Chapter I

ENVIRONMENTAL MONITORING SYSTEMS

Under the former Soviet Union, research institutes, hydrometeorological services, public health agencies and other bodies collected large volumes of data related to environmental conditions and trends. Often, however, agencies did not share their data. Moreover, data quality varied, and data series were often not directly compatible (covering, for example, different sampling areas, time series, etc.). The data collected contributed to environmental research and to overview reports on environmental conditions. Nonetheless, difficulties in compiling and comparing data limited a systematic evaluation of the state of the environment. Moreover, little work was done to analyse, integrate and synthesize data for policy development and environmental information was rarely released to the public. (UNECE, 2000d)

A. Monitoring activities

As part of their efforts to establish and strengthen national environmental policy and management, the countries of Eastern Europe, the Caucasus and Central Asia have sought to improve their environmental monitoring systems over the past decade. However, difficult economic conditions, together with other factors (including political instability and conflict), have hampered reform and investment across the EECCA subregion (see fig. I). The subregion has returned to economic growth since the mid-1990s (the solid line presents an average across all EECCA countries). Nonetheless, economic conditions in many countries remain well below levels of a decade ago. For the three Caucasus countries, GDP trends have been worse than the EECCA average. In contrast, the Central Asian countries, many of which have extensive oil and other natural resources, have on average done better.

Economic problems have created severe difficulties for government budgets and public services, including environmental monitoring systems.

The situation concerning environmental monitoring systems varies substantially across EECCA countries. Nonetheless, two main groups can be identified. The first group of countries has maintained the scope of monitoring activities over the past 10 years, or seen only limited decreases. These countries have launched institutional reforms and introduced new programmes for specific geographic areas and environmental issues. Ukraine provides one example (see box 1). Belarus and the Russian Federation are also in this category.

Figure I. GDP trends in EECCA (1990 = 100)

Source: UNECE
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The second group includes countries, in particular in the Caucasus as well as in Central Asia, that have faced severe economic conditions and in some cases political uncertainty and conflict. As a result, these countries have had difficulty maintaining existing monitoring systems: the number of monitoring stations, the volume of data collected and the range of environmental media covered have declined drastically. Georgia provides an example of this group of countries (see box 2).

**Box 1. Environmental monitoring in Ukraine**

In Ukraine, environmental monitoring systems have continued to operate over the past decade. Networks of monitoring stations have remained fairly stable with, for example, about 150 fixed ambient air monitoring stations in about 50 cities. Wastewater monitoring stations have increased slightly, from almost 850 in 1991 to over 1,100 in 2001. Across monitoring networks, however, equipment is ageing and needs replacement.

For biodiversity, although Ukraine has greatly increased its protected areas over the past 10 years, the monitoring of species and ecosystems has been reduced to a minimum.

Ukraine’s Government has strengthened the legal basis for and the overall coordination of monitoring work, and current programmes seek to improve environmental monitoring (see box 3).

*Sources:* Ukraine, 2002; UNECE, 1999.

The second group includes countries, in particular in the Caucasus as well as in Central Asia, that have faced severe economic conditions and in some cases political uncertainty and conflict. As a result, these countries have had difficulty maintaining existing monitoring systems: the number of monitoring stations, the volume of data collected and the range of environmental media covered have declined drastically. Georgia provides an example of this group of countries (see box 2).

**Box 2. Environmental monitoring in Georgia**

Georgia’s difficult economic situation brought severe cutbacks in funding for environmental monitoring. Over the past decade, monitoring stations and equipment have deteriorated and many have become unusable. In general, budget allocations cover only salary costs and minimum services at monitoring institutions, leaving little money for essential maintenance or new equipment.

The Ministry of Environment’s 12 subnational departments oversee the self-monitoring by companies: this is based mainly on energy and mass balance calculations with little actual emission measurements, as equipment is either obsolete or non-existent. Similar resource problems affect State agencies involved in direct monitoring, such as the State Department of Hydrometeorology (Hydromet), which is responsible for collecting, storing and analysing data on surface water quality, air quality and soil. Hydromet currently monitors ambient air pollution in only four cities, tracking but five pollutants. At the State Department of Geology, responsible for mineral resources, only 30 of its 500 stations to monitor groundwater levels are operating. Moreover, there has been little work to update operating methods, guidelines and protocols over the past 10 years. Quality control for monitoring data is uncertain. Overall, Georgia at present does not have systematic environmental monitoring.

Georgia’s Ministry of Environment, in cooperation with other agencies, has drafted a strategy to strengthen environmental monitoring to be implemented in stages through 2010 – however, funding for this initiative remains uncertain.

*Sources:* UNECE, 2003a; Georgia, 2002.
Policy context

All EECCA countries have developed new environmental policies over the past decade, including environmental strategies and NEAPs. They have also established new environmental laws, typically starting with framework laws. In this process of reform, governments and environmental authorities have sought to improve the policy relevance of their monitoring systems.

The linkage between policy and monitoring priorities remains an important area for work across the EECCA subregion. Existing environmental monitoring systems do not meet all policy needs. In some countries, a contrast remains between the large volume of data produced on certain topics and the difficulty in using these data to support decision-making (UNECE, 2000d). In many EECCA countries, however, the decline in monitoring work means that data are incomplete or simply not available in key environmental policy areas.

Institutions

The new national framework laws in EECCA countries typically refer to environmental monitoring, as well as to public access to environmental information. In addition, many countries have developed specific legislation and regulations that define monitoring responsibilities and tasks among public authorities. For example, table 1 lists the various agencies involved in monitoring in Belarus. Subnational and local offices, as well as research institutions, are often involved.

A few countries have sought to consolidate the agencies involved. For example, in a few countries, hydrometeorological agencies, which are commonly responsible for a broad range of monitoring, such as ambient air quality, have been placed under ministries responsible for environmental protection.

### Table 1. Agencies involved in environmental monitoring in Belarus

<table>
<thead>
<tr>
<th>Environmental category</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health, including environmental health</td>
<td>Ministry of Health, National Health and Epidemiology Centre, Belarus Hygiene and Epidemiology Research Centre, Belarus Health and Hygiene Research Institute</td>
</tr>
<tr>
<td>Air, surface water, radiation,</td>
<td>Radiation Control and Natural Environment Monitoring Centre</td>
</tr>
<tr>
<td>agriculture-related soil contamination</td>
<td></td>
</tr>
<tr>
<td>Groundwater</td>
<td>Belarus Geological Survey Research Institute</td>
</tr>
<tr>
<td>Land/soil</td>
<td>State Committee on Land Resources, Geodesy and Mapping, the Soil Science and Agro-chemistry Institute (a State-owned research establishment), Belgorod State University</td>
</tr>
<tr>
<td>General atmospheric ozone content</td>
<td>Department of Hydrometeorology, National Ozone Monitoring Centre</td>
</tr>
<tr>
<td>Earthquakes/seismic activity</td>
<td>Belarus Academy of Sciences Institute of Geological Science</td>
</tr>
<tr>
<td>Environment – Complex</td>
<td>Belarus Ekologia research centre</td>
</tr>
<tr>
<td>Flora</td>
<td>Belgosles State forestry association, Beliesinvest unified enterprise, Belarus Academy of Sciences Institute of Experimental Botany, Belgorod State University</td>
</tr>
<tr>
<td>Fauna</td>
<td>Belarus Academy of Sciences Institute of Zoology</td>
</tr>
<tr>
<td>Emergencies</td>
<td>Ministry of Emergency Situations, Radiation Control and Environmental Monitoring Centre</td>
</tr>
<tr>
<td>Local environmental monitoring</td>
<td>Ministry of Natural Resources and Environmental Protection</td>
</tr>
</tbody>
</table>

Source: Belarus, 2002.
Given the broad array of agencies involved, however, most EECCA countries have instead focused efforts on improving coordination and cooperation among these bodies and establishing a unified environmental monitoring system. In Belarus, the Government approved the National Environmental Monitoring System Programme in 1995, assigning the Ministry of Natural Resources and Environmental Protection to implement it. An interdepartmental supervisory board oversees reforms. The Russian Federation created the Unified State System on Monitoring in 1993. The 2000 Government Decree on the National Monitoring Service further strengthened coordination: the Federal Hydrometeorology and Environmental Monitoring Service (Roshydromet) and the Ministry of Natural Resources have the main responsibility for environmental monitoring, assisted by other agencies. Ukraine established the Interdepartmental Commission on Environmental Monitoring Issues in 2001 (see box 3). These national coordinating bodies and unified systems have worked to establish common standards and procedures for monitoring activities and ensure data exchange.

In a few other EECCA countries, however, national monitoring responsibilities remain loosely defined, resulting in a duplication of effort and a lack of coordination and cooperation among agencies. In one country, data exchange between public authorities is based on payments.

Coordination between central agencies and subnational and local offices is also a major challenge. Subnational and local monitoring needs to respond to specific conditions, policy priorities and institutional arrangement. In the Russian Federation, the Federal Environmental Protection Act gives the local entities some jurisdiction over monitoring. The National Monitoring Service is negotiating cooperative agreements with these entities to devise programmes that provide the necessary data for both national and subnational purposes. More than 70 such agreements had been concluded by mid-2002. (Roshydromet, 2002). Ukraine is also seeking to improve coordination across levels of government (see box 3).

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**Box 3. Ukraine: improving institutional coordination**

While the Ministry of Environment and Natural Resources has a key role in monitoring, in particular through its Hydrometeorological Service, a series of other ministries and State committees are also involved.

In 1998, Ukraine’s Council of Ministers established the State Environmental Monitoring System to integrate the different monitoring networks at these entities, improve the compatibility of equipment, data and software and provide timely, accurate data to end-users. In 2001, the Council passed a series of amendments, creating an ad hoc Interdepartmental Commission to strengthen coordination. The amendments also call for the development of common monitoring standards and indicators. The Commission itself created several sections for air, water, land and waste monitoring, as well as an expert board.

The System also intends to integrate subnational environmental monitoring programmes: monitoring of pollution emissions is organized at the sub-national level. In specific areas, such as Zaporozhye oblast (in the highly polluted Donetsk-Dnieper area), a regional monitoring system and observation network was created to bring together all active monitoring entities. Similar programmes are under way or planned for other oblast networks, though funding difficulties slow their implementation. Coordination within the national system, however, is an important challenge.

A recent strategy proposes short- (2002 and 2003), medium- and longer-term actions to strengthen the System. Key actions include: further coordinating and unifying the different elements of the System; improving harmonization with European approaches in areas such as indicators; setting priorities for data collection; and improving data quality.

*Sources:* Ukraine, 2002; UNECE, 1999.
Despite these goals and actions, coordination among the organizations involved in environmental monitoring remains poor overall across many EECCA countries (EEA, 2003).

**Funding**

Financing remains a significant obstacle to improving monitoring systems across EECCA countries.

As noted, a few EECCA countries have been able to maintain the basic outlines of their monitoring systems and start reforms. In some cases, in particular in Belarus and the Russian Federation, off-budget environmental funds have at times played a vital role by financing environmental monitoring in the face of budget cuts. However, even in these countries, monitoring equipment is ageing and needs replacement. Modern computer systems are needed to collect, analyse and share data (see chap. II). In addition, environmental authorities have difficulty hiring and retaining monitoring experts.

In other EECCA countries, funding problems are much more acute, and routine monitoring activities have been sharply reduced or discontinued altogether. Many industrial facilities also lack the financial resources to maintain the equipment that measures their pollution. The reliability and accuracy of available ambient data are highly uncertain for some areas. Thus, it is impossible to fully evaluate the environmental situation in these countries (UNECE, 2000d).

International assistance programmes have provided some support for new equipment and ongoing monitoring work. International assistance has also supported monitoring programmes, for transboundary ecosystems such as the Caspian and Aral Seas. For example, the European Union (EU) TACIS Programme has financed water pollution accident and emergency warning stations in the Republic of Moldova and Ukraine for the Danube River Basin Programme.

**Specific monitoring activities**

The reporting process for the third pan-European environmental assessment report (Kiev Assessment) identified important gaps across specific monitoring areas. The biggest gaps in data availability across the EECCA subregion are related to urban air pollution, soil contamination, soil remediation, waste management systems including hazardous waste, water quality, waste-water treatment and discharge to water and hazardous substances. In contrast, coverage was relatively good for soil erosion, land cover, and water quantity and use (EEA, 2003).

Monitoring coverage and data availability for Urban air quality are poor in some countries. This is a concern in particular as air pollution in relation to human health is a serious problem in EECCA cities (box 4 provides an overview of air pollution monitoring in Central Asia). Other areas of air monitoring, in particular for transboundary pollution, described in the following section, need to be strengthened across the region.

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**Box 4. Urban air pollution monitoring in Central Asia**

Environmental monitoring systems across Central Asian countries have declined severely over the past decade, owing in particular to insufficient funding. The situation varies significantly, however. The problems are the most obvious in Tajikistan, where the number of fixed ambient air pollution stations declined from 21 to 3. In Kyrgyzstan, only a dozen stations continue to operate in four cities.

Other Central Asian countries have been able to maintain more elements of their air-monitoring network. In Uzbekistan, for example, 69 stations operate in 25 cities. However, some key stations in these countries have been closed: Tursunzad, in Turkmenistan, for example, has lost three stations that track air pollution from the nearby Tajik Aluminium Plant. In addition, sampling has been reduced at many monitoring stations that continue to operate.

*Source: Regional Environmental Centre for Central Asia (RECCA, 2002).*
For soil and land use, monitoring related to soil contamination is another important gap. Although more data on the number of contaminated sites have gradually become available, their analysis is hampered by a lack of comparability and information on progress in and costs of remediation. In contrast, information on the extension of the area affected by soil erosion, especially the area of agricultural land affected by erosion, is available (most countries have data for the past 10 years). However, not all countries have data on the amount of soil lost by erosion; moreover, units measured are not homogenous, making comparisons difficult. The most complete data set concerns land use with time series covering the past 10 years.

Although data on the generation and management of solid waste – both total levels and for key categories – are generally accessible, data quality is not good enough for analysis in all countries. In several countries, hazardous waste data are also unreliable because of inaccurate inventories and different classification systems. Quantitative and qualitative data on the generation, use, disposal and environmental effects of industrial waste are not reliable in a number of countries (UNECE, 2000d). Industrial waste and chemicals monitoring in Armenia is described in box 5.

An overview of waste monitoring in three Central Asian countries is presented in box 6.

There is a general lack of environmental monitoring and comparable data and information on the water quality in EECCA (across rivers, lakes, groundwater and coastal waters). National surface-water monitoring systems are not coherent, as neither the data reporting systems nor the methodologies are harmonized. One issue affecting many countries is that tasks and mandates of various ministries and agencies involved in monitoring water quality and quantity are not well defined, leading to overlapping efforts and lack of coordination. In Ukraine, seven national bodies – ministries and State committees – had a role in different aspects of water monitoring in the late 1990s (UNECE, 1999). In Uzbekistan eight major agencies are involved, together with an extensive network of their subordinate departments and other local entities (RECCA, 2002). The lack of coordination can reduce the effectiveness of environmental policy instruments, contributing to low collection rates for water use and water pollution charges and penalties.

In most EECCA countries, monitoring systems for biodiversity are cumbersome and expensive to manage (UNECE, 2000d). This is a problem also for shared ecosystems, such as marine and coastal areas of the Caspian Sea (UNECE, 2000b). In some cases, biodiversity monitoring has largely ceased, for financial reasons. This is the case in Uzbekistan, whose wetlands are of global and regional importance (UNECE, 2001), and in Armenia, whose Red Data Books are based on data from the 1970s and early 1980s (UNECE, 2002a).
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Beyond specific environmental issues, the environmental impacts of major economic sectors such as transport, energy and agriculture are poorly monitored. In many countries, emission data on polluting enterprises are lacking, and environmental performance reporting (including data on environmental expenditures) by companies is only just starting. Moreover, the emission data available in some EECCA countries give only a rough idea of the role of transport in air pollution (often, the share of pollutants such as carbon monoxide and lead emissions that originate from transport is not estimated). (UNECE, 2000d)

Sampling and measurement of industrial emissions are often uncertain, even in countries that have largely maintained their monitoring systems (box 7 describes the situation in Ukraine). In countries facing severe funding problems, this monitoring has been significantly curtailed. In Kyrgyzstan, for example, only two of the Ministry of Environmental Protection’s six regional offices regularly carry out emissions sampling (UNECE, 2002c). Self-monitoring by industry poses a problem of information reliability on several levels, including the often poor condition of measuring equipment used. In Uzbekistan, highly polluting facilities, such as oil and gas processing plants and coal-fired power plants, lack efficient monitoring equipment (UNECE, 2001). Weak monitoring of compliance with permits discourages their strict application by industry in many cases.

Box 6. Waste monitoring in Central Asia

The Kazakh National Statistics Agency has considerably improved its reporting system for industrial waste generation, including hazardous waste, over the past 10 years. In contrast, data on municipal waste generation are poor and in some cases unreliable. Kazakhstan does not have an inventory of contaminated sites. Data on hazardous wastes stored at industrial areas are also incomplete.

In Kyrgyzstan, the National Statistics Committee has collected data on hazardous industrial waste from enterprises via questionnaires since 1994. However, the accuracy of responses is not verified. Mining industry, in particular for uranium, has been a major sector in Kyrgyzstan – one specific concern is the need to improve monitoring of mine tailings for soil and water contamination and other threats. Unmonitored mine tailings are a potential concern in other Central Asian countries as well.

In Uzbekistan, data on solid waste generation and disposal are fragmentary and conflicting. Among the areas that require attention is hazardous medical waste, a potential health risk. Its transport and disposal are not tracked.


Box 7. Monitoring industrial air pollution in Ukraine

In the late 1990s, Ukraine had over 2,500 inspectors who checked emissions at major polluting facilities. Random inspections were also made. Samples were analysed at 49 inspectorate laboratories across the country. Overall, however, equipment was ageing and the inspectorate was not able to ensure regular and complete control of major polluters. Moreover, most industries had little capital investment: factories typically were poorly equipped with pollution measuring devices. Samples were taken only occasionally – there was no equipment for continuous emissions measurement. These were important concerns, as factory pollution control equipment had been ageing and emissions in some cases rising. Air emissions were and continue to be calculated based largely on production processes, energy consumption and mass balances.

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One issue across different monitoring activities is that EECCA countries often lack national guidelines that ensure uniform sampling, measurement and analytical work. Moreover, in many countries there is no system in place for accrediting laboratories that analyse samples (UNECE, 2000d).

Case study: monitoring transboundary air pollution

Eight EECCA countries are Parties to the Convention on Long-range Transboundary Air Pollution (CLRTAP). Among these, the Russian Federation also participates in the Arctic Monitoring Assessment Programme (AMAP) and the Helsinki Commission for the Convention on the Protection of the Marine Environment of the Baltic Sea Area. These and other international conventions and programmes call on member countries to submit information on transboundary air pollution. Currently, however, limited measurement data make it impossible to develop an overall pattern of pollution in EECCA. (This section is based on Meteorological Synthesizing Centre - East, 2002.)

Some countries provide only partial data on emissions levels. For example, in its reporting for the CLRTAP, Armenia does not estimate lead emissions from road transport, although for the majority of countries this is the main source. Other countries (including Belarus and Ukraine) assess only ammonia emissions from industrial sources, while the main input of ammonia is typically from agriculture.

The EECCA subregion has few air pollution monitoring stations that contribute data to transboundary air pollution programmes, such as the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) under CLRTAP. For example, the Russian Federation provides measurement data on nitrogen and sulphur compounds to EMEP. Figure II shows that there are few monitoring stations, and these are located mainly in the northwest of the Russian Federation.

The primary network of long-range atmospheric transport monitoring stations, particularly for persistent organic pollutants (POPs), was developed during earlier AMAP activities. Recently this network has been expanded to fill gaps in geographical coverage. A POPs monitoring station was established in 2000 in Amderma, in the Russian Arctic, within the framework of a joint Russian/Canadian AMAP project.

Along with monitoring data, mathematical modelling provides information about pollution levels from national and external sources, long-term trends, seasonal variations, contributions of different source categories, and exceedance over critical loads. The EMEP Meteorological Synthesizing Centre – East (MSC-E) in Moscow performs calculations of heavy metal and POP transport and deposition in Europe and provisional model runs for the northern hemisphere, providing estimates for Central Asia.

Figure II. Map of East European monitoring stations involved in EMEP, HELCOM and AMAP
Ukraine provides an example of the availability of environmental information and the use of modelling techniques. At present, Ukraine submits only emission totals for the pollutants required under EMEP. Spatial distribution of emissions for the evaluation of transboundary transport has been estimated by MSC-E. Modelling is used to calculate the spatial distribution of environmental pollution: figures III to VI show emissions levels, emission trends and related modelling results for lead.

The results show that the bulk of the pollution emitted in Ukraine (55%) is deposited within its borders. Figure V shows that the main countries-receptors of lead deposition from Ukrainian sources are the Russian Federation (19%), Romania (4%) and Belarus (3%). Some 7% of lead is deposited in the Black Sea. In its turn, Ukraine is polluted by emissions from the Russian Federation, Romania, Poland and other countries (fig. VI).
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Figure VII shows calculated trends in lead depositions from European countries to Ukraine, from 1990 to 1998.

A similar situation exists in most EECCA countries in terms of the availability of emission and measurement data. Modelling could therefore be an important source of information on the state of the environment.

Overall, EECCA countries need to develop their transboundary air monitoring networks. Given the high cost, however, an integrated approach strengthening both monitoring networks and modelling techniques to evaluate pollution levels appears appropriate. In addition, EECCA countries should consider further accession to international agreements, conventions and protocols: among the benefits, international cooperation under these instruments can help improve air pollution monitoring through technical assistance and training as well as the harmonization of methods.

**Figure VII. Trend in total (wet and dry) deposition densities of lead to Ukraine, kg/km²/year**

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**Recommendations to strengthen environmental monitoring**

While monitoring systems vary among EECCA countries, a series of common gaps and constraints are apparent across the subregion (see box 8).

The UNECE Working Group on Environmental Monitoring has provided a forum to address common problems, integrate monitoring systems more closely into international networks, and strengthen cooperation both among EECCA countries and across the pan-European region. At its special session in February 2003, the UNECE Committee on Environmental Policy approved a set of recommendations, prepared by the Working Group, on strengthening national environmental monitoring and information systems in EECCA countries. This section summarizes these recommendations, which were endorsed by Environment Ministers at the Kiev Conference in May 2003 (the full text is available in annex I).

**Policy context**

The recommendations call for a continuous dialogue between policy makers and those who design and implement monitoring systems. Priorities for environmental monitoring should be identified. Moreover, environmental monitoring systems should be periodically reviewed to strengthen their operation, prioritize new information needs and evaluate costs.

**Institutional framework**
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National legislation should regulate data management and identify or establish a lead agency for core monitoring activities. At the same time, a workable structure should facilitate inter-ministerial cooperation and coordination. Specialized institutions and subnational and local bodies should have authority for relevant monitoring and information activities, as well as necessary advice and support. Common data analysis protocols should be developed to facilitate cooperation between agencies.

Countries in the EECCA subregion need to provide continuous public funding for core monitoring activities. A mix of funding sources and mechanisms is desirable to ensure the necessary investment in the basic monitoring infrastructure; this mix may include external assistance where necessary. Major polluters should regularly monitor their emissions and waste flows and should also support the cost of environmental monitoring at the local level, to the extent possible.

Funding

Box 8. Environmental monitoring in EECCA: common gaps

- Monitoring systems need to be linked more closely to the policy context.
- Greater coordination is needed among national institutions responsible for different areas of monitoring, and often between institutions at different levels of government.
- Funding mechanisms need to be strengthened.
- Essential sampling and laboratory equipment is often old and needs maintenance or replacement to ensure data quality. Data-processing networks also need to be modernized.
- There are several difficulties in monitoring, in particular in monitoring urban air quality, soil contamination and remediation, solid and hazardous waste management, water quality and hazardous substances.


Specific monitoring activities

Countries should harmonize their definitions, classifications and monitoring protocols with international standards. Where the original monitoring networks are significantly degraded, countries should focus their restoration initially on a limited number of major pollutants and major polluting sources. At the same time, they need to ensure continuity in the monitoring of “traditional” parameters to be able to track long-term environmental trends.

The recommendations also call for stronger monitoring across a series of themes, including biodiversity, air pollution and waste management.

International cooperation

The Working Group has provided a forum for cooperation on these issues across the UNECE region and in particular in EECCA. The Working Group plans to continue its efforts, focusing on three monitoring areas where common difficulties were identified: inland surface water monitoring; air pollution monitoring; and waste classifications and inventories.

B. Information systems: using computer-based technologies

Information systems provide the link between monitoring data and reporting that can be understood and used by end-users (chap. II in turn focuses on reporting). Information systems cover a wide variety of functions: from transmitting, compiling and storing monitoring data, to their analysis and synthesis, to reporting formats for end-users.

This section focuses on the use of computer-based technologies, including the Internet, in environmental information systems. These technologies can link the various elements of the “pyramid” into a network and provide reporting approaches for different types and levels of uses. Computer-based technologies are an area for development in EECCA countries, and also a focus of attention for the UNECE Working Group.
Databases and information exchange in EECCA countries

Most EECCA countries lack advanced computer systems to collect, store, analyse and work with monitoring data. Moreover, databases at different national agencies, and those at different levels of government, are rarely connected and often use different formats for data storage. In a few countries, some monitoring data are still provided in writing. Overall, the exchange of data is often difficult, owing to both technical and institutional constraints, hindering reporting and information efforts.

Central Asian countries, for example, lack unified databases for environmental information: databases are scattered among different ministries and organizations, including international ones. Moreover, many government ministries and departments are involved: they do not always share the statistics they produce, nor do they make them easily available to the public. In Kyrgyzstan, the Hydrometeorological Institute monitors air quality – however, its monitoring results are not regularly transmitted to the Ministry of Emergency Situations and Environmental Protection. Access to databases in Central Asia is at times difficult. In Uzbekistan, data and information are often in closed archives and sometimes on paper rather than in electronic form. Moreover, databases often contain contradictory data (RECCA, 2002).

Across EECCA, countries are planning and introducing new information technologies for creating digital environmental databases, inventories of natural resources and ecosystem maps. Box 9 describes the national goals in Belarus. In Georgia, the Ministry of Environment intends to build a system for the collection, compilation, processing and storage of data on environmental pollution, and a suitable geographic information system. In Ukraine, an important objective for the State Environmental Monitoring System is the use of Internet technology to submit and process data, and also to provide wide public access.

Strengthening networks

In 2001, the Working Group on Environmental Monitoring established a Task Force to develop recommendations for practical tools, using modern information technologies, to improve the use and exchange of environmental information within EECCA, and to harmonize their approaches with those of European networks. The Task Force reviewed the current state of environmental databases and computer technology used in EECCA.

Throughout this work, the Task Force has focused on harmonizing EECCA information networks with EIONET, the EEA information network (see box 10). The Task Force supported the development of a prototype web site for presenting environmental information using EIONET formats. The prototype covers information on air quality in EECCA countries, and has been tested using data from the Russian Federation (from the report on “The State of atmospheric air contamination in the cities of the Russian Federation in 2000”) and Kyrgyzstan (from the national state-of-the-environment report for 2000). In addition, a prototype meta-database, using EIONET software, was developed.

Harmonization with EIONET would help EECCA environmental information networks move towards higher standards. However, significant efforts will be needed. Further work is required to understand the needs of EECCA environmental authorities in terms of access to environmental information in electronic form. New equipment and software, as well as major changes in the management and communication of data, will be needed. Concerted approaches and facilities will have to be developed across EECCA for receiving, preparing and disseminating environmental information on the basis of the EIONET approaches and technology. Moreover, government authorities will need to build capacity in using electronic facilities for receiving environmental information of interest to them.

Technical assistance will also be needed to help integrate EECCA environmental monitoring information systems into EIONET. Initial steps are under way to develop national web sites on sources of environmental information. Collaboration with EEA and integration with EIONET technology will continue to be important.
Box 9. Belarus: unifying databases and analysis centres

In Belarus, establishing a unified information system is a key goal for the national environmental monitoring system, as various government bodies hold databases related to the environment, without an overall system of organization. Developing common standards for data storage and analysis, including the development of common indicators, is an important related goal. Moreover, computer technology needs to be installed or upgraded. The Government intends to build a unified information network step by step. To begin with, analysis centres for different monitoring areas should be integrated into the Main Information Analysis Centre. In addition, dedicated operating software is needed for the overall network.

Source: Belarus, 2002.

Box 10. EIONET

EIONET is a collaborative network of the European Environment Agency and its 31 member countries (the 15 current EU members, the 10 accession countries, Iceland, Switzerland, Turkey and other European countries). EIONET is both a network of organizations and the electronic network (e-EIONET) linking these together.

The network of organizations is comprised of four main types of institutions:

- National focal points, the offices responsible for national coordination of activities related to the EEA work programme;
- Main component elements, key institutions of national networks that regularly collect and supply environmental data;
- National reference centres, which are nominated to cooperate with EEA on specific topics; and
- European topic centres, consortiums (each with one leading institution) that undertake specific tasks in the EEA work programme (topics include air quality, air emissions, soil, inland waters, marine and coast, nature, land cover, waste, and cataloguing of data sources).

These institutions jointly provide the information used for reporting to support EU and European environmental policies.

The EIONET electronic network is organized in concentric layers, including the EEA Intranet, an “extranet” connecting the main institutions, and public Internet sites providing data and reports. The network has developed and uses a variety of software for communication (for example, supporting various interest groups), project cooperation, common database and document management, and web-based reporting. The electronic network establishes a common European approach to collecting data and information on the state of the environment. The work programmes through its topic centres will help harmonize data collection approaches.

Among the applications in development, EIONET will provide EEA member countries a single gateway – called Reportnet – for reporting to different MEA secretariats, international organizations and other forums. For EU members, Reportnet will assist with reporting requirements under environmental legislation. EIONET is also seeking to connect to databases on economic sectors, to provide information, including indicators, to support policy integration, a key EU goal.


Recommendations and upcoming work

The UNECE recommendations on strengthening national environmental monitoring and information systems in EECCA countries call for greater use (resources permitting) of computer networks, with common databases and software, and improved access to information.
The Working Group and its Task Force will continue to focus on these and related issues. Among the topics of the Task Force’s upcoming activities are:

- Using EIONET standards to develop and organize databases and communicating data;
- Developing national meta data bases on the Internet using EIONET software; and
- Using common formats for presenting environmental information and supporting decision-making.