIS will benefit from the possibilities supplied by the information and communication technology for putting into practice the principle ”Monitor once for timely and multi-purpose uses”. This will enable that real-time data to be made available to decision-makers and allow them to make immediate and life-saving decisions. Experienţele cu incendiile de pădure, inundaţii şi secetă, arată cât de mult poate să reprezinte o informaţie despre mediu cunoscută la timp în timpul unei situaţii de urgenţă. SEIS will allow data to be seamlessly combined with information from various sources and thus quickly perform cross thematic and cross-sector analyses that EU environmental policy requires. De exemplu, efectele poluării asupra sănătăţii pot fi evaluate dacă statistica despre calitatea aerului, concentrările de populaţie şi statisticile despre sănătate se suprapun pentru o regiune sau o arie geografică specifice şi sunt analizate colectiv. Action can then follow based on the results.

Informing the public on air quality by using the color significance is also possible by accessing some web pages [8]. Information can be got from automatic stations for air quality monitoring, which are integrated into this system. An example of this information is presented in section 9.9., for two stations in Romania and Bulgaria.

9.5. The SEIS cost

When assessing the costs of implementing the SEIS principles, it is important to recognise that many relevant activities are already ongoing, and the main challenge—and the reason why a more formal political commitment around these principles is required—is to align these activities more effectively.

Some further investment is likely to be necessary in order to achieve full implementation of the SEIS principles. These can be categorised as follows:

- Ongoing efforts to implement the INSPIRE directive will need to be given increased political and administrative attention, and be adequately resourced, at both European and national level;
- Institutions, governmental or otherwise, involved in the collection and processing of environmentally-relevant data will have to review, and in some cases may have to change their organisational and business models to render their existing systems interoperable and link them to an integrated "system of systems";
- EU institutions and bodies will need to continue or reinforce efforts to update and streamline legislative requirements while ensuring that existing reporting systems, most of which currently take a centralised approach, are designed or adapted to be compatible with an increasingly interoperable distributed network;
- Further investments will be needed to create new data that is not currently collected but is found to be essential to support policy, or possibly to harmonise monitoring and data systems, although such investments will be offset by better prioritisation of data requirements and repeal of obsolete obligations.

9.6. Present efforts for building SEIS

Various initiatives contributing to implementation of the SEIS principles have been taken at European level, and with the engagement of the Member States, to address these challenges and to take advantage of the possibilities that evolving information technology offers. These include the following:

- Lately, European Commission has proposed or is working to drawing up some measures leading to the substantial rationalization of the legislative requirements on reporting. Among the already proposed measures there is the thematic strategy regarding atmospheric pollution (CAFE). The review of the

IPPC directive (96/61/EC) is looking inter alia at the coherence of its provisions (including reporting requirements) with those of directives on large combustion plants and waste incineration and a project has recently been launched to identify inter-linkages between monitoring and reporting requirements in various pieces of legislation in the fields of air pollution and climate change, and to provide concrete suggestions for streamlining;

- Present evolutions within the context of the environmental thematic legislation recognize more and more the necessity of adopting a more modern approach of the generation, exchange and use of data and information. An example of this is the Water Information System for Europe (WISE), which was initially designed as a reporting tool in the context of the Water Framework Directive and is now being extended to integrate reporting data flows from a number of existing and upcoming water-related directives as well as water relevant statistical data by 2010;
- Directive 2007/2/CE for establishing an infrastructure for spatial information in European Community (INSPIRE) was adopted in March 2007 and contains provisions which aim at improving the accessibility and interoperability of spatial data. INSPIRE is based on similar principles to SEIS and successful implementation of this Directive will go a long way towards overcoming existing inefficiencies relating to the use and usability of spatial data stored by public authorities. It is important to recognise, however, that INSPIRE will not directly address data of a non-spatial or non-numerical nature, will not by itself guarantee organisational consolidation within Member States, and will not lead directly to an improvement in the quality and comparability of data;
- Directive 2003/4/CE regarding public access to environmental information (directive Aarhus) gives the citizens the right to access the environmental information hold or produced by public authorities, and also to the information related to adopted policies or taken measures, or related to the people health and safety if these could be affected by the environment state. Applicants are entitled to obtain this information within one month of the request and without having to say why they require it. In addition, public authorities are obliged to actively disseminate environmental information in their possession.

- Initiative of Global Monitoring for Environment and Security has as objective providing services of operational information based on Earth monitoring data coming from satellites and in situ observations performed on water, air and soil. These services will specifically address the needs of policy makers at all levels, from EU to local. GMES is initially focusing on the development of three "fast track services"—land, marine and emergency response—with preparations for implementing a fourth service on atmosphere having started recently. These fast-track services offer a good opportunity to consolidate and improve existing monitoring systems in Europe by helping to identify and address gaps in currently available data and information products and to ensure their sustainable, operational provision;
- Both the Community and the Member States are full members of the Group on Earth Observation (GEO), having as objective building a Global Earth Observation System of Systems (GEOSS) and therefore they are obliged to observe the data interoperability and sharing principles promoted by GEO. Initial activities in this area have focused on improving data access and data sharing, advancing the development of interoperability between systems through international standards and other interoperability arrangements, developing mechanisms for the sharing and use of data and information products, and developing detailed specifications and demonstrations of the underlying architecture and user-interface components;
- As part of the EU's maritime policy a European Marine Observation and Data Network will be set up to provide a common gateway for researchers and service providers of high quality marine data—geological, physical, chemical, biological—as well as of the human activity that has an impact on our seas and oceans;
- Various Commission-funded research and non-research activities focus on distributed open systems for environmental management. These include the research Framework Programmes, eTEN, eContent and more recently the CIP policy support programme. In addition, in the context of the IDABC Programme the Commission developed in 2004 a European Interoperability Framework, in close collaboration with Member States. This document defines a set of

recommendations and guidelines with regard to organizational, semantic and technical aspects of interoperability for Pan-European eGovernment Services (PEGS) so that public administrations, enterprises and citizens can interact across borders and across sector;

- The European Environment Agency of course plays a crucial role in collecting and providing environmental information, with the help of its European environment information and observation network (EIONET). EIONET is a network of some 900 experts from over 300 national environment agencies and other bodies dealing with environmental information in 37 European countries, as well as five European Topic Centres (ETCs) working on specific environmental themes. EIONET also benefits from an infrastructure for supporting and improving data and information flows (Reportnet), which integrates different web services and allows for distributed responsibilities. Reportnet has initially been mainly used for reporting environmental data to EEA, but is now also hosting some of the Commission's environmental reporting information.

Besides these European initiatives, different initiatives at national, regional and local level help also to concretizing SEIS:

- a German Environmental Information Portal (PortalU) covering several hundred thousand web sites and data bases from public institutions operating at the Federal and Länder levels;
- In Ireland, the tool The North-South Share Risk Assessment Reporting Tool, which contains an interactive map and a database system which could be used both by the public and the specialists;
- in Italy, an Environmental Information and Monitoring System (EIMS) being developed by the Agency for Environmental Protection and Technical Services and the regional Environmental Agencies Systems;
- In the Netherlands, portal RIVM for specialists in environment field, launched in September 2007;
- also in the Netherlands, a recent review jointly commissioned by various governmental bodies concerning monitoring and reporting obligations and

efforts relative to the environment, nature and water in the Netherlands in terms of international, European, national and inter-provincial regulation;

- Austria has as objective reaching an electronic reporting of 100% , being already successful in reporting all the data required by EEA as part of its annual "priority data flows";
- the UK Marine Monitoring and Assessment Strategy, adopted by the UK Marine Assessment Policy Committee in May 2006, which aims to shape the UK's capability to provide and respond to the evidence required for sustainable development within a clean, healthy, safe, productive and biologically diverse marine ecosystem.

9.7. What actions are necesary to realise SEIS

Political commitment around the principles set out in this Communication is the first step for implementing SEIS, since it will send a clear signal to the many players, inside and outside government, whose efforts need to be channelled towards an integrated project that will serve many different individual purposes. It will also help to avoid the risk that ongoing activities continue to be fragmented and therefore less effective than they could be in addressing the challenges described in this Communication. This leadership needs to be accompanied by concrete action within Member States to ensure adequate coordination of national information activities.

Ongoing activities at European, national and regional level need to be reinforced and co-ordinated in line with SEIS. Within the Commission, priority will be given to the implementation of the INSPIRE directive and further development of the GMES initiative, as a basis for improving respectively the sharing of environment-related data and information within Europe and the provision of services to public policy makers and citizens. The success of both these activities in solving the problems they have been designed to address will be carefully monitored, along with the possible need to launch complementary initiatives. In this way, it will be ensured that SEIS, INSPIRE and GMES are mutually supportive.

As noted above, a key step in implementing SEIS, and especially to trigger the expected simplification benefits, will be to modernise the legal provisions relating to way in which information required by environmental legislation is made available. It is expected that this will be done by revising the Standardised Reporting directive 91/692/EC, which needs to be updated and brought into line with the SEIS principles. To this end, the Commission intends to come forward with a relevant legislative proposal in 2008, including a repeal of outdated provisions in the current standardised reporting directive. Although the current standardised reporting directive (SRD) applies only to relatively small proportion of reporting obligations in environmental legislation, the envisaged provisions in the revised directive to modernise the way in which the information is made available could cover essentially all of the more than 100 existing environmental reporting obligations. The proposed new directive will also set out the principles and objectives of the SEIS as legal obligations. The Commission will also take the opportunity of further amendments to environmental legislation to ensure that the SEIS principles are systematically integrated into existing reporting and monitoring provisions wherever possible.

The Commission will continue its efforts to streamline the content of information requirements in thematic environmental legislation and bring them into line with the principles set out in this Communication. Further analysis, building on ongoing work within thematic environmental policy and GMES, will be needed to clarify real data and information requirements and to develop the required legal and/or financial instruments. The Commission will also use its participation in relevant international fora to push for similar efforts in relation to international obligations. Member States will, for their part, need to support the Commission in pushing for streamlining in international fora, and take further steps to streamline and simplify data-gathering procedures at national and regional level.

The European Environment Agency (EEA) has a crucial role to play in implementing the SEIS and has been a leading proponent of many of the principles described in this Communication. As it continues to fulfil its mandate to provide timely and reliable environmental information, it will be essential for EEA to make SEIS the centre of its strategy. The EEA's Reportnet tool needs to be taken up fully by the EEA member countries, and will need to be progressively adapted to be compatible with the emerging distributed European system.

In order to ensure adequate funding of the necessary infrastructure, Community financial support will be allocated for this purpose through the Research Framework Programmes, LIFE+, the Competitiveness and Innovation Framework Programme (CIP) and the Structural Funds. Since not all these programmes are designed to sustain operational infrastructures, the success of SEIS will also depend on adequate allocations from national and regional budgets towards the necessary actions and objectives as set out above.

A significant improvement in the availability of information and cost-effectiveness of investments needed to produce it will only come about if there is further harmonisation of existing monitoring systems and cross-thematic co-ordination of their planning and implementation in Member States. Examples of the need for cross-thematic co-ordination would include in-situ monitoring of freshwater, soil, land use and biodiversity in an ecosystem context, and the role of in-situ monitoring to validate space observation data. With this in mind, the Commission will publish a report within three years outlining which measures are most necessary and will, if necessary, come forward with appropriate legislative proposals.

While this Communication focuses primarily on developing SEIS within the EU, the above principles will also be promoted in the context of relations with third countries, in particular accession candidate and neighbouring countries, and efforts will be made to ensure that SEIS will be open to participation from these countries.

The Commission services will draw up in 2008, in collaboration with Member States and the EEA, a detailed implementation plan for achieving the objectives outlined in this Communication. This implementation plan will in particular provide further details on how SEIS will be put in place, taking full account of the associated costs and benefits. This will cover, in addition to the more technical aspects, issues relating to legal, financial, organisational, procedural and business model aspects to the extent that they are not already being satisfactorily addressed.

9.8. An example of what can be done: OZONE WEB

In 2006, 22 countries provided near real-time ozone values on a regular basis to European Environment Agency (EEA), while five others were involved in the project by undertaking the set-up procedure. The Ozone web project delivered an initial result in July 2006 when a pilot was published on the EEA website. A gradual increase in data provision continued until the end of the summer when around 700 measurement stations across Europe were providing data for the near real-time ozone website.

The site gives data providers, air quality experts, as well as EU-citizens the opportunity to have an overview of the situation at European level as well as follow the development of air quality in a specific region and inform users about local air quality information sites by linking to national and regional ozone websites. Comparison of air quality conditions across national and regional borders is facilitated.

For the general public, the EEA near real-time ozone website displays measured ozone levels in a map interface and provides background information on wider air quality impacts. The information on the EEA website is as recent as two hours old in many instances. If full EU coverage could be achieved the system could be used to provide information relating to summer ozone reporting to the Commission. The EEA plans to expand Ozone web to other pollutants but in order to work properly all Member States need to participate. A completed system therefore could provide information for the citizens, data needed by researchers, state of the environment information for the EEA and compliance information for the Commission.

Ozone web [7] provides a current, real-world example of the kind of services that an open, shared environmental information system will enable, and thus provides proof of concept for the SEIS. However, it is limited to a single pollutant. This type of approach needs to be generalised a much wider range of environmentally-relevant information in order to underpin the integrated analyses that are required to address the challenges of the 21st century.

In figure 9.3., the network of the stations from Europe which report in real time the ground level ozone concentration is presented.

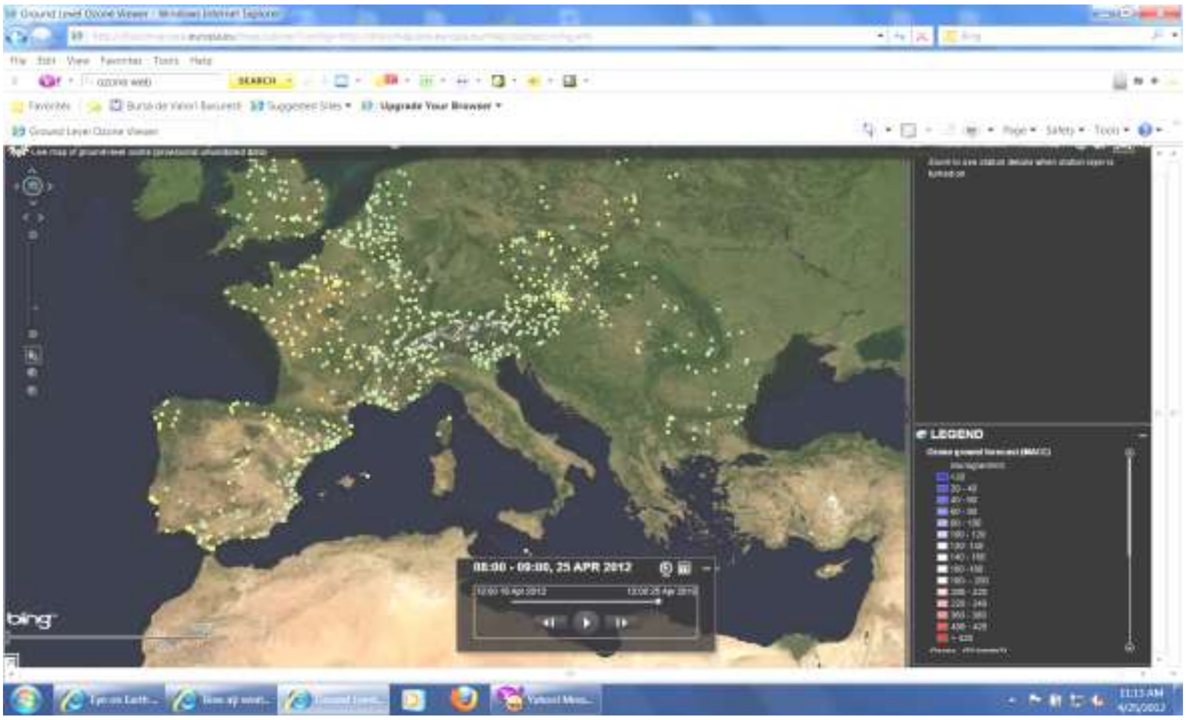


Figure 9.3 – Network of the stations from Europe which automatically report the ground level ozone concentration

By a click on the related square, any station may be selected from the map and the information on ozone concentration will appear, both numerically and graphically, for the time interval selected by the user. For exemplification, information from one station in Romania and one station in Bulgaria is presented. (Figures 9.4. and 9.5.).

Figure 9.4 - Ozone concentration at the station CT-2 ROMANIA

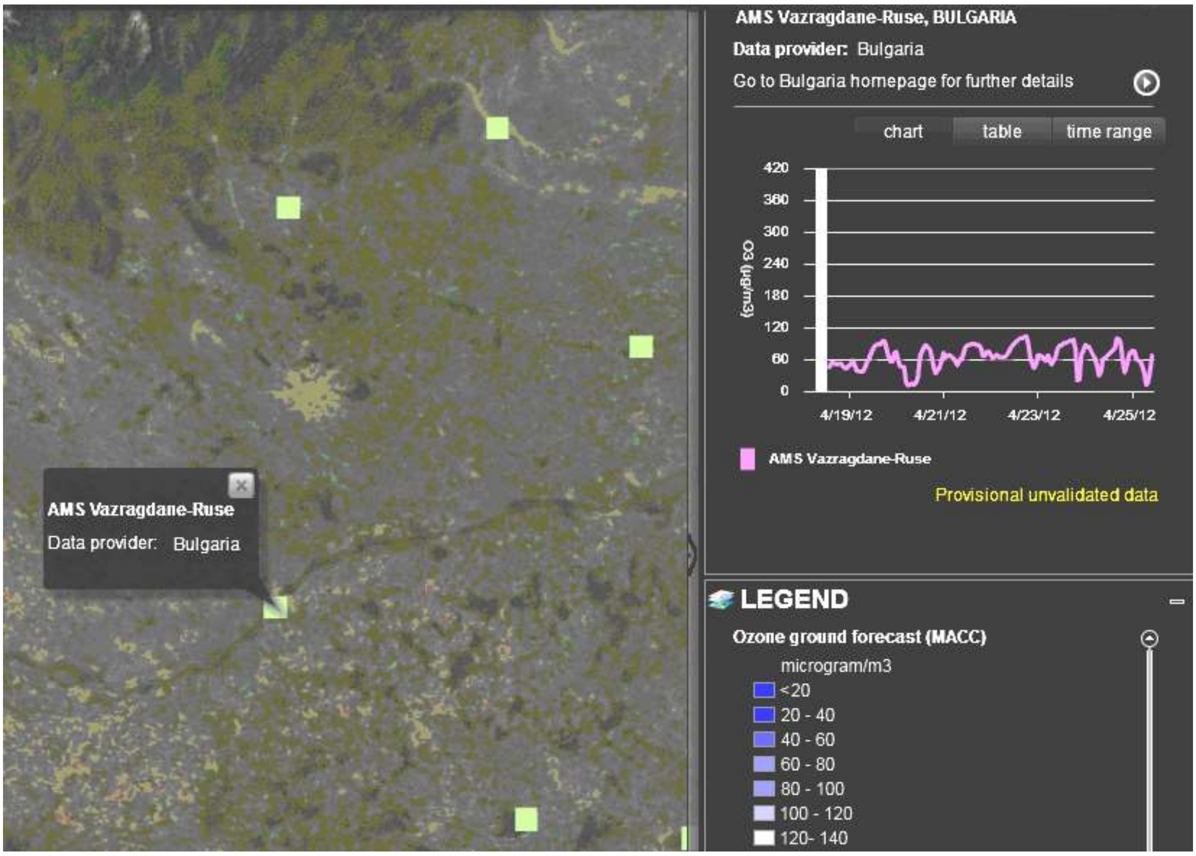


Figure 9.5 - Ozone concentration at the station RUSE -BULGARIA

9.9. Visualization of data on air quality, site http://network.eyeonearth.org/home/

Eye on Earth [8] brings together scientific information on environment with feedback and observations from millions of people.

Air quality may be seen on the map in more than 2 000 monitoring stations in Europe.

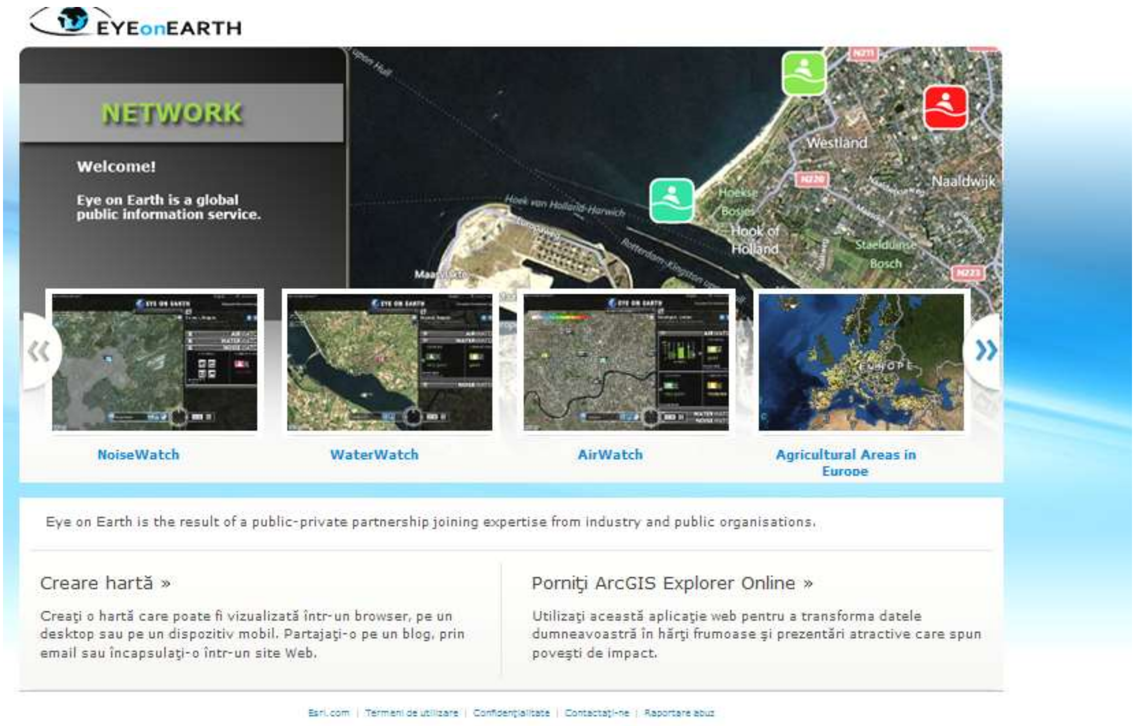


Figure 9.6 - Presentation page of the web site http://network.eyeonearth.org/home/

Figure 9.7 - Information on air quality at the station DJ1 ROMANIA (BILLA)

Figure 9.8. Information on air quality at the station RUSE – BULGARIA

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