

Chapter 6

Information and Data Management



A fundamental obstacle to achieving the purposes and goals of the annexes of the Agreement relates to the availability and management of information and data.

This is an overarching concern in the decision-making and policy formulation activities of the Agreement. Implicit in many of the Agreement annexes is the availability and accessibility of needed information, but such information is not always available. Several Commission-sponsored activities, ranging from the Indicators Implementation Task Force to work of the International Air Quality Advisory Board, have had problems obtaining information and data. The concerns expressed by these groups indicate the need for an information and data management policy specifically keyed to the Agreement.

What should such an information and data management policy contain? First, it should be binational and specifically formulated to serve the Agreement as well as many other needs. Second, it must recognize the different uses and sources of information and data, including the design, organization, and management of the repositories of the information and data, and the utilization of the information and data for effective decision-making and policy formulation.

An appropriate place to start the development of an information and data management policy is in the area of monitoring and surveillance. These activities provide a quantitative basis for assessing the state of an ecosystem. Monitoring and surveillance provide clues about the evolution and possible future development of the ecosystem, alert managers to emerging problems, and indicate whether a given program is making progress toward its assigned goals. Most Agreement annexes depend on monitoring programs to track implementation progress. The wide-ranging monitoring activities initiated under the Agreement share several common challenges such as funding, efficiency, and quality control/quality assurance.

6.1 Annex 11 - Surveillance and Monitoring

Monitoring and surveillance programs require careful design and implementation to assure high-quality data. In turn, the analysis and interpretation of these data must meet rigorous statistical and scientific standards. Monitoring is often an expensive undertaking. It is always necessary, usually repetitive, and sometimes tedious. The United States and Canada have amassed enough data overall to support the use of indicators in monitoring and surveillance programs. However, data collection, analysis, and reporting need improvement because of the nonuniform quality and the many gaps in existing data sets.

The Commission is greatly concerned that the Parties cannot fulfill their goals under the Agreement because they currently lack, and will lack for the foreseeable future, the full breadth and depth of programs to obtain the environmental monitoring information necessary to guide Agreement-related programs.

Monitoring and surveillance have historically received low priority from both researchers and managers who decide which projects receive financial and other resources. Over the past five years, the funds allocated to monitoring in both the United States and Canada have declined considerably both in amount and in areas of coverage. Air quality monitoring may be the exception and the only activity that has received increased funding. Total funding for monitoring and surveillance is, however, declining steadily, and some researchers and managers are concerned that current programs will not be adequate to provide the information needed for regulatory and other programs.

The Commission is greatly concerned that the Parties cannot fulfill their goals under the Agreement because they currently lack, and will lack for the foreseeable future, the full breadth and depth of programs to obtain the environmental monitoring information necessary to guide Agreement-related programs.

THE COMMISSION RECOMMENDS THAT:

The Parties should develop and maintain the full range of monitoring and surveillance programs necessary to enable them to fulfill their commitments under the Great Lakes Water Quality Agreement.

Factors Inhibiting Access to Data and Information for Monitoring and Surveillance

The discussion of monitoring and surveillance and indicator reporting assumes that when data are collected they will be made available by the Parties for use and review by the Commission. Unfortunately, as the Indicators Implementation Task Force experienced, this is not always the case. Restrictions exist in both countries based on the confidentiality of industrial, census, and other proprietary data. In some cases, the data are licensed. Because of cost recovery policies in some agencies, and despite the Agreement's wording in Article IX(1) that data be available without restriction, the Commission must pay for the use of the data. In another example, the U.S. and Canadian census agencies collect data, but they only provide these data after some processing to ensure that individual sources remain anonymous. In other cases, the data are not provided because of corporate confidentiality agreements.

For many years, the Commission has requested that the Parties address the data availability issue. Some recent progress has been made through legislative and policy changes that remove some of the protection on data related to environmental contamination. Notable here are the toxic substances inventories of various kinds and community right-to-know laws. However, there are limitations associated with toxic substances inventories. The regulations under the laws only address chemicals that are discharged, manufactured, or used in commerce in excess of certain quantities, and they only apply to some sources that have gross receipts or capitalization levels above certain monetary values. The problem of data accessibility will only increase with the need for data that meet rigorous statistical tests for the implementation of indicators and for monitoring persistent toxic substances.

THE COMMISSION RECOMMENDS THAT:

The Parties should provide adequate access to data while protecting confidentiality agreements and waiving cost recovery policies that contradict the intent of Article IX of the Great Lakes Water Quality Agreement.

6.2 Data Management

Data Quality

Regulatory agencies require strong emphasis on quality assurance. This is important because in numerous court cases environmental problems have not been addressed because proponents could not demonstrate that data could pass the test of legal evidence. This has led to the view that the data must be capable of being defended in legal proceedings (*defensible*). It has also caused some agencies to disregard or ignore the research findings of other agencies because of perceived difficulties with quality assurance requirements and programs of these other agencies.

The Commission has noted that, over the years, the evolution of quality assurance to secure scientifically and legally defensible data for these other purposes has also resulted in significant increases in the value and credibility of the data supplied by the Parties under the Agreement. A good quality assurance program is a necessary part of any monitoring activity, including data and information management programs.

Trend Analysis

One use of surveillance and monitoring data is to analyze trends, but current programs have not made trend study a priority. This is somewhat surprising because, with the advances in mathematical statistics over the past 20 years, the statistical tools for trend analysis are readily accessible. Discerning trends, cycles, outliers, interventions, and system change characteristics has become relatively sophisticated. For example, effective time series studies can be performed when either or both time and distance intervals are nonuniform.

Comparability and Compatibility of Data

One problem that plagues decision-making is the incompatibility among various monitoring protocols used to provide information for systemwide decision-making. The Commission has long advocated that monitoring emphasize both comparable and compatible data. Comparability is achieved by measuring the same things in the same way, or by establishing that different measures of the same thing by different instruments, groups, or protocols are equivalent and thus can be used for comparison purposes. Compatible measurements are those that can be pooled for overall assessment because they come from the same statistical universe. Ecosystem integrity requires compatible data because of the integrative nature of the subject. Great strides have been made to assure comparable data, but problems related to compatible data remain largely unresolved. These concerns were addressed at a Commission-sponsored Workshop on Transboundary Monitoring in 1984. The concerns remain and were reiterated by the Indicators Implementation Task Force, which recommended improvements to data collection, analysis, and reporting.

THE COMMISSION RECOMMENDS THAT:

The Parties should correct existing problems with the collection, analyses and reporting of data, including establishing sampling protocols, filling data gaps and ensuring the quality of data.

6.3 Information Management

The application and interpretation of data generate information. Information forms the basis for policy decisions. Indicators are one type of information, but there are many others. Information management encompasses both information technology and data management. Information management has several dimensions, such as availability, organization, and application. Each of these dimensions has problems that concern the Commission because each affects the Parties' ability to meet their obligations under the Agreement as well as the Commission's ability to act as an objective adviser on how the Parties are meeting their obligations.

"One of the key ingredients missing from a serious attempt to increase the productivity of environmental protection efforts is the absence of agreed upon, valid environmental data upon which to base policy decisions."

*Council of Great Lake Industries
Spring 2000 Newsletter*

There has been an explosion in the information technology and management fields in the past ten years. The Commission, the Governments, and other organizations have active web sites on the Internet that provide a broad spectrum of information and services related to the Great Lakes. However, these efforts are ad hoc and not part of a coordinated policy on information management related to the Great Lakes Water Quality Agreement.

An enduring problem is the lack of an appropriate and readily accessible repository of information. Many of the technical problems of centralization are being addressed through the development of virtual data bases (meta data bases) with links to wherever the appropriate data and information are stored. Further technical advances in data base organization allow one to use linked data sets for statistical analyses and computer modeling. The Commission sees great potential for using these tools to organize Great Lakes environmental monitoring and surveillance data to provide a readily accessible repository.

In the *1997-99 Priorities Report*, the Great Lakes Science Advisory Board considered a coupled Great Lakes observation and modeling system. Board discussions emphasized the great strides made in information technology since the original signing of the Agreement, as well as some philosophical and practical issues that hampered the effectiveness of monitoring and surveillance in the 20th century.

The Board looked at the benefits of establishing a transboundary monitoring network, as first described at the Commission's 1984 Workshop on Transboundary Monitoring, and considered how such a network could be coupled with current technological advances to make the Board's vision a reality. The Board assessed modern field techniques involving satellite and GIS approaches, advanced instrumentation used by oceanographers and climatologists, the ever-increasing capability of computers, and modern advances in information technology. (IJC 1999)

Some of the existing monitoring and surveillance components, such as IADN, not only meet the vision but provide a potential pathway to the realization of many of its anticipated benefits. These include continuous monitoring capabilities during extreme climatological events (often missed in the analysis of environmental effects), improved capabilities to design and undertake lakewide management strategies, the integration of weather satellite data and lake data on a time- and location-specific basis, increased data and information sharing, and greater cost and operational efficiencies in the use of research vessels and the scheduling of crews.

The Science Advisory Board recommended that the Commission promote information technology applications on a high-priority basis for better management and binational cooperation for the Great Lakes (IJC 1999). The Commission considers this Board recommendation as the basis for the development of an information management policy under the Agreement, one that goes beyond the many useful Internet sites that provide information, publications, and other kinds of access to Great Lakes information.

THE COMMISSION RECOMMENDS THAT:

The Parties should, within two years, develop and implement a binational information policy employing advanced technology to support implementation of the Great Lakes Water Quality Agreement. This policy should include provision for:

- (i) accessibility of data and information,**
- (ii) organization and management of data bases,**
- (iii) protocols to ensure compatibility and comparability of data for weight of evidence and ecosystem integrity analysis,**
- (iv) support of indicator development, particularly indicators that support the goals of drinkability, swimmability, and edibility of fish, and**
- (v) principles for evaluating information for decision-making.**