

WORKING GROUP ON ENVIRONMENTAL MONITORING AND ASSESSMENT

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Latest Developments in Environmental Monitoring and Assessment at the National, Subnational and Company Levels

Submitted by the former Yugoslav Republic of Macedonia¹

A. Modernization and upgrading of monitoring networks, especially those on air, water and soil quality (in terms of number of stations, automated measurements and parameters measured)

AIR QUALITY

Air quality monitoring is performed by 3 institutions: Institute for Public Health, Hydrometeorological Administration and Ministry of Environment and Physical Planning.

The Hydrometeorological Administration started the installation of the air quality monitoring network in 1972. The total number of stations is 19, 18 of which are in urban areas and one in a rural area. Nine measuring points are located in Skopje. At one measurement point the measurements are done in Berovo, Bitola, Tetovo, Gevgelija, Kumanovo, Ohrid, Prilep, Stip and Veles. The measuring station in Lazaropole is background station and also part of the EMEP (European Monitoring Environment Program) network. Practically, all monitoring stations are at the same places as the meteorological stations. All stations are manual with 24 hours measurement periods, providing mean daily values. SO₂ and black smoke are measured on all these stations. From 1994 on 2 monitoring stations (at one station in Skopje and in Lazaropole) NO₂ and O₃ have been measured. In this moment three stations (Skopje, Lazaropole and Prilep) are operational because of lack of finance.

The Ministry of Environment and Physical Planning is managing with the State automatic ambient air quality monitoring system which consists of 15 monitoring stations. The designing of the network started with the establishment of four automatic air quality monitoring stations in 1998 in Skopje. In 2002, three additional monitoring stations were installed in Kocani, Kumanovo and Kicevo. In 2004 the following stations were established: one additional monitoring station in Skopje (measuring air pollution caused by traffic); two monitoring stations in Veles and Bitola respectively; one in Tetovo; one in the rural environment – village of Lazaropole located at the peak of a mountain to monitor transboundary air pollution. We have mobile monitoring station covering urban areas for which no fixed air monitoring station has been envisaged. For the beginning the mobile station is located in Kavadarci. In December 2008 two stations from Skopje were dislocated in the area of oil refinery (Mrsevci and Miladinovci). Almost all monitoring stations measure ecological and meteorological parameters. From among the ecological parameters SO₂, NO, NO₂, NO_x, CO, PM₁₀, O₃ are measured. BTX are measured on two monitoring stations. The following meteorological parameters are measured: temperature, humidity, pressure, wind direction, wind speed, and global radiation. In the frame of the State automatic ambient air quality monitoring system, six low volume samplers and four high volume samplers are placed, used for measuring PM₁₀ and heavy metals in the air.

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The Institutes for Health Protection have their own air quality monitoring network. Actually, Public Health Institute in Skopje has established monitoring network for measuring the concentrations of SO₂ and black smoke at seven measuring points and aerosediment at 30 measuring points. CO and Lead are measured two times per year with the duration of one week at four measuring points. Public Health Institute - Veles measures SO₂, black smoke and aerosediment at three measuring points in the City. Cadmium, Lead and Zink are measured continuously at one measuring point. Public Health Institutes in Kumanovo, Kocani, Tetovo, Bitola, Ohrid, Prilep and Stip monitor just aerosediment. All these stations are manual with 24 hours measurement periods, providing mean daily values.

Future extent of the monitoring network with two automatic monitoring stations will be realized in 2011 within the IPA project "Strengthening of central and local level capacities for environmental management".

WATER

Water monitoring

The general river monitoring strategy in the country is based on international experience and modern concepts. The River Monitoring System Project (RIMSYS), a cooperation project between the governments of the former Yugoslav Republic of Macedonia and Switzerland, is designed to revitalize the 40 year old national river monitoring system in the country. The project objectives are to establish good operating practices in the areas of water discharge measurement, water sampling, chemical analysis, and the processing and publishing of the monitoring data. RIMSYS is a prerequisite for the implementation of future water management strategies and measures for water protection.

Key actors in RIMSYS are, on the Macedonian side, the Ministry of Environment and Physical Planning (MEPP), the Hydrometeorological Administration (HMA) as implementing agency, and the Public Water Management Enterprise "Water Management of Macedonia" (PWME). On the Swiss side, the project is supported by the Swiss Agency for Development and Cooperation (SDC) together with its Coordination Office (COOF) at the Swiss Embassy in Skopje.

An essential element of RIMSYS is the reconstruction and revitalisation of part of the existing national measurement and monitoring network. The river monitoring procedure involves two distinct chains of action: water discharge measurement (with sensors installed at the stations) and water quality measurements (with sensors at the stations and/or water sampling with subsequent analysis in the laboratory). The outputs from these two chains are combined into load calculation and joint data processing and management.

An essential part of a modern monitoring system is a reliable and flexible data management system. To cover the needs of the Hydrometeorological Service within Rimsys the hydrological data management system HydroPro was implemented.

Monitoring of Surface Water Resources

Hydrology

Initial sporadic meteorological measurements and observation in the country commenced in Skopje in 1981. Organized systematic hydro-meteorological measurements and monitoring started in 1920's, when network of meteorological and hydrological stations was established. Presently, surface water resources are monitored at 110 gauging stations and 115 measuring points are used to monitor the groundwater. Hydrometeorological Administration (HMA) is performing the monitoring of the surface and groundwater quantities.

At 54 gauging stations on rivers, discharge and water level are monitored (45 stations in River Vardar Basin, 9 in River Crn Drim basin, 3 stations in River Strumica basin). On each of the three natural lakes: Ohrid, Prespa and Dojran there is one gauging station for monitoring the water level.

Water Quality Monitoring

Surface water quality monitoring is performed by Hydrometeorologica Administration (HMA). Monitoring covers a network of 20 measuring points located on rivers, lakes and reservoirs. Analyses are performed 12 (8) times per year (on monthly base). Quality control comprises analysis of physical-chemical, toxic-chemical, and saprobiological parameters. This is the full list of analyzed parameters: Ph value, visible waste substances, considerable smell, colour, dissolved oxygen, saturation with oxygen, BOD, permanganate index, rate of biological productivity, total soluble substances, total suspended substances, ammonium ion, nitrates, nitrates of iron, lead, zinc, cadmium, chrome Cr+6, specific indicators, indicators of oxygenic regime, indicators of mineralization, toxicity of chemical compounds, most probable number of coliform bacteria, radioactivity, quality of water proscribed by law and total quality assessment obtained from the water analyses.

Water quality monitoring of lakes Ohrid, Prespa and Dojran regarding physical-chemical parameters and bacteriological is performed by the Republic Health Institute, while detailed monitoring of physicochemical and microbiological parameters of the lakes Ohrid and Prespa are performed by Hydrobiological Institute from Ohrid.

Hydrobiological Institute from Ohrid is responsible institution for monitoring of Ohrid and Prespa Lakes, but also for their tributaries. In the framework of the Ohrid Lake Conservation Project, Monitoring programme was established with ten primary sampling stations on Lakes Ohrid and Prespa. Additional sampling locations were established at the mouths of the rivers into the lakes, along the shoreline, and in the littoral zone to investigate the pollution entering the lake.

Monitoring of Groundwater – quantity and quality

Monitoring of the ground water started in 1949 in Skopje and its surrounding, while in 1979 groundwater quality monitoring started on 20-30 sample points in the same region. In that period, with the same applied methodology, groundwater in Pelagonija, Polog and Strumica was monitored at 10 sampling points in each region. Due to budget reduction, this monitoring process was terminated. Out of 115 piezometric pipes installed, only 30 are still functioning.

Unfortunately, there is no systematic quantity and quality monitoring of the groundwater in the country. This area is the weakest point in the Macedonian monitoring system. Groundwater is very important due to links between surface and ground, especially in karst areas and alluvium area along the riverbeds.

SOIL

Permanent monitoring, which means systematized measurement, monitoring and control of the state, quality and changes in the soil as environmental media in the Republic of Macedonia does not exist.

There has been an increasingly recognized need to adopt appropriate law in the country, to regulate soil from several points of view, as environmental medium. It is necessary to establish the maximum permissible concentrations in soils for different purposes, with regard to heavy metals, certain substances as pesticides, polycyclic aromatic hydrocarbons, halogen hydrocarbons, etc.

Regarding data and information for soil quality, we have an erosion map to the scale 1:50 000 which was completed in 1992, but the digital version was finished in 2002, map of the irrigation net and these data, combined with a climatic map, could be used for the quick assessment of area vulnerable to salinization. The PHARE project Corina Land Cover 2000 (data of 1996) based on decoding of satellite images give data about land cover. All maps are to the scale 1:100 000. Based on these data an area vulnerable to land degradation and land use change could be assessed. A soil map to the scale 1:50 000 has not been finished yet.

The monitoring of the state of the soil concerning certain heavy metals, was carried out in the Municipality of Veles in the course of 2004 and 2005, as one of the most endangered and most contaminated areas in the country, due to the long operation of the Lead and Zinc Smelter. Such monitoring was conducted by the Institute for Health Protection in Veles.²

In the area of monitoring of soil degradation and protection, we should mention the Project National Waste Management Plan and Feasibility Study, financed by the European Union and implemented through European Agency for Reconstruction. In the framework of this project, a Case Study was developed on Industrial Contaminated Hot-spots, where based on certain parameters, examinations and application of algorithm, hot-spots have been ranked by the risk they pose to environment and human health.³

The second project carried out with the donation provided by the Japan Agency for International Cooperation (JICA) is the Study on capacity building in the management of pollution related to mining. This Project provides detailed analyses of soil with regard to the presence of heavy metals as pollutants produced by mining activities in the eastern part of the former Yugoslav Republic of Macedonia in the area of 201.5 km², as well as capacity building in mining related pollution management.⁴

B. Development of inventories of air emissions, wastewater discharges and waste

AIR EMISSIONS

There are three existing inventories in our country National Cadastre of polluters and pollutants, CORINAIR inventory and GHG Inventory. The system of Pollutant Release and Transfer Register (PRTR), National emission ceilings (NEC) inventory and Inventory on the large combustion plants (LCP) have not been established yet. The development pathways of the three existing inventories are given below:

CADASTRE of polluters and pollutants

Data on companies identified as air polluters are entered into the national electronic Access database - the Cadastre of air pollutants and polluters. The first prepared Cadastre for air emissions includes data from 2004/2005. This database contains data from around 1600 entities, regarding the amount of pollution for the following five pollutants: CO, NO_x, SO₂, VOC and TSP, as well as additional data on entity location, description of the technological process, general data for the business subject, electricity consumption etc. These data are gathered by site distribution and collection of the questionnaires from the business subjects, emission measurements and estimation. The Cadastre is currently updated with 2008-2009 emission data.

² Annual report for the state and quality of environment in Republic of Macedonia, 2005. Ministry of Environment and Physical Planning.

³ Special study E, Industrial Contaminated Sites (hotspots), 2005. National waste management plan and feasibility studies, European Agency for Reconstruction.

⁴ JICA-Mitsubishi materials natural resources development corporation, December 2007, The Study on capacity development for soil contamination management related to mining in the Republic of Macedonia, Final report-Summary.

CORINAIR Inventory

Calculations of pollutants emission are carried out on the basis of multilateral agreements in the area of air, namely Convention on Long-Range Transboundary Air Pollution (CLRTAP) through the program for inventory of pollution CORINAIR (CoR Inventory for Air Emission). Establishment of CORINAIR Methodology for Emission Inventory in the country was carried out through the support provided by EEA, and the Topic Centre, ETC/ACC (European Topic Centre on Air Quality and Climate Change) in the period 2004-2005. This program through the SNAP (Selected Nomenclature of Air Pollution) methodology is applied for air emission inventory of the main air pollutants: CO, NO_x, SO₂, VOC and TSP. The application of CORINAIR methodology received status of adopted national methodology in 2009 in the the former Yugoslav Republic of Macedonia and it is also used for reporting towards the European Environmental Agency and CLRTAP. The new cycle of CORINAIR inventory was finished in March 2010 and accordingly reported towards UNECE and EEA.

GHGs Inventory

In addition to inventory by SNAP methodology under the CLRTAP, inventory of substances belonging to the group of greenhouse gases (GHGs) have been prepared for the first time in 2002 under UNDP project. The Intergovernmental Panel for Climate Change (IPCC) was the methodology used for this inventory. The three main GHGs (CO₂, N₂O, CH₄) were estimate and time series 1990-1998 were included. The inventory referred to the following key sectors: Energy, Industrial Processes, Agriculture, Land-use Change and Forestry, and Waste. In 2008 Second National Communication on Climate Change has been produced. This cycle included information on the other non-direct GHGs: HFCs, PFCs and SF₆ as well as CO, NO_x, SO_x and NMVOCs. Time series 1999-2002 were recalculated for the period 1990-1998. No other update of the GHGs inventory has been established since then, because of the lack of funds.

WASTEWATER DISCHARGES AND WASTE

Identification of polluters and pollution with waste production and wastewater discharges in the country through development and upgrade of Cadastre of polluters and pollutants at national level is ongoing and will be finished till the end of 2010.

C. Expanding monitoring of biodiversity, including forests

BIODIVERSITY

Continuous monitoring of natural heritage and biodiversity in the country has not been established yet. Under the Law on Nature Protection, the Ministry of Environment and Physical Planning is obliged to monitor and organize the monitoring of the status of nature. The monitoring of nature protection includes: measurement, monitoring, assessment and control of the state of species, their habitats, habitat types and environmentally important areas. Methodology for monitoring performance and a National monitoring programme need to be adopted.

At national level, state and scientific institutions perform activities by which partial investigations of the state of individual components of biodiversity and geodiversity are carried out.

In terms of biodiversity, monitoring is performed with regard to Balkan lynx (*Lynx lynx martinoi*) within National Parks Mavrovo, Pelister and Galicica, determination of biocorridors for the brown bear (*Ursus arctos*), monitoring of common birds and birds of pray in several

ornithological sites in the country, as well as monitoring of Prespa trout (*Salmo peristericus*) in Prespa region and parts of the National Park Pelister.

In the frames of the ongoing UNDP/GEF Project: "Integrated Ecosystem Management in the Prespa Lakes Basin of Albania, FYR of Macedonia and Greece (2006-2011)", Study on the Transboundary Prespa Park Monitoring has been prepared. The goal of the Study is to organize transboundary monitoring system with routine surveillance as a key short/medium-term guideline in the Prespa Park basin

The monitoring includes components of biodiversity (habitats and species), water (quantity/quality), and socio-economic characteristics. The Study focuses on seven thematic areas requiring monitoring at transboundary level, namely:

- Water (quantity/quality)
- Aquatic vegetation and habitats
- Forests and terrestrial habitats
- Fish and fishery
- Birds and other biodiversity (species)
- Socio-economic characteristics
- Land use

Pilot phase of monitoring of parameters/indicators of transboundary importance has been initiated. The Study has envisaged of significant number of parameters, while limited number of monitoring parameters have been selected for the pilot phase.

Under the thematic area - Aquatic vegetation and habitats, the activities focus on identification of locations and areas under reed, species composition and structure of reed vegetation.

Under the thematic area - Fish and fishery , current activities are aimed at determining the trend of populations of endemic fish species in Prespa Lake, trends in populations of Prespa trout, chub, barbel and carp, as well as the trend of introduced fish species and qualitative and quantitative fish species composition, used by cormoranes as food.

Under the thematic area - Forests and terrestrial habitats, the activities should determine the structure and dynamics of forests and other terrestrial habitats in Prespa Park.

Under the thematic area - Birds and other biodiversity (species), monitoring activities are carried out with regard to bat populations in certain caves, the status of the populations of winter migratory birds and waterfowls in Prespa Park, as well as activities concerning man and Brown bear interaction.

At present, monitoring of forest ecosystems has not been established and data is obtained through the developed plans for forests growth, protection and use.

For the purpose of implementing intensive and permanent monitoring of forest ecosystems, taking into account damages caused by atmospheric impacts and other natural disasters which cause changes in the status of forests and forest land, the state administrative body responsible for the performance of the affairs in the area of forestry adopts a Programme of measures and activities for data collection in relation to the extent of damage of the forest and establishes register of forest damage extent. The programme is adopted for two years, and it is prepared and implemented by the Faculty of Forestry-Skopje.

D. Improvement of data handling, including data quality assurance and control standards and norms and database management

Data handling and quality assurance

Improvement of data handling including data quality assurance have been carried out through the activities of the Twining project “Air quality improvement” during the period September 2006-2008. Within component 3 and 4 of the project following trainings have been completed: Training of data processing according to EU Air quality directives; Training on basic data validation from State automated air quality monitoring system, Training on correction of the data using linear interpolation according to the performed instrument calibration; Training for preparation of SOP’s and documents for providing quality assurance of the air quality data (Forms, Registers, Plans), development of QA/QC plan and trainings for implementation of the QA/QC procedures. The new Twining project “Strengthening of central and local level capacities for environmental management in the area of air quality” which will start in September this year will insure further improvement of data handling and higher data quality assurance.

Control standards and norms

Regarding use of control standards and norms, Technical committee for Air quality 17 working under Institute for standardization have already adopted air quality and air emission ISO and CEN standards as national standard with endorsement. Rulebook on the methodology for ambient air quality monitoring adopted in 2009 content EU air quality standards regarding reference methods.

Database management

Many institutions are included in the establishment of the regulated environmental programmes, such as: pollution control and quality of air, water and soil; noise control; solid and liquid waste control etc. Within this programmes information systems have been developed that refer to strictly focused areas in the environment and are suitable only for special needs. The institutions manage with a large amount of small, mutually unconnected and unsynchronized databases, inadequate for fulfilling wider needs and requests;

No predefined and established criteria and standards for the design of the information systems and unreliability of the data management methods used by different institutions or in the frame of the same institutions that results with creation of mutually independent and incompatible information system. Coordination and cooperation between the relevant institutions is not on the satisfying level.

Review of present situation for air data management system and identification of needs for furthered development of the software were carried out within the twinning project Air quality improvement. Upon this, specification and procurement of new data management software is currently performed through the IPA project “Strengthening of central and local level capacities for environmental management”. The new software will be purchased in 2011 and further develop through the Twining project “Strengthening of central and local level capacities for environmental management in the area of air quality”.

E. Enhancement of institutional mechanisms for data sharing and data exchange between environment ministries, environmental information institutions, institutes of ecology, hydrometeorological services, statistical offices, ministries of health, water, agriculture, industry, transport and energy.

All environmental data and information obtained by the monitoring networks and self-monitoring originating from different institutions, entities and bodies, in accordance to the provisions of the Law on environment are submitted to the Ministry of Environment and Physical Planning (MEPP) i.e. to the Sector- Macedonian environmental information centre (SMEIC). SMEIC establishes and maintains relevant and adequately processed (systematized and standardized) database, accurate, transparent and publicly available information of the condition/state, quality and trends in all environmental segments (water, air, soil, noise ionising and unionising emission and protected parts and objects of the nature). There is an adequate communication and data transfer system between MEPP and other relevant institutions, but needs enhancement. There is a big progress in the development of the Environmental information system, but the system needs further development towards establishment integration- relation base of all environmental data.

Cooperation between MEPP and Ministry of Health is essential for crating adequate concept and implementation of integration between environment and health protection policies. MH joins in this area through competences of the State sanitary and health inspectorate and the Republic institute for health protection.

SOIL

All activities regarding measurement and monitoring for soil quality are not well defined and are spread over different institutions which have responsibilities in agriculture, forestry, water economy, ecology and environment. One of the biggest problems is the communication between different institutions and lacking the mechanisms for data sharing and data exchange.

F. Publication of environmental assessments at the subregional, national, subnational and project-based levels and the indicators used therein

- Annual Report on all environmental media
- SOER –every fourth year
- Environmental statistic - every second year
- Yearly indicators report

G. Environmental reporting to the international community, especially to multilateral environmental agreements

AIR

Each year until 1 October, air quality data from the previous year (from all institutions performing air quality monitoring), are submitted to the European Topic Centre on Air and Climate Change in the DEM (Data Exchange Module) format proposed by EEA, by NRCs for air quality or its substitute.

The data on ozone monthly and summer exceeding is processed separately in accordance with Directive 2002/3/EEC on ozone air pollution, and submitted to the European Topic Centre on Air and Climate Change by NRCs for air quality. Monthly data (information on the exceeding of alert thresholds) is reported before the end of the following month. Summer data (summer reference period is 01 April – 30 September) is reported not later than 31 October.

The air emission data based on CORINAIR methodology required by the convention for Convention on Long-Range Transboundary Air Pollution (LRTAP) are reported each year until 15 February, and the informative report is reported latest on 15 March. The CORINAIR

inventory and the informative report that were prepared in 2010, were with the air emission data for 2008.

In relation to United Nations Framework Convention on Climate Change (UNFCCC), using the methodology of the Intergovernmental Panel of Climate Change (IPCC), the Second National Communication on Climate Change of the Republic of Macedonia has been produced, including Green House Gas inventories (GHG), by 2002 and the inventory and the communication were reported towards EEA.

WATER

Each year until 31 October, water quality and quantity data from the previous year (from all institutions performing water monitoring), are submitted to the European Topic Centre on Water in the WISE SOE Reporting format proposed by EEA.

The water emission data based on Cadastre of polluters and pollutants at national level are reported until 31 October, are submitted to the European Topic Centre on Water in the WISE SOE Reporting format proposed by EEA.

From this year until 31 October, data on biological quality elements in surface waters from the previous year (from all institutions performing water monitoring), are submitted to the European Topic Centre on Water in the WISE SOE Reporting format proposed by EEA.

SOIL

Macedonian Environmental Information Centre within the Ministry of Environment and Physical Planning regarding soil quality is responsible for gathering and analyzing of data and information related to any way of soil degradation and contamination, land use change, erosion, salination, etc, as well as for reporting. Data and information have been gathered from certain published papers, books of individual authors or group of authors, environmental statistics, measurements from some institutions, environmental inspectorate etc.