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STATE OF THE NATIONAL ENVIRONMENTAL MONITORING SYSTEM IN UKRAINE AND PROSPECTS FOR DEVELOPMENT

Submitted by the delegation of Ukraine[1]

Summary

The report discusses the regulatory underpinnings of the Ukrainian State Environmental Monitoring System and the positions and roles of the Interdepartmental Commission on Environmental Monitoring Issues and monitoring entities.

It describes the methods, measuring equipment and information employed in environmental monitoring, the formulation and execution of regional monitoring programmes, and State monitoring of the air, water, land and other aspects.

It identifies the main improvements pending in the Ukrainian State monitoring system with due regard for priorities in the monitoring field and efforts to put them into effect.

[1] Report prepared by Mr. Oleg Velichko, Chief, Environmental Monitoring Department, Ukrainian Ministry of the Environment and Natural Resources.

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Introduction

1. Environmental monitoring is an important means of controlling the quality of the environment, providing timely warning of harmful pollutants affecting the air, the water, the soil, public health and welfare, and keeping the public informed about the state of the environment and environmental trends.

2. Monitoring is carried out in order to obtain precise and accurate quantitative information on flux levels of harmful or potentially harmful substances in the environment; its principal purpose is to trigger administrative action to protect, preserve and restore the quality of the environment etc.

3. The availability of standard monitoring equipment, mandatory monitoring indicators and standard programmes and procedures for collecting and processing information, modelling and forecasting environmental processes is an important aspect of an effective monitoring system at the State level.

4. While seeking to improve the operation of a functioning State monitoring system with limited resources, it is vital to work towards harmonization with European Union environmental monitoring indicators; the Committee on Environmental Policy of the United Nations Economic Commission for Europe can be of notable assistance in this regard.

I. REGULATORY UNDERPINNINGS OF THE STATE ENVIRONMENTAL MONITORING SYSTEM

5. Ukraine has a fairly extensive set of laws and regulations governing environmental monitoring. A list of some of them is given in table 1.

6. In implementation of article 22 of the Environmental Protection Act of 25 June 1991, the Cabinet of Ministers, by resolution No. 785 of 23 September 1993, approved regulations governing State monitoring of the environment which set forth the basic requirements of a State monitoring system - structure, levels, organizational principles, modus operandi and so forth.

7. By resolution No. 391 of 30 March 1998, the Cabinet of Ministers endorsed the Charter of the State Environmental Monitoring System, which, taking account of experience within the State monitoring system, lays down the procedure for the establishment and operation of the State Environmental Monitoring System (SEMS).

8. Cabinet of Ministers resolution No. 528 of 16 May 2001 introduced some amendments into the Charter, making for better organization and tighter coordination among the entities within SEMS by setting up an ad hoc Interdepartmental Commission on Environmental Monitoring Issues, having departmental standards drawn up on the procedure the SEMS entities would use to monitor the environment, clarifying the indicators to be used in environmental monitoring, reaching agreement on these provisions with the Ukrainian Ministry of the Environment and Natural Resources, and registering them accordingly.

Table 1

Some laws and regulations governing environmental monitoring

	Title, date of adoption	Title of article(s)
State Environmental Monitoring System	Environmental Protection Act, 25 June 1991 Cabinet of Ministers resolution approving the Charter of the State Environmental Monitoring System, No. 391, 30 March 1998 Cabinet of Ministers resolution No. 1551 establishing an interdepartmental commission on environmental monitoring issues, 17 November 2001	Article 22, "Monitoring of the natural environment"
Atmospheric monitoring	Air Protection Act, 16 October 1992 Cabinet of Ministers resolution No. 343 approving the procedure for arranging and conducting air-protection-related monitoring, 9 March 1999	Article 43, "Air-protection-related monitoring"
Water monitoring	Ukrainian Water Code, 6 June 1995 Cabinet of Ministers resolution No. 815 approving the procedure for conducting State water monitoring, 20 July 1996	Article 21, "State water monitoring"
Soil monitoring	Ukrainian Land Code, 25 October 2001 Cabinet of Ministers resolution No. 661 approving the land monitoring regulations, 20 August 1993	Article 33, "Land monitoring"
Biological monitoring	Plant Life Act, 9 April 1999 Animal Life Act, 3 March 1993 Act ratifying the Convention on Biological Diversity of 5 June 1992, 29 November 1994	Article 39, "Plant-life monitoring" Article 50, "Animal-life monitoring"
Waste monitoring	Waste Act, 5 March 1998	Article 29, "Monitoring of waste generation, storage and disposal sites"
Monitoring of hazardous natural phenomena and other items	Hydrometeorology Act, 18 February 1999	Article 12, "The State hydrometeorological observation system"

9. SEMS (see Annex 2) is a system for observing, gathering, processing, transmitting, storing and analysing information on the state of the environment, forecasting changes and putting forward scientifically based recommendations for decisions to forestall undesirable changes in the environment and meet environmental safety requirements. SEMS is a component of the national data infrastructure, an open information system, and its operational priorities are to protect the vital environmental interests of mankind and society, preserve natural ecosystems, avert disastrous changes in the state of the environment and forestall environmental emergencies.

10. SEMS uses the existing organizational structures at monitoring entities, operating on the basis of a single set of regulatory, organizational and methodological standards and measuring equipment, and an amalgamation of constituent parts and unified system components. The administrative integration of system elements at all levels is handled by the Ministry of the Environment and Natural Resources authorities on the basis of nationwide and regional (local) monitoring programmes, which consist of programmes at the respective levels put forward by entities belonging to the monitoring system.

11. The purpose of SEMS is to integrate the environmental information systems covering particular land areas; it is based on the principles of harmony between regulatory and administrative arrangements, compatibility among the equipment, data and software used by its constituent parts, systematic monitoring of the environment and man-made facilities with an environmental impact, timely acquisition, thorough processing and application of the environmental data reaching and stored by the System, and objective, routinely distributed raw data, analysis and environmental forecasts.

12. SEMS is intended to enhance investigation and understanding of the state of the environment and the timeliness and quality of the information supplied to users at all levels, the quality of the justification offered for environmental protection measures and the effectiveness of their execution, and to promote international cooperation in protecting the environment, making rational use of natural resources, and ensuring environmental safety.

13. A number of research efforts concerned with information-sharing among environmental monitoring entities under routine conditions and in emergencies, corresponding regulations on cooperation among such entities, and instructions and requirements relating to the equipment installed at standard environmental monitoring stations are being coordinated with a view to improving the organizational arrangements for the establishment and upgrading of SEMS; so, too, are the establishment of an observations database (air and water properties) at the Ministry of the Environment and Natural Resources and work under the interdepartmental "Environmental diagnostics, assessment and monitoring" and other such scientific programmes.

II. MONITORING ENTITIES

14. Monitoring is carried out by monitoring entities under nationwide and regional (local) programmes. The establishment and operation of SEMS and its component parts is financed, in accordance with the procedure for financing nature conservation activities, out of the resources available in State and local budgets, as the law requires.

15. A list of environmental monitoring entities and the domains they have been assigned to monitor is given in table 2. Altogether 10 entities belonged to the State monitoring system over the period 1993-1999; between 2000 and 2002, eight did, partly owing to administrative reforms of the central executive authorities in Ukraine.

Table 2

Monitoring entities and features monitored

Entity	Features monitored
Ministry of the Environment and Natural Resources	Air and precipitation Sources of industrial atmospheric emissions Surface, underground and marine waters* Sources of waste-water discharges, including radionuclides Land used for various purposes* Geochemical state of terrain Terrestrial and aquatic ecosystems Industrial and household waste dumps Endogenous and exogenous processes Elemental and hazardous natural phenomena Geophysical fields
Ministry of Emergency Situations (in radioactively contaminated zones)	Air Sources of atmospheric emissions Surface and underground water Terrestrial and aquatic ecosystems Sources of waste-water discharges Land and terrain Radioactive waste burial sites
Ministry of Health (in residential/recreational areas)	Air Marine waters Drinking water Land Physical factors

Table 2 (continued)

Entity	Features monitored
Ministry of Agro-Industrial Policy	Surface water in agricultural use Land in agricultural use Agricultural crops and derivatives Farm animals and animal products
State Forestry Committee	Forest land Woodland growth Hunted species
State Committee on Water Management	Rivers, reservoirs, canals, irrigation systems and bodies of water within the footprints of nuclear power stations Surface water in border areas and areas of intensive industrial use Terrestrial and marine waters Irrigated and drained land Areas surrounding reservoirs
State Committee on Land Resources	Land and terrain Irrigated and drained land Land vegetation cover
State Committee on Building, Architecture and Housing Policy	Underground water Drinking water in centralized water-supply systems Waste water from urban sewage networks and treatment facilities Green spaces in cities and urban-type settlements

* Including within conservation areas.

16. The main tasks of SEMS entities are to conduct long-term, systematic observations of the state of the environment, analyse it and forecast changes, provide information and analysis in support of decision-making on environmental protection issues, the rational use of natural resources and environmental safety, and offer information services.

17. Relations between entities in the system are based on the reciprocal supply of information in support of decisions on environmental conservation, the rational use of resources and environmental safety, coordination before and during the planning, organization and conduct of common environmental monitoring exercises, effective use of existing organizational structures and means of monitoring environmental features and the computerization of processes, cooperation in securing the most efficient approach to common monitoring and environmental safety challenges, accountability for the completeness, timeliness and accuracy of the information they transmit, and collective use of information resources and communications media in exchanging information.

III. THE INTERDEPARTMENTAL COMMISSION ON ENVIRONMENTAL MONITORING ISSUES

18. To give effect to its resolution No. 528 of 16 May 2001, the Cabinet of Ministers on 17 November 2001 passed resolution No. 1551 establishing the Interdepartmental Commission on Environmental Monitoring Issues and approving the Charter of the Commission.

19. The membership of the Commission includes senior representatives of all SEMS entities and officials from all State monitoring bodies. With a view to more effective operation, the Commission decided in 2002 to set up separate sections dealing with air monitoring, water monitoring, land and waste monitoring and information support, and an expert board.

20. The creation of the Commission is bound up with the need to increase the level of organization and coordination of work on matters relating to the establishment of SEMS by defining a specific range of questions it can take up, and to ensure coordinated take-up of the component parts of SEMS by monitoring entities under the appropriate national and regional-level programmes.

21. The single Interdepartmental Commission, bringing together all strands of environmental monitoring, will allow the functions of monitoring entities to be clarified, and will make for more rigorous organization and a focus on results by monitoring entities as efforts to improve SEMS continue. The Charter of the Commission takes account of the experience that has been acquired in dealing with coordination issues, with due regard for contemporary socio-economic and environmental problems, and of corresponding approaches to the establishment of component parts of an environmental monitoring system.

22. Tackling questions that affect all SEMS entities is the Commission's main sphere of activity: establishing nationwide and regional (local) monitoring programmes in accordance with jointly established priorities; formulating or fine-tuning the standards and methods on which monitoring is based; and creating basic computer resources for the component entities in the system, debugging them for collective use.

IV. ENVIRONMENTAL MONITORING METHODS AND INFORMATION SUPPORT

23. Determining the methods for use by the amalgamated constituent parts and components of the monitoring system is the responsibility of the Ministry of the Environment and Natural Resources, with backing from system entities and other institutions and organizations, and is gone about on the basis of a single set of methods for measuring environmental parameters and defining environmental indicators and sources of human influence on them, the introduction of unified methods for analysing and forecasting environmental properties, the computerization of operating processes and data communication, standard rules governing the creation and maintenance of distributed data/knowledge banks and bases, the production of environmental maps, and standard technologies that draw on geographical data systems.

24. Information reaching SEMS is used by State and local authorities in decision-making on matters to do with environmental conservation, the rational use of natural resources and environmental safety, and is made available to them in accordance with the approved regulations on the provision of information to users of SEMS and its constituent parts. Regulations on the procedure for data exchange by Ministry of the Environment and Natural Resources bodies and other constituents of the environmental monitoring system in their conduct of prescribed state-of-the-environment observations, which have been agreed upon by all monitoring entities, are being introduced by monitoring entities as a means to improve information support within the SEMS framework.

25. National reports on the state of the environment in Ukraine are published every year in Ukrainian and English pursuant to article 25 of the Environmental Protection Act of 25 June 1991. They are submitted at specified times to the national parliament - the Supreme Council of Ukraine - and to the Presidential Administration, the Cabinet of Ministers, ministries, government departments, libraries, academic institutions, the parties chiefly responsible for implementation of parts of the reports, voluntary organizations and anyone else interested in receiving environmental information.

26. Aggregate assessments based on monitoring information are used in appropriate sections of the reports; monitoring information is also used to produce regional reports on the state of the environment. The national reports also make use of remote sensing data produced by the National Space Agency (space maps and imagery). Publication of the reports has increased from 100 copies in 1991 to 1,500 copies in 2000, and there are plans to increase it further to 2,000 copies in the year 2001. In recent years, electronic versions of the reports have also appeared on CD-ROM (for principal report users).

27. Other yearly compendiums drawing on monitoring information are also published in Ukrainian, both nationally and locally. These include “Environmental protection and use of natural resources in Ukraine: a statistical compendium” published by the State Committee on Statistics; “Safety from natural and man-made disaster in Ukraine and principal efforts to enhance it”, produced by the Ministry of Emergency Situations; regional reports such as the compilation on Donetsk oblast, “Land of our Disquiet, from material in the report on the state of the environment in Donetsk oblast in 2000”; annual bulletins by the State Hydrometeorological Service, and many others.

28. Since 2001 the Ministry of the Environment and Natural Resources has had a web page on the Internet in Ukrainian and English (www.mepr.gov.ua) on which it posts monitoring information. It has had a web server in operation since 2002 and is now gathering and systematizing environmental data already available on the Internet and loading the web server with environmental information (yearly state-of-the-environment reports, the web pages of the Ministry's branches in the regions and so forth). Later it is planned to use the Ministry's web server as the foundation for an environmental portal, something Ukraine does not yet possess.

V. REGIONAL ENVIRONMENTAL MONITORING PROGRAMMES

29. To make State and regional environmental monitoring more efficient, in 2001 the Ministry of the Environment and Natural Resources approved recommendations on methods for the preparation of regional and State environmental monitoring programmes, which are now being introduced at the regional level. Regional monitoring systems continue to be set up and enhanced under SEMS. Monitoring programmes are drawn up with due regard for the regulations on the procedure for drawing up environmental programmes approved by Cabinet of Ministers resolution No. 1091 of 31 December 1993, and Cabinet of Ministers resolution No. 44, "Some questions relating to the financing of nature conservation activities from the State budget", of 24 January 2001.

30. A multipurpose environmental monitoring data analysis system for Zaporozhye oblast has been set up in the Donetsk-Dniepr region under the Zaporozhye oblast monitoring programme. High levels of man-made pollution in the oblast adversely affect the environment, and setting up a regional monitoring system and a working observation network involving all monitoring entities active in the oblast is thus a component part of any solution to the important problems this situation causes.

31. Monitoring entities in Lugansk oblast are defined in regulations on the regional (oblast-level) environmental monitoring system approved by the head of the oblast-level State authorities. The procedure for setting up and ensuring the effective operation of an environmental information network to serve the regional monitoring system, exchanging data from monitoring entities on the current status of the environmental features they have under observation, cooperation, access to environmental information, the procedure for divulging environmental information and the regularity with which information should be divulged while monitoring takes place are laid down in regulations on exchanges of information and cooperation in the conduct of monitoring, and notification of the appropriate executive and local authorities and the population of the oblast, which have also been approved by the head of the oblast-level State authorities.

32. Similar efforts have continued in 2001-2002 in the Ukrainian capital, Kiev, where the Programme for the creation of the Kiev environmental monitoring system, 1999-2003, is in progress in accordance with the technical proposal registered with the Ministry of the Environment and Natural Resources. The establishment of the regional monitoring system is being directed and followed up by the State Department of the Environment and Natural Resources in Kiev and the Kiev Council Standing Committee on Environmental Protection, Environmental Safety and Protection of the Population from the Consequences of the

Chernobyl Disaster. As part of this process a round-the-clock monitoring centre receiving data from two checkpoints situated alongside busy highways has been set up. Each checkpoint has automatic gas detectors for NO_x, SO_x and CO, the readings from which are uploaded into the EkoGIS-Kiev geodata system database on the state of monitored features.

33. Work is also under way in many other oblasts, but the establishment of similar systems is being hampered by the lack of materials and equipment at the monitoring services and by insufficient computerization and automation of the measurements themselves.

VI. ATMOSPHERIC MONITORING

34. Council of Ministers resolution No. 343 of 9 March 1999 approved rules on the organization and conduct of atmospheric monitoring which lay down the features to be monitored, including air quality, precipitation and atmospheric emissions. Lists of common pollutants, precipitation indicators and ingredients and pollutants taken into account for monitoring purposes have been established.

35. Atmospheric monitoring yields raw data on emissions and pollution readings, aggregate data on pollution levels in given parts of the country over a specified time period, and emission composition and volumes, and an estimate of pollution levels and the threat they pose to the environment and human activity. Every year, the Ministry of the Environment and Natural Resources produces aggregate assessments (qualitative and quantitative) of emissions and air quality for, inter alia, the environmentally least favoured cities in Ukraine. The findings of these assessments are also published in the yearly national reports.

36. Atmospheric monitoring was conducted in 48, 54 and 52 Ukrainian cities at 165, 167 and 159 fixed monitoring stations in 1991, 1996 and 2001 respectively, in addition to two transboundary pollution monitoring stations. Atmospheric content of 36, 39 and 34 pollutants, including heavy metals and benz[a]pyrene, was checked. The observation network also makes use of 18 mobile stations. Mobile observations were conducted, additionally, in seven cities (see Annex 1).

37. The monitoring network has displayed a slight fall in the number of observations made, from 165 in 1991 to 159 in 2001. The number of ingredients measured changed slightly as the environmental situation in various parts of Ukraine altered. The observation network chiefly uses the set of rules and standards employed in the former USSR. The number of laboratories rose from 34 in 1991 to 35 in 2001, while the number of expert staff employed in identifying pollutants fell somewhat.

38. The general trend in the number of observation stations at individual enterprises checking atmospheric emissions over the period 1991-2001 proves to have been upward, while the number of sources at which emissions were determined has declined. Over the period, there has also been a sustained tendency for numbers of contaminants analysed, laboratories and, consequently, staff engaged in such analysis to rise.

VII. WATER MONITORING

39. Cabinet of Ministers resolution No. 815 of 20 July 1996 approved rules on State water monitoring, which measures water quality and quantity with a view to the collection, processing, storage and analysis of information on the water situation, the forecasting of changes and the production of well-founded recommendations for decisions on water-resource use and renewal.

40. Water features monitored by the State include surface water (natural bodies of water - lakes; watercourses - rivers, streams; artificial bodies of water - reservoirs, canals and other structures), underground water and sources, inland marine waters and the territorial sea - Ukraine's exclusive economic zone; sources of water pollution, including backflows, accidental discharges and waste, losses of products and materials during underwater mining operations in surface waters, inland marine waters and the territorial sea, waste dumping, surface run-off from farmland; leakage of pollutants from technology-related reservoirs and storage facilities; proliferation of blue-green algae, secondary contamination from river- and lake-bed deposits, and other pollution sources susceptible to monitoring.

41. The fruits of monitoring are the raw data (observations) obtained by monitoring entities, aggregated data relating to a defined interval of time or a particular area, indices and compound indicators derived from parameter-based interpretation, an assessment of the water situation and adverse influences upon it, forecasts of the water situation and changes in it, and the well-founded recommendations necessary for decision-taking at the national and regional levels.

42. National, regional, departmental and local water monitoring programmes are under development by monitoring entities; these define networks of observation stations, indices and observation regimes for water features and pollution sources, and regulations to govern the transmission, processing and use of information. The monitoring entities are improving or setting up their own internal special services.

43. As regards purpose, monitoring divides into background (on bodies of water in areas with a minimal average man-made environmental burden), general (at stations in the State observation network, measuring man-made impact on bodies of water where they are exploited, and ad hoc monitoring) and crisis (in areas at high risk or affected by accidents or disasters).

44. Forecasts of the state of bodies of water are produced by mathematical modelling of qualitative and quantitative features in order to come up with recommendations for action to avert possible adverse changes and improve the current state of the bodies of water concerned. Monitoring entities submit their own assessments of water quality and forecast changes to the Ministry of the Environment and Natural Resources every year, along with the recommendations needed for decisions to be taken. The aggregated assessments are used in the corresponding sections of the national (State-level) and regional (regional-level) reports on the state of the environment.

45. The state of a body of water is monitored in accordance with a general list of indicators which includes indicators of the quantity of water resources and changes in them, water quality and environmental safety standards for water use, environmental standards and water-quality category for bodies of water etc., observations of the sources of adverse influences on the state of

water bodies - indicators used in establishing maximum emission standards, water-resource use, toxicity of circulating water, ground-water quality within the footprints of solid waste burial sites and so forth.

46. The network that monitors sources releasing waste water and surface water has seen a significant increase in the number of observation stations, from 836 in 1991 to 1,125 in 2001, while the numbers of ingredients checked, laboratories and staff engaged in identifying pollutants have all increased (see Annex 1). The surface water monitoring network has shown an upward trend in the number of observation stations and ingredients measured, the latter accompanied by an increase in laboratory numbers. There has been a slight tendency for the number of laboratories to decline and the numbers of experts engaged in identifying contaminants to stabilize.

47. For underground water monitoring, the trend has been towards a decrease in the number of observation stations, from 7,000 in 1991 to 1,400 in 1996 and 1,496 in 2001. For underground water monitoring, the trend has been towards a decrease in the range of equipment used. Quantitative information on the list of ingredients monitored is unavailable. As for the methods followed, typically the methods employed in the former USSR are applied, among them the 1987 Temporary Recommendations on methods for the organization and conduct of geological monitoring.

48. In 2001 the Ministry of the Environment and Natural Resources approved Standard Interdepartmental Guidelines on the organization and conduct of water monitoring, which specify the division of functions among State water monitoring entities, lay down precision and accuracy requirements for laboratories measuring water composition and properties and so forth.

49. A number of international water monitoring projects have been and are under way in Ukraine. Between 1996 and 2000, a Tacis programme to set up an accident and emergency warning system (AEWS) and monitoring, laboratories and information management (MLIM) for the Ukrainian and Moldavian segments of the Danube basin was in effect. The project has resulted in the creation of two main international reporting centres, in Uzhgorod (western Ukraine) and Izmail (southern Ukraine).

VIII. LAND MONITORING

50. Regulations on land monitoring were approved by Council of Ministers resolution No. 661 of 20 August 1993. According to the Land Code, land monitoring is a system of observations of the state of land in the country conducted with a view to the timely discovery and evaluation of changes, the reversal of undesirable processes and elimination of their effects. The regulations are to be reviewed shortly in connection with the adoption by the Supreme Council of a new Land Code in 2001.

51. Reports, forecasts and recommendations are drawn up by monitoring entities on the basis of their assessment of the state of the land. Depending on the extent of the territory encompassed, land monitoring can be global, national, regional or local; in each case it consists in systematic observations of the state of the land (surveys, investigation and prospecting), the identification of changes, and evaluation of a series of parameters. Observations are divided,

depending on their timeframes and regularity, into background (initial, establishing the state of the feature monitored at the time when monitoring begins), periodic (occurring every year or longer) and routine (capturing current changes).

52. The state of use of land, fields, and plots; processes associated with changes in land fertility (water and wind erosion, humus loss, deteriorating soil structure, swamping and salination); agricultural land becoming overgrown; land contamination with pesticides, heavy metals, radionuclides and other toxic substances; the state of stream, sea, lake, bay, reservoir and estuary shorelines; hydraulic structures; processes associated with ravine, landslip and mudslide formation, earth tremors, sink holes, cryogenic and other phenomena; the state of the land in inhabited areas, areas with oil and gas drilling facilities, refining plants, fuel, lubricant and fertilizer stores, vehicle and lorry parks; and land containing burial sites for toxic industrial waste and radioactive material and other industrial facilities, are all subject to assessment.

53. The network that monitors soil and irrigated land is made up of isolated fragments (see Annex 1) but has shown an upward trend in numbers of observation stations, ingredients measured and laboratories. There has been a steady trend in the monitoring of endogenous and exogenous processes towards a reduction in the number of observation stations and laboratories while the number of ingredients measured has increased somewhat. Beginning in 2002, there are plans to monitor the geochemical state of terrain, given that there are 1,500 test sites on Ukrainian soil. Such observations have been carried out in Kiev and elsewhere since 1996.

IX. OTHER KINDS OF MONITORING

54. Article 39, "Plant life monitoring", of the Plant Life Act of 9 April 1999, and article 50, "Animal life monitoring", of the Animal Life Act of 3 March 1993 specify that plant and animal life monitoring are an integral part of environmental monitoring and are to be carried out by SEMS. The entities responsible are the State Committee on Forestry and the State Committee on Land Resources, which carry out monitoring as part of their assigned budget programmes.

55. Article 29, "Monitoring of waste generation, storage and disposal sites", of the Waste Act of 5 March 1998 specifies that with a view to the determination and forecasting of the environmental impact of waste and the timely discovery, prevention and reversal of undesirable effects, generators of waste and their owners, together with executive authorities with special powers to deal with environmental protection and nuclear safety, are to monitor waste generation, storage and disposal sites as part of the work of SEMS. The entities responsible are the Ministry of the Environment and Natural Resources (industrial and household waste dumps) and the Ministry of Emergency Situations (radioactive waste disposal facilities).

56. Article 12, "The State hydrometeorological observation system", of the Hydrometeorology Act of 18 February 1999 covers the range of fixed and mobile observation stations and equipment available to the Ministry of the Environment and Natural Resources' hydrometeorological service, which includes background measurements of chemical and radioactive pollution in the environment. The features monitored are air quality and precipitation, surface and marine waters, soil including radionuclides and, in particular, elemental and hazardous natural phenomena. Information on the service's observation network showing changes over time (1991, 1996, 2001) is given in Annex 1.

57. Common problematic issues for the various types of monitoring discussed in this section and for others not discussed above include a lack of established standards and methods and facilities and equipment for carrying them out.

X. MEASURING EQUIPMENT FOR ENVIRONMENTAL MONITORING

58. Responsibility for the measuring equipment employed by the amalgam of the constituent parts and components of SEMS rests with the Ministry of the Environment and Natural Resources, with backing from all monitoring entities and the authorities of the State Committee on Standards: the system employed is based on a unified technical policy on questions of standardization, metrology and measurement certification, computer and communications equipment and a unified set of standards and methods, ensuring reliability and comparability of measurements and results from the processing of environmental information at all the constituent parts of the system.

59. The analytical methods used display an established preference for the traditional methods of chromatography, spectrophotometry, potentiomentry, flame photometry, conductivity measurement, gravimetry, titration analysis, atomic absorption, turbidimetry and radiometry. Among other methods employed mention should be made of electrochemical gas analysis, which is used to monitor industrial emissions into the atmosphere.

60. There is a distinct tendency to use automatic gas analysing equipment operating in real time and employing chemiluminescent, fluorescent, flame-ionization and other analytical techniques to monitor atmospheric pollution.

XI. PENDING IMPROVEMENTS TO THE STATE ENVIRONMENTAL MONITORING SYSTEM

61. According to the Environmental Performance Review of Ukraine approved by the ECE Committee on Environmental Policy on 29 September 1999, the Ministry of the Environment and Natural Resources needs to increase its coordinating activity as regards the conduct of environmental monitoring. The Ministry's coordinating role is being increased by clarifying a number of provisions within SEMS relating to the management of the Interdepartmental Commission on Environmental Monitoring Issues secretariat and specialist sections, and the harmonization of departmental standards governing the procedures to be followed by SEMS entities in environmental monitoring etc.

62. Effective coordination by the Ministry and effective operation of SEMS at the State and regional levels should also be secured by organizing and coordinating work on the preparation of regional and State environmental monitoring programmes and so forth. More effective environmental conservation is directly bound up with the quality of environmental monitoring.

63. A range of research is in process to influence the current administrative reform of the State apparatus in Ukraine; this includes an inventory of laboratories and creation of an updated database of instruments and methods for observation networks with corresponding proposals for

enabling them to work more efficiently. Activities of this kind should make for a higher level of organization and coordination in monitoring efforts at the State level and define the procedure to follow in improving the monitoring system at both State and regional levels, while logically linking the functional obligations of all monitoring entities.

64. While improving SEMS at a time when resources are limited, efforts must be made to work towards harmonization with the environmental monitoring indicators in use in the European Union. This can be accomplished by developing common standards and formats and an established environmental vocabulary and arranging for them to come into common currency. Such an approach would yield standardized indicators for the yearly national reports on the state of the environment and pave the way for the future integration of SEMS into the overall European monitoring system.

65. Testing the methodology for harmonizing the monitoring and environmental reporting systems in the newly independent States, enhancing the role played by Governments in this area, making use of new environmental research methods and technologies and making extensive use of monitoring data in environmental data systems intended for wide public access using, for example, Internet technology to process and submit environmental data, are all important issues.

66. If the necessary decisions are to be taken on the basis of the data obtained through SEMS, the algorithms and necessary conditions for them must be known and national- and regional-level information must be distributed. There would be merit in using European Union experience, i.e. evaluating its directives as a means of obtaining information not only on the state of the environment but on changing environmental phenomena (before and after action is taken) so as to see how effective environmental conservation measures are.

67. The basic criterion judging for whether monitoring data need to be collected should be a basic list of the minimum information needed by officials taking decisions on environmental matters. Gathering and then analysing and selecting among the largest possible volume of monitoring data is economically and environmentally pointless. The basic approach should be one based on the need for the country to comply with its international obligations and national requirements deriving from current legislation. Varying quantities of raw data must be used for decision-making at different levels.

68. How to manage the resulting information flows, clearly assign responsibility for supplying accurate information and define the purposes for which it is applied are questions it is important to answer. An effective means of organizing the information acquisition process is to make it mandatory (EU directives, for example, are binding on EU States). Since monitoring is environmentally worthwhile and a preventive measure, it must be given due attention when the case for attracting investment is made.

69. The apparatus and equipment in use at SEMS observation networks, which is obsolescent both on paper and in actual fact and is leading to a degradation of the networks themselves, must be replaced by modern, automatic or automated instruments and systems and up-to-date

equipment that can be used extensively and effectively in field conditions. Beside the limited financing available under the State budget, it would be appropriate to attract technical assistance funds from a variety of international, regional and national environmental organizations for this purpose.

70. Ukraine has mapped out a strategy for developing and increasing the efficiency of SEMS over the short term (2002-2003), medium term (3-5 years) and long term (5-10 years) which is directly bound up with forecasts of national economic growth and prospects for the integration of the country into European political and economic organizations and structures. The recommendations of the Ad Hoc Working Group on Environmental Monitoring could prove an important source in the formulation of the new strategy and the correction of the existing one.

Annex 1: Some figures on the SEMS observation networks

FEATURES MONITORED	No. of observation stations			No. of ingredients measured			No. of laboratories			No. of staff employed		
	1991	1996	2001	1991	1996	2001	1991	1996	2001	1991	1996	2001
Air quality	165 (18**)	167	159	36	39	34	34	36	35	412	392	378
Sources of industrial emissions*	551/ 2 565	629/ 2 490	841/ 629	56	68	61	37	46	54	76	121	121
Precipitation	33	33	33	11	11	11	1	1	1	2 (33***)	2 (33***)	2 (33***)
Sources of waste-water and surface-water discharges	836	907	1 125	42	51	66	44	51	57	140	151	201
Underground water (geological observation network)	7 000	1 400	1 496	30	34	35	17	17	12	1 100	680	480
Surface water, incl. hydrobiological indicators (hydrobiological observation network)	240	240	240	50	47	46	12	12	12	82 (240***)	82 (240***)	82 (240***)
Surface water, incl. rivers, reservoirs, canals, irrigation systems, etc.	…	…	324	…	24	29	…	28	29	170	168	153
Land used for various purposes, incl. conservation areas	150	266	588	21	57	70	12	15	26	12	17	38
Land (under meteorological service programmes)	61	49	53	18	14	13	1	1	1	30	26	28
Irrigated land	…	49 350	32 440	…	17	19	…	17	20	…	62	58

* The "Sources of industrial emissions" entry indicates first the number of businesses, then the number of sources at which monitoring took place;
** Number of peripatetic stations (additional); *** Number of staff also performing other functions (additional); … = no information available.

Annex 2: The State environmental monitoring system (State-level)