INTRODUCTION

This Introduction identifies key elements of environmental monitoring and assessment.

Environmental monitoring is generally defined as gathering, assessing and reporting environmental information obtained through continuous or periodic sampling, observation and analysis of both natural variation or changes and anthropogenic pressures and their effects on humans and the environment. Today the difference between environmental monitoring and the production of other types of environmental information is less distinct than it once was. Environmental assessment uses monitoring data and other information to evaluate environmental conditions and trends, including the effectiveness of environmental policy.

Environmental monitoring and information systems: key elements

Environmental monitoring systems are crucial for environmental policy: they are the "eyes and ears" for policy makers, researchers, and the public seeking to understand and improve the environment. National environmental policies, institutions and funding mechanisms provide the context for monitoring systems. National policies can also specify goals for their development. Moreover, providing information to support national policies is a key objective of monitoring systems.

The framework for monitoring systems themselves includes: legislation and regulations establishing monitoring goals and requirements including technical monitoring standards; institutions mandated to carry out monitoring and information activities; the mechanisms of cooperation and coordination among these institutions; national information strategies; and, funding mechanisms.

Environmental monitoring covers various areas. Some of these – for example, ambient air quality, air pollution emissions, water resources and quality – are indispensable for nearly all countries. The importance of other areas – such as those related to specific natural resources, for example forestry and fisheries – can depend on the geographic context.

Monitoring starts with data collection – observations and measurements – and it depends on sampling equipment, monitoring stations, laboratories, and skilled personnel. Monitoring work follows specific methodologies, protocols and classifications. These are in turn influenced by information systems, including reporting approaches and indicators used. Harmonizing data availability, parameters and quality is important, both at national and international levels, so that, for example, national decision makers can compare conditions in different parts of the country, and international forums can review information (such as water quality or air emissions indicators) across countries.

In addition to direct in situ measurements, aerial and satellite remote sensing promises to be of growing value. Non-governmental organizations (NGOs) and volunteers may contribute to data collection, in particular for themes such as species inventories. Modeling can substitute where data collection is difficult and less cost-effective; for example, modeling is important for the

development of national air pollution emission inventories and the estimation of transboundary air pollution flows.

Environmental information systems analyse and synthesize monitoring data, developing "information" for reporting to end-users, such as policy makers and the public. Effective information flows are needed to transmit and share data between polluters and environmental authorities, among monitoring agencies and between local, subnational and national levels of government. Raw data need to be transmitted, stored, processed, interpreted and analysed: computer networks, databases and software are vital tools. The integration of environmental, economic, health and other data is important for policy objectives, including sustainable development goals. The Internet provides a key tool for sharing, presenting and using environmental data and information across government levels, among countries, and with the public.

This CD-ROM includes an overview of policy and institutional issues related to environmental monitoring systems in EECCA countries over the past decade, and of the state of key monitoring activities. Case studies identify common gaps and national efforts regarding transboundary air and national waste monitoring. Key recommendations for strengthening monitoring and reporting, including those endorsed by the Kiev "Environment for Europe" Ministerial Conference, are also provided. Strengthening the use of computer-based systems and networks is among the key areas of attention for WGEMA: the CD contains Guidelines for the development of the Internet-based meta-databases on the environment in EECCA countries.

The role of environmental assessment and indicators

Environmental assessments such as state-of-the-environment (SoE) reports use data and information from monitoring systems to evaluate conditions and trends and communicate conclusions to end users, including policy makers and the public.

Assessment typically has four closely linked objectives:

- *Evaluating environmental conditions and trends*. This is necessary for all subsequent objectives. Conditions and trends change over time, and assessment is a continuous task. Scientific understanding of natural cycles and human interaction with the environment also continues to evolve: assessment requires a dialogue with scientific research, in particular for emerging issues;
- *Supporting environmental policy*. Environmental data and information are vital throughout the policy cycle;
- *Reporting to international forums*. As Parties to various multilateral environmental agreements (MEAs), EECCA countries have undertaken obligations that can include data reporting on relevant environmental trends. In addition, several international organizations request their member countries to provide environmental data regularly;
- *Providing information to the public*. The public's right to environmental information is affirmed in national laws and principle 10 of the Rio Declaration on Environment and Development. Moreover, public awareness of and concern for the environment can be a key force promoting environmental protection.

Environmental indicators are an essential tool for assessment and for communication: they can synthesize often complex numerical data to show key trends, help describe causes and effects of environmental conditions, and track and evaluate policy implementation.

The documents in this CD-ROM describe state-of-the-environment reporting in EECCA countries, including the use of indicators in SoE reports. The recent SoE report of Armenia is also provided. Recommendations and guidelines identify main avenues for strengthening the preparation of environmental assessments and the use of indicators. The CD also includes the core set of environmental indicators for EECCA countries, developed within WGEMA, and a Trial Compendium prepared using selected indicators from this core set. New opportunities, such as indicators based on remote-sensing data, are also described.