

AIR-Q-GOV Report Supplement

Pollutant Emissions Inventory and Air Quality Monitoring in Ukraine

AIR-Q-GOV & Ukraine - June 2012

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Kiev, Ukraine



This project is funded
by the European Union



A project implemented
by a consortium led by MWH

REVISION	DATE	DESCRIPTION	PREPARED BY (AUTHORS)	REVIEWED BY
1	30.06.2012	AIR-Q-GOV Report Supplement	Gennadiy Averin and Antonio Rodrigues	

Summary

PROJECT TITLE: AIR QUALITY GOVERNANCE IN THE EAST COUNTRIES

COUNTRIES: Armenia, Azerbaijan, Belarus, Georgia, Republic of Moldova, Russian Federation and Ukraine

FOCUS COUNTRY: Ukraine (this supplement)

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ABBREVIATIONS

ASLI	Approximately Safe Level of Impact
CMU	Cabinet of Ministers of Ukraine
GD	Guidance Document
MENR	Ministry of Ecology and Natural Resources of Ukraine
MEP	Ministry of Environmental Protection of Ukraine
MES	Ministry for Emergency Situations of Ukraine
MOH	Ministry of Health of Ukraine
PE	Pollutant Emissions
SEMS	State Environmental Monitoring System
SEI	State Ecological Inspectorate
SES	Sanitary-Epidemiological Service
SND	Sectoral Normative Document
SSS	State Statistical Service of Ukraine
SSTU	State Standard of Ukraine
UkrHMS	State Hydrometeorological Service of Ukraine
UkrNIINTIZ	Ukrainian State Leading Scientific-Research and Industrial Institute for Engineering-Technical and Ecological Investigations
UkrSCTE	Ukrainian Scientific Centre of Technical Ecology

1. STATE SYSTEM FOR AIR MONITORING AND QUALITY CONTROL IN UKRAINE

1.1. STATE ECOLOGICAL MONITORING SYSTEM

Environmental monitoring is vital for efficient ecological management and sustainable development. The Law of Ukraine "On protection of the environment" (articles 20 and 22) provides the development of the State Environmental Monitoring System (further - SEMS). The execution of the state monitoring duties are assigned to the MENR and other central authorities as well as enterprises, institutions and organizations the activity of which leads or may lead to the degradation of environmental quality.

Main policy documents in the domain of environmental protection and ecological monitoring are:

- The 2004 Concept of the State Program on Environmental Monitoring;
- The 2007 State Target-Oriented Program on Environmental Monitoring;
- The Law of Ukraine «On the Basic principles (strategy) of state ecologic policy of Ukraine until 2020» (approved on 21.12.2010);
- National Action Plan for Environmental Protection for 2011-2015 (Resolution of the CMU №577 on 25.05.2011).

There is no any special strategic document for air quality protection in Ukraine which would be analogous to the Thematic Strategy on Air Pollution (2005).

In 2012, the MENR started to develop new state environmental programs on conducting environmental monitoring in Ukraine until 2020.

Basic SEMS operation principles are defined in the CMU Decree on 30.03.1998 №391 "On approval of the Provision on the State Environmental Monitoring System".

The main SEMS objectives in the domain of air quality monitoring: provide observation, collection, transmission, storage, processing and analyses of air pollution data, forecast pollution changes, develop science-based recommendations for air protection decision making.

Key standard acts and normative-technical documents regulating air quality monitoring:

- The Law of Ukraine "On air protection";
- The CMU Decree on 09.03.1999 №343 "On approval of the Procedure of organization and execution of monitoring in the domain of air protection";
- State standard 17.2.3.01-86 "The nature conservancy. Atmosphere. Air quality control regulations of human settlements";
- GD 52.04.186-89 "Guidelines for atmospheric pollution control", Moscow: 1991. - 698 p.

Basic SEMS operation principles for air monitoring are defined in the CMU Decree on 09.03.1999 №343 "On approval of the Procedure of organization and execution of monitoring in the domain of air protection". In SEMS, three state-level monitoring entities provide monitoring functions, tasks, and dataware:

- The Ministry of Environment and Natural Resources of Ukraine (MENR);
- The Ministry for Emergency Situations of Ukraine (MES);
- The Ministry of Health of Ukraine (MOH).

In addition, monitoring entities include enterprises, institutions and organizations the activity of which leads or may lead to the degradation of environmental quality.

Regional-level air quality monitoring is carried out by the following organizations that are under the state monitoring entities:

- Regional state ecological inspections (under the MENR);
- Regional centers for hydrometeorology (MES);
- Regional sanitary-epidemiological station (MOH).

Currently, SEMS consists of monitoring subsystems that are subordinate to governmental entities. SEMS is based on the execution of functions defined by the Provision on the State Environmental Monitoring System. Extensive state air quality monitoring networks are available to the State Hydrometeorological Service (MES) and the Sanitary-Epidemiological Service (MOH). These entities carry out air quality monitoring on stationary posts by sampling and subsequent laboratory testing.

State Hydrometeorological Service (UkrHMS - state entity of the MES) carries out monitoring of air pollution in 53 cities of Ukraine by 163 stationary, 2 observational mobile posts and 2 stations of transboundary transport. At the stationary posts, observations are carried out 4 times a day except Sundays and public holidays. Sampling is performed with the absorption filters within 20 minutes with subsequent determination of substance concentration.

The program of air quality monitoring consists of seven main pollutants: dust, nitrogen dioxide, sulfur dioxide, carbon monoxide, formaldehyde, lead and benzo(a)pyrene. The heavy metals for mandatory monitoring include cadmium, iron, manganese, copper, nickel, lead, chromium and zinc. Furthermore, according to local peculiarities of human settlements, stationary posts also monitor specific pollutants (e.g. ammonia, benzene, phenol, hydrogen sulfide, anhydrous hydrogen fluoride, toluene and other). In addition, the analysis of pollutant presence is carried out in precipitation and snow cover; hydro-meteorological parameters are also observed. The concentrations of 31 harmful air contaminants are determined in 53 cities. The observations are carried out in accordance with the requirements of the GD 52.04.186-89 "Guidelines for atmospheric pollution control".

Monitoring of air quality is carried out in accordance with the approved list of hazardous substances, which is approved for each of the 53 Ukrainian cities, including:

- Dust, nitrogen dioxide, sulfur dioxide in 53 cities;
- Carbon monoxide in 49 cities;
- Nitrogen oxide in 28 cities;

- Heavy metals and benz (a) pyrene in 50 cities;
- Formaldehyde in 43 cities;
- Phenol in 23 cities;
- Ammonia in 23 cities;
- Anhydrous hydrogen fluoride in 14 cities;
- Hydrogen sulfide in 16 cities;
- Hydrogen chloride in 11 cities;
- Soot in 6 cities;
- Dissolved sulfate in 20 cities;
- Sulfuric acid in 2 cities;
- Benzene, toluene, ethylbenzene and xylene in 2 cities;
- Aniline in 1 city.

In Ukraine, concentrations of ozone, PM_{2,5} and PM₁₀ are not controlled in human settlements. Concentrations of arsenic and mercury, are controlled by the sanitary-epidemiological stations (MOH) when the need arises.

Sanitary-Epidemiological Service (SES - state entity of the MOH) carries out periodic monitoring of air quality in residential and recreational areas, particularly near major roads, sanitary protection zones and residential buildings, on the territory of schools, preschool and medical institutions in urban areas. In addition, the analysis of air quality is carried out in residential areas upon inhabitants' complaints. The flare observations are also carried out near the sources of emissions.

Usually observations are carried out accordingly to the various social and health monitoring programs (5-15 air pollutants). The SES air quality monitoring programs are approved for each city and major settlement.

Monitoring of air quality is carried out on mobile or stationary control posts. Observations on the stationary posts are carried out by sampling with absorption filters during 24 hours with subsequent determination of daily average concentrations by laboratory methods.

State Ecological Inspectorate (SEI - state entity of the MENR) provides selective sampling at the emission sources. It measures over 65 parameters at more than 3,000 major sources of emissions, which belong to more than 1,500 enterprises.

Governance of state ecological monitoring of the MENR, as well as Regional governances of ecology and natural resources collect data from monitoring entities. The MENR does not have its own network of air quality monitoring.

Air polluting enterprises. Industrial enterprises of the first group (objects taken on the state inventory and having manufacturing or processing equipment where the best available technologies and management practices must be introduced) carry out mandatory monitoring of air pollution at the enterprise impact zone. Total number of enterprises of the first group is approximately 1,500. Enterprises have services for environmental protection and ecological laboratories. Each enterprise

has a program for air pollution monitoring, according to which air quality is being monitored at the enterprise impact zone.

Air quality monitoring at the boundaries of sanitary protection zones of an enterprise is usually carried out periodically. Continuous air quality monitoring is carried out at only a few enterprises like "Concern Stirol".

Municipal monitoring. The municipal air quality monitoring is carried out in some cities of Ukraine. Monitoring of air quality is carried out on automatic control posts in the following cities: Kiev (1 post), Donetsk (1), Dnipropetrovsk (1), Makeevka (1), Krivoy Rog (1).

Ukrainian Hydrometeorological Center prepares yearly national reports on air quality monitoring, information about the reports is given in Table 1. Existing information resources on the raw air monitoring data are presented in Table 2.

Regional hydrometeocenters and the SES do quarterly reviews on the air pollution state in cities. Reports are distributed in accordance with the Procedure for informational interaction between monitoring entities, which is accepted and approved at the level of Regional State Administrations and cities of central subordination. The information is provided to governmental authorities, the Governances of natural resources and ecology, the Governances for emergency situations, and other interested organizations and businesses. This information usually comes in the form of bulletins, reports, surveys, briefs or descriptions.

In cities, monthly reviews of the air pollution state are carried out by Regional hydrometeocenters. Weekly bulletins are not developed in Ukraine.

Quarterly and monthly information is not provided in a broad open printing.

Daily information is considered operational according to the Procedure for informational interaction between monitoring entities. Operational information on the threats or occurrence of natural disasters as well as extremely high air pollution levels are urgently transferred by the ecological monitoring entities via e-mail, telephone or fax to operators that are currently on duty in State administrations, Governances of natural resources and ecology, Governances for emergency situations, as well as to operators currently on duty in other interested organizations and enterprises. The decision to declare the threat (alarm) related to extremely high levels of air pollution is made by the Governances for emergency situations of the MES in coordination with the Regional State Administrations.

1.2. STATE GOVERNANCE SYSTEM IN THE DOMAIN OF AIR PROTECTION

Ukraine, as part of its policy for approximation with the environmental protection requirements of the EU legislation, introduced new permitting system in the domain of air protection. The Law of Ukraine "On air protection" (articles 4, 5, 6, 7, 11, 35) and a number of the CMU Decrees govern new technology-oriented approach to issuing permissions for pollutant emissions (PE) into the air.

The main policy documents of the domain of air protection are:

- National Action Plan for Environmental Protection for 2011-2015 (Resolution of the CMU № 577 on 25.05.2011);
- The Law of Ukraine "On the Main principles (strategy) of the state ecological policy of Ukraine till 2020" (approved on 21.12.2010);
- The CMU Decree № 610-p on 15.10.2003 "The concept of state policy implementation of PE reduction into the atmosphere which lead to acidification, eutrophication and ground-level ozone formation."

There is no any special strategic document for air quality protection in Ukraine which would be analogous to the Thematic Strategy on Air Pollution (2005).

There is a strategic program document that is related to emissions of dust, sulfur and nitrogen dioxides, ammonia, hydrocarbons and light organic compounds (Resolution of the CMU № 610-p on 15.10.2003), but the document is outdated and requires revision. In Ukraine, there are no any special strategic documents in the domain of air quality control that concern heavy metals and persistent organic compounds.

Methodological foundations of governmental regulations in the domain air protection are determined by the Laws of Ukraine "On environmental protection" and "On air protection".

Ukraine carries out emissions regulation of the most common and dangerous pollutants in order to ensure ecologic safety, create favorable living environment, prevent harmful impacts of air on human health and the environment.

The main standard acts that define the governance system in the domain of air protection:

- The Law of Ukraine "On air protection";
- The CMU Decree on 29.11.01 № 1598 "On approving the list of the most common and dangerous substances the emissions of which into the atmosphere are subject to regulation";
- The CMU Decree on 13.12.01 № 1655 "On approval of the procedure of state inventory in the domain of air protection";
- The CMU Decree on 28.12.01 № 1780 "On approval of the procedure of development and approval of standards for allowable PE from stationary sources";
- The CMU Decree on 13.03.02 № 299 "On the procedure of development and approval of ecologic safety standards for atmospheric air".

In addition to the Laws of Ukraine and the CMU Decrees, the governance system in the domain of air protection is also implemented by appropriate standard acts and normative technical documents approved by the ministries and departments, in particular:

- The MENR Order № 465 on 13.12.2001 "On approval of the registration procedure of institutions, organizations and establishments who are granted the right to develop documents that justify emission volumes for enterprises, institutions, organizations and citizens - entities of entrepreneurial activity";
- The MENR Order № 177 on 10.05.2002 "On approval of the Instruction on the procedure and criteria for taking objects on the state inventory that produce or might produce harmful impact on human health and air state, types and amounts of pollutants emitted into the atmosphere";
- The MENR Order № 108 on 09.03.2006 "On approval of the Instruction on general requirements for execution of documents that justify emission volumes for obtaining permission on the PE into the atmosphere by stationary sources for enterprises, institutions, organizations and private entrepreneurs";
- The MENR Order № 309 on 27.06.2006 "On approval of standards for maximum allowable PE from stationary sources";
- The MENR Order № 12052/11/10-07 on 08.11.2006 "On clarification in the domain of air protection".
- The MENR Order № 541 on 22.10.2008 "On approval of the technological standards for allowable PE from thermal power plants with nominal thermal power exceeding 50 MW";
- The MENR Order № 7 on 10.02.1995 "On approval of the Instruction for the content and the procedure on preparing the report on the inventory of PE from an enterprise";
- The MENR Order № 317 on 16.08.2004 "On approving the List of equipment types for which standards for maximum allowable PE volumes from stationary sources are developed";
- The MENR Order № 407 on 17.09.2010 "Methodical recommendations for permitting PE into the atmosphere by stationary sources of economic players with regard to the technological standards for allowable PE into the air";
- State sanitary rules for air protection from pollution (with chemical and biological agents) in human settlements. Approved by the MOH on 09.07.1997, № 201;
- State standard 17.2.3.01-86 "The nature conservancy. Atmosphere. Air quality control regulations in human settlements";

The state governance in the domain of air protection is carried out by:

- Cabinet of Ministers of Ukraine (CMU);
- Ministry of Ecology and Natural Resources of Ukraine (MENR);
- Ministry of Health of Ukraine (MOH);
- Local State Governances and Executive Authorities;
- Local Government;

State inventory of stationary emission sources. The CMU Decree on 13.12.2001 № 1655 and the MENR Order on 10.05.2002, № 177 define the procedure, general requirements and criteria for taking objects on the state inventory that have harmful impacts on human health and air quality as well as the types and amounts of pollutants that are released into the atmosphere.

State inventory of objects, types and amounts of PE is carried out by the territorial authorities of the MENR according to the materials of PE Inventory.

Objects, types and amounts of PE are registered within the state inventory according to the following criteria:

- objects - if their emissions contain at least one polluting substance (or group of polluting substances) potential emission of which equals or exceeds the threshold;
- types and amounts of PE that are released into the air providing that the amount of potential emissions equal or exceeds the threshold for a single pollutant or a group of them;

Criteria for 131 pollutants (pollutant groups) are given at “The list of pollutants and thresholds of potential emissions according to which state inventory is carried out” approved by the MENR Order on 10.05.2002 №177.

The emission control methodology for air protection. PE into the air from stationary sources can be performed by operators (economic players) only after obtaining the permission that is issued by a territorial body of the MENR in agreement with the territorial authority of the MOH.

Permission for PE into the atmosphere from stationary sources is an official document that grants the right to operators to exploit the objects which release pollutants or mixtures thereof into the air providing compliance with established standards for maximum allowable emissions and requirements for technological processes in terms of restriction for PE within a certain period defined in the permission. The permission is issued not less than for five years.

The CMU Decree on 29.11.01 r. № 1598 lists the pollutants that are subject to permission. These are mostly common substances: nitrogen oxides, benzo(a)pyrene, sulfur dioxide and other sulfur compounds, ozone, substances in the form of suspended particulate matter (particulates and fibers), lead and compounds, formaldehyde, etc.; dangerous pollutants: metals and their compounds, organic amines, light organic compounds, persistent organic compounds, chlorine, bromine and their compounds, cyanides, freon, and arsenic and its compounds.

The CMU Decree on 28.12.01p № 1780 approves the procedure of development and approval of standards for maximum allowable PE from stationary sources. According to that procedure, standards for maximum allowable PE from stationary sources are divided as follows:

- standards for maximum allowable PE from stationary sources;
- technological standards for maximum allowable PE.

Standards for maximum allowable PE from stationary sources are approved by the MENR Order on 27.06.2006 №309. Standards for maximum allowable emissions are used as primary normative and are set as concentrations of pollutants in effluent gases.

Technological standards for separate categories of stationary sources are developed for thermal power plants, sinter and coke plants, cement industry, production of sunflower oil refining. The MENR Order on 22.10.2008 №541 approves technological standards for thermal power plants. Analogous Orders function for other productions: №540 on 13.10.2009, №524 on 05.10.2009, №507 on 29.09.2009 etc. Technological standards are currently under development for blast furnaces and steel industries.

Those Orders of the MENR also introduce perspective standards for new and being upgraded facilities in terms of the best available technologies.

If both, standard for maximum allowable emissions and technological standard for maximum allowable emissions exist (are introduced by standard acts) technological normative is proffered.

At regional level, all permissions for PE into the air are issued by the Governances of the MENR. Sanitary-epidemiological stations of the MOH adjust the documents that justify pollutant emission volumes as well as prepare resolutions while issuing permissions for PE into the air. Local government adjust justifying documents when issuing permissions and issue letters about reactions of the population on published by the operator (enterprise) "Claim for obtaining (prolonging) the permission for emissions into the air" in press.

To obtain the permission, operator must prepare the application according to the set form and documents justifying emission volumes and activities for air protection as well as publish information on obtaining permission for public awareness. To accomplish this, the enterprise carries out following activities:

- carries out inventory of stationary emission sources of pollutants into the air and existing dust filters;
- carries out inventory of types and volumes of PE into the atmosphere from stationary sources;
- carries out assessment of PE impact on the state of the atmosphere;
- develops plans for activities in the domain of air protection.

Activities for environmental protection must be directed to:

- achieving existing standards for maximum allowable emissions;
- air protection in case of anthropogenic and natural emergencies;
- eliminating causes and consequences of air pollution;
- irrevocable discontinuance of ecologically dangerous processes;
- excess prevention over existing standards for maximum allowable PE during production process;
- carrying out monitoring of emissions and control of compliance with existing standards for maximum allowable PE;
- creating sanitary-protection zones and cost assessment of their creation.

Enterprise carries out cost assessment and analysis for implementation of planned activities on preventing air pollution and publicly provides information on obtaining permission.

There are three groups of objects for which permitting documents are developed:

- first group: objects taken on the state inventory and having production or technological equipment which are subject to introduction of the best available technologies and management practices;
- second group: objects taken on the state inventory but which do not have production or technological equipment which are subject to introduction of the best available technologies and management practices;
- third group: objects not attributed to the first or the second group.

According to existing requirements, all enterprises carry out emission volumes inventory and provide quarterly and yearly statistical reports. Enterprises that belong to the first group also carry out monitoring of PE and air quality in the enterprise impact area. An enterprise carries out regular monitoring of PE from stationary sources by sampling released gases and subsequent laboratory control of their chemical composition. In Ukraine, continuous uninterrupted monitoring of chemical composition and volumes of emissions is carried out only on several electrogenerating plants: Zuyevskaya, Bushtynskaya, Kurakhovskaya, Luganskaya and Krivoy Rog thermal power plants. Automated systems for emission monitoring are introduced on Pridneprovskaya thermal power plant. Ltd. "Lukoil energy and gas of Ukraine", "Zaporozhskiy fat-and-oil plant" and others have systems for emission control on cogeneration installations for combined heat and electrical power production. There is no automated emission control from stationary sources on metallurgical and by-product coke plants.

Requirements for documents that justify emission volumes. The MENR Order on 09.03.2006, №108 determines general requirements on documents that justify emission volumes for obtaining permissions on PE into the air from stationary sources.

The documents contain the following information: about the object, its location and area of impact, production program, production output volumes; production description and information on operating conditions of technological equipment; layout drawing and situational schematic map; on sanitary-protection zone, raw materials, chemicals, fuel and lubricants; PE types and volumes; assessment of PE impacts; activities on introduction of the best available technologies, requirements for equipment, facilities and technological processes; suggestions on standard PE volumes and target rates; plan for environment protection activities and their implementation costs; measures on emission monitoring implementation and on control of compliance with standards for maximum allowable emission volumes; liabilities of operator; permitted emissions for public awareness.

The permission for emissions is issued providing that until its expiration: existing standards for ecologic safety are not exceeded, standards for allowed PE from stationary sources are not exceeded, technological processes comply with requirements in part related to limitations of PE.

According to the CMU Decree on 13.03.02 № 302, design and scientific institutions and organizations provide technical support while enterprises and organizations are being issued permissions for PE into the air, carry out inventory of emission sources as well as develop documents justifying volumes of PE for obtaining permissions. Those institutions and organizations must obtain registration certificate from the MENR for the right to develop that documents.

2. STATISTICAL AND DEPARTMENTAL REPORTS

In Ukraine, statistical observations on environmental protection are carried out by state statistics bodies and sectoral ministries and departments. The former collect governmental statistical data, the latter – administrative data. Main provisions and principles of statistical observations are defined by the Law of Ukraine «On governmental statistics».

The Laws of Ukraine that regulate statistical observations in the domain of air monitoring and quality control:

- «On governmental statistics»;
- «On environmental protection»;
- «On air protection».

Statistical observations on PE are carried out by the statistical bodies according to the form № 2-тп (air), which contain the following data:

- the total pollutant and greenhouse gases emissions from enterprises;
- pollutant and greenhouse gases emissions from production and technological processes, technological equipment (facilities);
- activities directed towards the pollutant and greenhouse gases emissions reduction into the atmosphere.

Databases are maintained electronically for 10 indicators of 130 chemical substances and their groups. Databases contain data on emissions into the atmosphere of sulfur dioxide, nitrogen dioxide, dust, carbon monoxide, volatile organic compounds, ozone depleting substances, greenhouse gases, etc. The periodicity of reporting forms – yearly and quarterly, there are over 9000 enterprises in the database.

Emissions accounting from mobile sources of pollution is carried out apart, in particular: air, road, rail and water transport, industrial, agricultural, building and other production equipment. The calculations are based on the amount of fuel consumed and the unit emissions for 11 polluting substances and greenhouse gases.

Emissions assessment from areal (diffusion) sources, which are not covered by the statistics, is carried out by calculation methods during the development of the Programs for protection and sanitation of urban air. The Programs are periodically developed for 5 years for all industrial cities of Ukraine.

Data on emissions into the atmosphere from stationary and mobile sources for the whole territory of Ukraine are stored in the database of the Department for agriculture and environment which is under the SSS (Table1). Yearly Statistical digests on environment are published by all Regional Governances of Statistics of Ukraine and are publicly available.

The data are also transferred to the Information-analytical center of the SEMS of the MENR (IAC SEMS) and are accumulated in ecological data banks. Experts use the data to prepare National reports on the state of the environment in Ukraine, information-analytical surveys and bulletins

«State of the environment in Ukraine». They are publicly available at the IAC web pages (<http://www.ecobank.org.ua/Pages/default.aspx>, <http://www.ecobank.org.ua/GovSystem/EnvironmentState/Pages/National.aspx>).

Yearly data on emission types and volumes are given at the web portal of the MENR. The ecological data for all country regions are also present at that web portal: <http://ukrecopass.org.ua/>. Information resources on raw data of ecological monitoring are presented in Table 2.

3. STANDARDS AND NORMATIVE-TECHNICAL DOCUMENTATION IN THE DOMAIN OF AIR PROTECTION

The standardization and rating in the domain of air protection are carried out to set up mandatory standards, rules and requirements for air protection from pollution and ecologic safety insurance.

According to the existing requirements in the domain of air protection, the following standards are set:

- standards for air quality;
- standards for maximum allowable PE volumes from stationary sources;
- standards for maximum allowable impact of physical and biological factors of stationary sources;
- standards for pollutants containment in effluent gases and impact of physical factors of mobile sources;
- technological standards for allowable PE.

Air quality standards are defined by the State sanitary rules for air protection from pollution (with chemical and biological agents) in human settlements. In total, standards for 3 indicators are regulated (daily average maximum allowable concentration, one-time maximum allowable concentration, hazard class) for 509 chemical and biological substances.

Table 1 – Informational resources of ecological statistical information

№	Informational ecologic resources	Data owning authority	Data level	Establishment date	Internet address or way to access the data	Data characteristics
1	2	3	4	5	6	7
1.	The database of governmental statistical observations on PE into the atmosphere from stationary sources ¹	SSS	National	1991 year	Department for agriculture and environment Director Prokopenko Oleg Nikolaevich, Tel. +380-44-289-72-80, O.Prokopenko@ukrstat.gov.ua	PE into the atmosphere from stationary sources, all Ukrainian enterprises Quarterly and yearly reports on 10 indicators
2.	The database of state statistical observations on PE into the atmosphere from mobile sources ¹	SSS	National	1991 year	The same	PE into the atmosphere from mobile sources throughout the territory of Ukraine Yearly reports on 11 indicators
3.	Statistical digests in the domain of environmental pollution and protection for regions of Ukraine	SSS	National	1991 year	The same	Several hundreds of indicators in the domain of environmental pollution and protection Yearly data for regions of Ukraine
4.	UkrHMS bulletins «State of air pollution»	UkrHMS	Regional Local	2000 year	Laboratories of UkrHMS Regional GMCs	Surveys on the state of the environmental pollution Semi-annual and annual reporting forms

¹ – Standard act for database creation - the Order of the State committee for statistics of Ukraine on 06.06.2003 №166 «On approval of the state statistical observation forms from forestry and environmental protection» : The Instruction on the procedure for state statistical reports compiling on air protection according to the forms №2_тп (air) – yearly and № 2_тп (air) – quarterly «Report on air protection».

Table 2 – Informational resources of raw ecologic monitoring data

№	Informational ecologic resources	Monitoring entity	Data owning authority	Data level	Establishment date	Data storage type	Internet address or way to access data	Data characteristics
1	2	3	4	5	6	7	8	9
1.	The database of Information-analytical center of the SEMS	MENR	MENR	National	2004 year	Electronic	http://www.ecobank.org.ua/Pages/default.aspx	
2.	Regional system for ecological monitoring (OMOS)	MENR	Governance of ecology and natural resources in Donetsk region	Regional	2008 year	Electronic	http://omos.org.ua	Air, surface waters, waste Over 2 millions measurements 15 GIS layers
3.	The database of air pollution in cities	UkrHMS	Head information and computing center of UkrHMS	National	1970 year	On paper before 2000 Electronic since 2000	The software complex ASOIZA Files in EXSDAT.TXT format	Air, 163 posts, 11 years, 5 - 8 substances, 2 - 4 times a day
4.	The database of meteorological indicators of atmosphere	UkrHMS	Head information and computing center of UkrHMS	National	1970 year	On paper before 2000 Electronic since 2000	The software complex ASOIZA Files in EXSDAT.TXT format	Air, 163 posts, 11 years, 8 indicators, 4 times a day
5.	Information-analytical database «Ecological passport of Ukrainian regions»	MENR	MENR	National	2006 – 2009 years	Electronic	http://ukrecopass.org.ua/	30 forms, over 1 millions of measurements for all Ukrainian regions. Data on emissions and air quality

Temporal standards are set for substances that are not assigned hazard classes as Approximately Safe Levels of Impact (ASLI). ASLI are set for over 1300 substances by State standards ГН 2.2.6.-166-2009 «Approximately safe levels of impact (ASLI) of pollutants in the air of human settlements».

Air quality standards for main pollutants are given in Table 3. In Ukraine, there are no standards for air pollution by PM_{2.5} and PM₁₀. In Ukraine, air quality standards for dust are set not for particle sizes but for dust types and substances from which the dust is formed of as well as the content rate of silicon compounds in the dust. State sanitary rules for air protection define quality standards for 7 diverse dust types for which hazard classes are assigned. Document ГН 2.2.6.-166-2009 defines temporal standards (ASLI) for 92 diverse dust types for which hazard classes are not assigned.

In Ukraine, mandatory air quality standards for main pollutants related to vegetation or biosphere as a whole do not exist.

Box 1: Maximum allowable concentrations in the Ukraine (MACs) for the pollutants controlled by the EU Directives 2008/50/EC and 2004/107/EC

Pollutant	MAC ($\mu\text{g}/\text{m}^3$)		
	24-hours average	Maximum	Annual average
PM ₁₀	-	-	-
PM _{2.5}	-	-	-
Ozone	30	160	-
Sulphur dioxide	50	500	-
Nitrogen dioxide	40	200	-
Nitrogen oxides	60	400	-
Carbon monoxide	3000	5000	-
Benzene	100	1500	-
Lead	0.3	1.0	-
Nickel	1.0	-	-
Arsenic	3.0	-	-
Cadmium	0.3	-	-
Mercury	0.3	-	-
Benzo(a)pyrene	0.001	-	-

Source: State sanitary rules for air protection from pollution (with chemical and biological agents) in human settlements. Approved by the MOH on 09.07.1997 № 201

Standards for maximum allowed PE from stationary sources are approved by the MENR Order on 27.06.2006 №309. In turn, technological standards for separate categories of stationary sources are introduced incrementally by the MENR since 2006. Currently, technological standards are developed for relatively small number of stationary sources in thermal power, cement and coke industry.

Together with technological standards, there are recommended emission indicators (specific emissions) of pollutants into the air by various manufactures that produce diverse kinds of industrial

and agricultural products (Collection of emission indicators (specific emissions) of pollutants into the air by various manufactures. Vol. 1–3. UkrSCTE. Donetsk. 2004).

Those emission indicators are recommended and are not mandatory (not standardized), however they are taken into consideration during design works and development of documents that justify emission volumes.

Norms for concentrations of pollutants in the exhaust gases of cars are defined by the State standards:

- SSTU 4276-04 «Norms and methods of measuring smoke in the exhaust gases of cars with diesel or gas diesels»;
- SSTU 4277-04 «Norms and methods of measuring carbon monoxide and hydrocarbons in exhaust gases of cars running on petrol or gas-fired».

Besides, in Ukraine there are State standards for fuel quality that are introduced incrementally:

- SSTU 3868-99 «Diesel fuel. Technical requirements»;
- SSTU 4063-2001 «Gasoline for cars. Technical requirements» (corresponds to Euro-2);
- SSTU 4839-2007 «Gasoline for cars of higher quality. Technical requirements» (corresponds to Euro-4 and Euro-5).

Norms for concentrations of pollutants in the exhaust gases from other mobile sources are not standardized. Indicators of PE from mobile sources (vehicles: plains, locomotives, ships, etc., off-road machinery) are determined by calculations, for example, according to Methodology for calculating pollutant and greenhouse gases emissions into the air from vehicles (the SSS Order on 13.11.2008 №452) or Methodology for calculating PE from mobile sources (Donetsk: UkrSCTE, 1999).

4. PE DYNAMICS AND AIR QUALITY IN UKRAINIAN CITIES

The state of atmospheric pollution, PE characteristics, tendencies and dynamics of processes in the domain of air protection are provided in annual official reports on the state of the environment in Ukraine. The most important issues in this domain are «National report on the state of the environment in Ukraine» annually published by the MENR¹ and annual bulletins and reports on the state of the environment that are published by the UkrHMS and SSS (Table 1).

Dynamics of PE into the atmosphere. According to the data provided by the SSS, in 2011, 6.9 million tons of pollutants were released into the atmosphere. Among them, 4.4 millions are from stationary sources and 2.5 millions are from mobile sources. Compared to 2005 year, total volumes of PE are increased only on 4% while PE volumes from stationary sources are decreased on 0.1 million tons and increased on 0.35 million tons for mobile sources. Besides pollutants, 236.0 million tons of carbon dioxide are released into the atmosphere in 2011.

In 2011, there were 8699 enterprises that released pollutants into the atmosphere from stationary sources (almost on 2300 enterprises less than in 2006). The emissions content is dominated by sulfur compounds (30.7%), carbon monoxide (24.4%), methane (20.1%), dust (13.9%), nitrogen (8.7%), metals and their compounds (0.7%). In 2011 compared to 2005, the analysis of the emission compositions shows the decrease of dust (12.3%) and carbon monoxide (19%), increase of sulfur compounds (20%), methane (8%) and nitrogen oxides (11.7%). In 2011 compared to 2005, there is almost 56% increase in carbon dioxide emissions.

The main air polluters in Ukraine are enterprises that produce electricity, gas and water (41%), enterprises of metallurgical, mining and chemical industries (25% , 20% and 4% accordingly among all emissions).

Among human settlements of the Ukraine, the atmosphere of 14 cities, mainly of Donetsk, Dnepropetrovsk, Zaporozhye and Lugansk regions suffers from the highest anthropogenic load from stationary sources of emissions (over 100 thousand tons of emissions per year). Mainly these cities have power plants and enterprises of metallurgy and coke.

The majority of PE from mobile sources are from automobile transport (90.1% of all emissions) and mobile production equipment (6.8%). In Ukraine, statistical data on emissions from mobile sources are collected since 2007. They take into account road, rail, aviation and water transport, as well as production equipment. The emissions structure of the main chemical substances that came into the air during the exploitation of vehicles and production equipment was dominated by carbon monoxide (73.6%), nitrogen dioxide (12.0%), light non-methane organic compounds (11.4%), soot (1.4%) and sulfur dioxide (1.2%).

State of air pollution in Ukrainian cities. Atmospheric pollution assessment is carried out accordingly to the State sanitary rules for air protection from pollution in human settlements. Nowadays, according to observational data, the highest air pollution level according to the atmosphere pollution index (API) is registered in 25 Ukrainian cities: Mariupol, Makeyevka

¹ <http://menr.gov.ua/content/category/74>

<http://www.ecobank.org.ua/GovSystem/EnvironmentState/Pages/National.aspx>

Dneprodzerzhinsk, Lisichansk, Donetsk, Odessa, Rubezhnoye, Gorlovka, Dzerzhinsk, Severodonetsk, Armyansk, Rovno, Slavyansk, Krasnoperekopsk, Kiev, Lutsk, Enakievo, Kramatorsk, Nikolaev, Dnepropetrovsk, Krivoy Rog, Uzhhorod, Yalta, Kiev, Kherson.

The first five cities are cities with very high air pollution level while the remaining 20 are cities with high air pollution level.

The majority of cities with high and very high air pollution levels are located in Donetsk region (8 cities), Lugansk, Dnepropetrovsk regions and Autonomous Republic of Crimea (3 cities each). Other cities include Kiev and seven cities that are regional centers.

High air pollution level in the listed cities was primarily due to high content of specific pollutants - formaldehyde, phenol, hydrogen fluoride, benzo(a)pyrene, ammonia; from the list of Controlled harmful air contaminants - particulate matter, nitrogen dioxide, carbon monoxide.

In 2010, in Ukrainian cities, average annual concentrations of the following harmful substances exceeded maximum allowable daily concentrations:

- dust in 22 cities (out of 53 cities where the observations are carried out);
- nitrogen dioxide in 29 cities (out of 53 cities);
- oxides of nitrogen in one city (out of 28 cities);
- carbon monoxide in 11 cities (out of 49 cities);
- benzo(a)pyrene in 8 cities (50 cities);
- formaldehyde in 37 cities (out of 43 cities);
- phenol in 12 cities (out of 23 cities);
- ammonia in 4 cities (out of 23 cities);
- hydrogen fluoride in 5 cities (14 cities);
- hydrogen sulfide in 8 cities (16 cities);
- black in one city (6 cities).

In other cities, annual average concentrations of harmful substances were below allowed standards.

Since 2003, according to the UkrHMS observational network data, the overall level of air pollution in the cities of Ukraine does not change and trends in the growth of air pollution is not observed.

5. AIR POLLUTION MODELLING AND ASSESSMENT TOOLS

A series of normative and methodological documents on the determination of air pollution level and air contaminants dispersion calculations are used during the development of documents justifying PE volumes into the atmosphere as well as during development of materials on impact assessment on the environment. The main document is the Methodology of calculating atmospheric concentrations of harmful substances that emissions from enterprises contain (SND-86, L.: Gidrometeoizdat, 1987).

Along with the aforementioned Methodology, other methodological documents are also used:

- “The Procedure for determining values of background concentrations of pollutants in atmospheric air”, approved by the MENR Order on 30.07.2001 №286;
- Guidelines for the development of the materials on assessment of impacts on the environment (State Building Standards A.2.2.1-2003), Kharkov: UkrNIINTIZ, 2005;
- Methodical Recommendations “Assessment of risk to public health from air pollution”, approved by the MOH Order on 13.04.2007 № 184;
- The assessment Methodology of consequences caused by accident-related emissions of hazardous substances²;
- “The collection of methodologies for PE volumes calculation from various industries”. – L.: Gidrometeozdat, 1986;
- State sanitary rules for air protection from pollution (with chemical and biological agents) in human settlements, approved by the MOH on 09.07.1997, № 201.

Models of dispersion and PE are used in the development of documents required to obtain PE permission for an enterprise, in setting standards for maximum allowable PE into the air, in devising location for new industrial objects and in the implementation of reconstruction or extension of existing industrial objects, as well as in the development of assessment materials on the environmental impact. These models are used on the per-object basis since this allows to assess the dispersion of a contaminant at the impact zone of one or several enterprises. With certain assumptions the models may be used for urban and human settlements scales. Models of dispersion and PE are not used at national and regional scales.

In Ukraine, 8 software packages are developed that comply with the SND-86 Methodology. They calculate the distribution of harmful contaminants in the air and are recommended for use by the MENR (<http://menr.gov.ua/content/article/5964>).

Currently there are about 15 main software packages for predicting the distribution of harmful contaminants in the air. In Ukraine, the most popular software packages are “EOL” and “Пленэр”. Foreign countries use “CalPuff”, “AerMod”, “Plume”, “TAPM”, “Chimere” etc. as well as software packages based on the EPA models. Russian Federation uses software packages УПРЗА “Эколог”, “Кедр” and other.

² “Токси”// <http://www.safety.ru>

Software packages of “ЭОЛ” line are developed by “Soft fund Ltd.”³ (Ukraine). It is an automated system for calculating PE into the air. The model is implemented according to the SND-86 Methodology and allows calculation of the pollution fields from point, linear and polygonal sources.

Software package “Пленер” is developed by НПВФ “Веда” and is used for calculating air pollution. The model is based on the SND-86 Methodology. Currently this package is outdated and used quite seldom.

УПРЗА “Эколог” is developed by “Интеграл” (Russian Federation) and allows calculating surface concentrations of air pollutants according to the SND-86 Methodology. The package is officially recommended for use on the territory of Russian Federation. Also occasionally used in Ukraine.

КИС “Кедр для предприятий” is developed by НПП “Логус” (Russian Federation). It is more universal than “ЭОЛ” and УПРЗА “Эколог”. In addition, it has wider capabilities. КИС “Кедр для предприятий” has numerous plug-ins that are devoted to certain tasks of ecological monitoring.

Software packages УПРЗА “Эколог” and КИС “Кедр для предприятий” are widely used in Russian Federation.

It is worth mentioning that some software packages that are used in Ukraine are outdated and have a great number of shortcomings. The software currently in use is incapable to perform a prediction for large territories and large number of sources. In most cases elevation as well as buildings are not taken into account. Also, there is no usable visualization, no Internet versions of the packages, no databases and built-in tools for input of geographical information, no meteorological preprocessor, no support for data import-export from other systems and a lot of other shortcomings.

The use of foreign software packages is impossible in Ukraine due to several reasons. The most prominent are the inconsistency of operational methodologies and absence of observations for some required indicators that are used for calculations. Besides this, foreign models have a wider range of input data and make a number of amendments resulting from the specific features of regions. This leads to the necessity of adapting computational models to the conditions of Ukraine.

³ <http://www.sfund.kiev.ua/eng/products/ecology.htm>

6. PREDICTIONS AND PLANNING IN THE DOMAIN OF AIR PROTECTION

Predictions and planning in the domain of air protection is systematically carried out according to the Laws of Ukraine "On state prediction and development of economic and social growth programs for Ukraine", "On environmental protection" and "On air protection".

Governances of ecology and natural resources are systematically develop Programs of air protection and sanitation as part of the Regional programs on the environmental protection and ecologic safety. They are created in each region of Ukraine for a five year period. The program contains measures to reduce PE at the regional level. There are also sections devoted to activities in the domain of air protection and ecologic monitoring.

In turn, Programs of air protection and sanitation in Ukrainian cities are developed by local authorities for a five year period, taking into account the requirements of the Law of Ukraine "On state prediction and development of economic and social growth programs for Ukraine " and the Law of Ukraine "On air protection" .

Separately, each enterprise upon obtaining the permission for PE, submits a program of environmental protection activities and target indicators. This program must provide measures for PE reduction and reaching the existing standards, measures for air quality monitoring and control of PE, etc. Every major enterprise has air pollution monitoring program, according to which air quality control is carried out at the impact zone of this enterprise.

Air quality and emissions predictions are carried out at urban scales, groups of enterprises or individual enterprises during the development of Programs of urban air protection and sanitation while obtaining permissions for PE, background concentrations assessment, etc.

For prediction, the dispersion models are used (SND-86 methodology) and corresponding software packages. Regression model estimates of emissions and air quality are also used together with the development of scenarios of economic development of cities and taking into account production programs of enterprises. Regression models establish the relationship between the observed annual average concentrations of some pollutants and the bulk volume of emissions for certain industrial areas, such as areas of cities. The main problem in this domain is a trustworthy prediction of socio-economic development of cities for several years. A trustworthy prediction of technical and economic performance of enterprises is also very important for the preparation of production programs upon changing of economic conditions.

Predictions of air quality and emissions at regional and national scales with complete area coverage (e.g. on a regular latitude-longitude grid) is carried out quite rarely. This is due to the absence of commonly accepted and trustworthy models for prediction of air pollution over large areas of Ukraine. Predictions are carried out primarily during the research at, both, public and regional levels.

7. GAP-ANALYSIS OF COMPONENTS IN THE DOMAIN OF AIR PROTECTION

GAP-analysis of components in the domain of air protection is directed towards the study of differences between the air quality monitoring, PE management and general trends in this domain in European countries.

The purpose of GAP-analysis of components is to identify the trends and opportunities, which would eliminate the lagging from general development trends and improve the situation in the domain of air protection in the future.

Based on information collected during the GAP-analysis and a subsequent detection of differences in the domain under investigation compared with other countries, the primary tasks for improvement of the overall situation were devised. Mainly, these tasks are directed towards reaching the desired situation in the domain of air protection in the future.

It is obvious that Ukraine should continue further improvement of the legislation in the domain of air protection, develop systems for air quality monitoring and PE control, improve the existing norms and standards, carry out wider use of modern modeling tools of air pollution, as well as use modern prediction and planning tools for the preparation of Programs on the environmental protection and ecologic safety.

Appendices 1 and 2 give the analysis of problems in the domain of air protection in Ukraine, in turn, suggestions and recommendations that were formulated based on the results of analysis are given in the next section of this report.

8. RECOMMENDATIONS ON THE IMPROVEMENT OF AIR MONITORING AND QUALITY CONTROL SYSTEM

Considering the main results of the analysis carried out in this report, we have identified priorities and developed recommendations for improvement of air quality monitoring and management. We also give some priority activities. The summary is given below.

Ecological legislation development:

- develop the State ecological program on environmental monitoring of Ukraine till 2020;
- prepare the Strategy on implementation of the state policy on PE reduction into the air. It must concern main pollutants as well as heavy metals and CO₂. In addition, it must take into account the requirements of the EU Directives 2008/50/EC and 2010/75/EC;
- develop the Procedure on the environmental monitoring of objects with increased ecologic risk. And, in perspective, the Rules for ecologic safety of objects with increased ecologic risk.

Environmental monitoring system development:

- create system of automatic stations for PE monitoring and air pollution control on objects with increased ecologic risk;
- create information systems and automated air pollution monitoring stations for carbon oxides, nitrogen and sulfur oxides in 25 cities that exhibit high and very high levels of air pollution;
- introduce tools for automatic control of ozone and dust concentration in 5 cities that have very high level of air pollution;
- increase quality and quantity of information on environmental pollution by introduction of modern measurement and computing technologies for ecologic monitoring entities;
- extend the network of background monitoring stations;
- the MENR, as ecologic monitoring entity, should create public air monitoring network by consolidation of automatic stations into a single open information system;
- provide access to timely information on air pollution for public over Internet.

Development of management system for air protection:

- design perspective plan on the introduction of the Technological standards for allowable PE from equipment (facilities) for the most major industrial objects and enterprises as well as the Perspective standards for new facilities as well facilities under modernization governed by indicators of the best available technologies;
- develop mandatory requirements for operation of ecologically dangerous objects and study the opportunities of their introduction. For example, using the Rules on ecological safety for objects with increased risk;

- study the opportunities of harmonization of national ecological legislation in the domain of air protection with the requirements of the EU Directives 2004/107/EC, 2008/50/EC и 2010/75/EC;
- study the opportunities and the necessity for the introduction of additions to the State sanitary rules for air protection in human settlements from pollutants in terms of accounting the requirements of the EU Directives 2010/75/EU (introduction of notification thresholds, maximum pollution levels for human health protection, informational thresholds, extension of rules for air quality assessment, etc.).

Development of statistical and departmental reports:

- create informational system for statistical and ecological data for collaborative use in Order to prepare reports on the state of the environment as well as public informing on national and regional levels;
- improve the reporting on the PE inventory in accordance with the EMEP/EEA Guidelines.

Development of standards, normative and methodological documents:

- introduce air quality standards for dust: PM_{2,5} and PM₁₀;
- develop air quality standards for main pollutants (sulfur and nitrogen dioxides) for vegetation and biosphere as a whole; create methodology on ecologic risk assessment in case of environmental pollution;
- study the opportunity of air quality standards introduction taking into account annual indicators of air pollution by the substances defined in the EU Directives 2008/50/EC and 2004/107/EC.

Development of modeling and prediction methods:

- adapt contaminants dispersion models and corresponding software that are recommended in the EU countries to the peculiarities of Ukraine;
- introduce proven in the EU countries PE and air quality prediction methods to the Programs of air protection and sanitation on regional and urban levels (for example, EC4MACS modeling methodology).

Collaboration and training:

- organize coordinating meeting with representatives of European countries concerning the introduction of automated air quality monitoring systems that comply with the EU standards;
- organize meetings devoted to methods and tools of PE and air quality modeling and prediction approved by the EU countries;
- organize trainings on the usage of the EMEP/EEA Guidelines on PE inventory from sources that are currently not taken into account in Ukraine.

APPENDIX 1

System Review

Assessment (monitoring of air quality and of emissions, reporting, dissemination of information)

Country table: Ukraine

Note: The whole system of air quality assessment is described: Policy level (strategic documents, programs and plans), legislative level (Laws and by-laws), institutional level (ministries, supporting institutions), operational level (air quality monitoring, national emission inventories, data processing and availability, recent and on-going projects)

Policy level		
1	Special document on air monitoring	No
2	Special document on environmental monitoring	Yes - The 2004 Concept of the State Program on Environmental Monitoring - The 2007 State Target-Oriented Program on Environmental Monitoring - National Action Plan for Environmental Protection for 2011-2015 (Resolution of the Cabinet of Ministers of Ukraine № 577 on 25.05.2011)
3	Explicit provisions on air monitoring in environmental policy document	Yes
Legislative level		
4	Special legal act on environmental monitoring	Yes
5	Special legal act on air monitoring	Yes
6	Provisions on air monitoring in the Law on air protection	Yes
7	Provisions on air monitoring in general Law	Yes

	on environment	
8	Provisions on air monitoring in other Laws	Yes
Institutional level		
9	Air quality monitoring carried out by Hydromet	Yes
10	Air quality monitoring carried out by the department of ministry	No
11	Air quality monitoring carried out also by other institution (hygiene service)	Yes

12	Air quality monitoring carried out by municipalities	Yes
13	Air quality monitoring carried out by enterprises	Yes
14	Data on air quality collected by the ministry	Yes
15	Data on air quality collected by other institution	Yes
16	Data on emissions collected by the ministry	Yes
17	Data on emissions collected by other institution	Yes
18	Centralized national air quality database	Yes
19	Centralized national emissions database	Yes
Operational level – air quality monitoring		
20	Total number of monitoring stations	171 - 163 permanent stations of State Hydrometeorological Service of Ukraine (53 cities) - 5 automated municipal stations in 5 cities - 1 station for background monitoring (EMEP station, Karadag Nature Reserve of National Academy of Sciences of Ukraine, Theodosius)

		- 2 stations of transboundary transport of Ukrainian Hydrometeocenter (Svityaz, Rava-Russkaya)
21	From this total: Automated stations	5 automated municipal stations
22	From this total: Manual stations	163
23	From this total: EMEP stations	1
24	Parallel meteorological measurement	Yes
25	Measurement of PM ₁₀	No
26	Measurement of PM _{2.5}	No
27	Measurement of ground level ozone	No
28	Measurement of sulphur dioxide	Yes
29	Measurement of nitrogen dioxide	Yes
30	Measurement of nitrogen oxides	Yes

31	Measurement of carbon monoxide	Yes
32	Measurement of lead	Yes
33	Measurement of benzene	Partially
34	Measurement of nickel	Yes
35	Measurement of cadmium	Yes
36	Measurement of arsenic	Partially
37	Measurement of mercury	Partially
38	Measurement of benzo(a)pyrene	Yes
39	Measurement of other pollutants	Yes
Operational level – national emission inventories		
40	Data on emissions from registered stationary sources collected	Yes
41	Data on emissions from diffused (non-registered)	Partially

	sources estimated	
42	Data on emissions from mobile sources calculated	Yes
43	Annual emission inventory – sulphur dioxide	Yes
44	Annual emission inventory – nitrogen oxides	Yes
45	Annual emission inventory - VOC	Yes
46	Annual emission inventory - ammonium	Yes
47	Annual emission inventory – other pollutants	Yes
Operational level – data processing		
48	Analytical centre exists	Yes, under the Ministry of Environmental Protection of Ukraine
49	Dispersion models at national level	No
50	Dispersion models at sub-national level	Yes
51	Air quality projections	Yes
52	Emission projections	Yes
Operational level – air quality and emission data publication		
53	Annual reports on air quality	Yes
54	Annual report on the environment	Yes
55	Specialized annual statistical yearbook	Yes
56	General statistical yearbook	Yes
57	Quarterly bulletins	Yes
58	Monthly bulletins	Yes

59	Weekly bulletins	No
60	Daily bulletins	Partially (when a dangerous situation emerges)
61	Website (annual data available)	Yes
62	Website (on-line / near-to-real time data)	Partially (websites are present in several

		cities)
Operational level – projects in the field of air quality assessment		
63	Projects executed during last 5 years	Yes
64	On-going projects	Towards a Shared Environment Information System (SEIS) in the European Neighbourhood Countries (EC/EEA, 2010 – 2013) Air Quality Governance (EC, 2011 – 2014)

APPENDIX 2

System Review

Air quality management

Country Table: Ukraine

Note: The whole system of air quality management is described: Policy level (strategic documents, programs and plans), legislative level (Laws and byLaws), institutional level (ministries, supporting institutions), instrumental level (air quality standards, command and control instruments, economic instruments, voluntary instruments) operational level (permitting and enforcement, recent and on-going projects).

Policy level		
1	Special document on air protection	No
2	Explicit provisions on air protection in general environmental policy document	Yes
3	Explicit provisions on air protection in energy policy	Yes
4	Explicit provisions on air protection in transport policy	Yes
5	Explicit provisions on air protection in other policies	Yes
6	Specific document (policy, action plan) on particular issues (e.g. POPs or Heavy metals)	Partially
Legislative level		
7	Special legal act on air protection	Yes
8	Provisions on air protection in general Law on environment	Yes
9	Explicit provisions on air protection in other Law	Yes
Institutional level		

10	Main central competent authority	Yes
11	Other central authority with competencies in air quality management	Yes
12	Subnational (regional) authorities with competencies in air quality management	Yes
13	Local authorities with competencies in air quality management	Yes
14	Supporting institutions specialized in air quality (scientific research institutes, institutes of academies of sciences)	Yes

15	Hydromet	Yes
16	Hygiene service	Yes
Instrumental level – air quality standards ⁴		
17	PM ₁₀	No
18	PM _{2.5}	No
19	Ground level ozone	Yes
20	Sulphur dioxide	Yes
21	Nitrogen dioxide	Yes
22	Nitrogen oxides	Yes
23	Carbon monoxide	Yes
24	Benzene	Yes
25	Lead	Yes
26	Nickel	Yes
27	Cadmium	Yes
28	Arsenic	Yes
29	Mercury	Yes

30	Benzo(a)pyrene	Yes
31	Other pollutants	Yes
Instrumental level – Command and control instruments (emission limit values and other requirements)		
32	Technology based emission limit values for stationary sources	Yes
33	Generally binding technical requirements for operation of particular categories of stationary sources Best available techniques defined	Partially Partially
34	Fuel quality standards	Yes
35	Product standards (other than fuels)	Yes
36	Emission standards for cars	Yes
37	Emission standards for other vehicles	Yes
38	Emission standards for non-road mobile machinery	Yes

39	Ban on import of obsolete vehicles	Yes
40	Ban on import of other products	Yes
41	Administrative measures in the case of non-compliance	Yes
42	Self-monitoring by enterprises	Partially
43	Reporting by enterprises	Yes
Instrumental level – Economic instruments		
44	Air pollution charges	Yes
45	Product charges	No

46	Import duty on obsolete vehicles	Yes
47	Import duty on selected harmful products	Partially
48	Tax on fossil fuels	Yes
49	Road tax	Yes
50	Penalties	Yes
51	Environmental funds	Yes
52	Incentives	Yes
Instrumental level – Voluntary instruments		
53	ISO 14 000	Yes
54	Eco-labelling	In preparation
55	Voluntary agreements	No
Operational level – Permitting and enforcement		
56	All permits issued by central authority	Yes
57	All permits issued by local authority	No
58	Combined permitting (major projects by central authority, the minor ones by local authority)	No
59	Enforcement by the permitting authority	Yes
60	Enforcement by other authority	Yes
Operational level – projects related to air quality management		
61	Projects executed during last 5 years	Yes
62	On-going projects	Air Quality Governance (EC, 2011 – 2014)