

SCIENCE FOR DECISION-MAKING: MEASURING PROGRESS ON POLICY IMPLEMENTATION

Environmental governance depends on integrated management mechanisms, which can enable good decision-making if there is sound scientific information to use as a basis. In Canada, all provinces and territories are involved in federally-led research on water quality research and policy-making. The National Water Research Institute (NWRI) is Canada's largest freshwater research facility, and works with other federal science partners in the Federal Water Research Network to contribute to the understanding of emerging challenges to aquatic ecosystem health. In 2002, a report was released on "Threats to Sources of Drinking Water and Aquatic Ecosystem Health" and a report on threats to water availability is forthcoming. A new innovative initiative is underway to develop a water quality index domestically and is the subject of this document. Still in the relatively early stages of application, it uses a set of indicators to provide consistently reliable data about the health of Canada's aquatic ecosystems.

DESCRIPTION OF INITIATIVE

A Water Quality Index (WQI) is a tool used to summarize large amounts of complex, highly technical water quality data into a simple, easy-to-understand message for the public and decision-makers. Similar to the ultra violet (UV) index or an air quality index, it can indicate whether the overall quality of water bodies poses a potential threat to various uses of that water, such as for drinking water, habitat for aquatic life, irrigation water for agriculture and livestock and recreation and aesthetics. The Canadian WQI describes water quality as excellent, good, fair, marginal or poor -- terms that are easily understandable for the public.

Although the message is simple, the methodology to arrive at that message is founded on sound science and reflects the complexity of aquatic ecosystems and the diversity of human uses of those systems. A wide range of chemical and biological measurements are taken on individual water bodies and each is measured against water quality guidelines that ensure human needs, as well as the needs of aquatic life are met. These measurements are then compiled, using a formula that assesses: i) if the guidelines are met; ii) how much out of compliance each measurement is; and iii) over how wide an area the objectives are not met. Based on the results of the analysis, a ranking is given for each water body, and then, the assessment for all water bodies are assembled together to provide a picture of overall water quality in Canada. Over time, trends on whether water quality is improving or deteriorating can be determined.

PARTNERS

The development of the Canadian Water Quality Index required engagement of a wide range of institutions and people at different points in the process. Although the process was sometimes difficult, it was well worth the effort, considering the innovative result.

The Index was launched by a request from a provincial auditor general who, in the interest of accountability, challenged water engineers to make the vast amount of water quality information that they collect useful not only to water quality experts, but also to policy makers and civil society. Initial technical development and testing with civil society took place at the provincial level. Since those early days the index has been:

- improved and nationalized through involvement of the Canadian Council of Ministers of Environment (CCME);
- made more efficient with help from database managers and experts in web-based analytical tools from the Canadian Information Systems for the Environment (CISE);
- tested with academics, the public and experts outside government by the National Roundtable on the Environment and Economy (NREE); and
- will be one of three indicators of environmental quality to be incorporated into the Government of Canada's decision-making.

The index drew on a foundation of scientific work conducted over many years with the help of federal and provincial governments and academic institutions. For example, Canada has developed guidelines for drinking water which define 'safe levels' for more than 85 different microbiological, physical, chemical and radiological parameters, such as bacteria, odor, arsenic and radon. Guidelines have also been developed for recreational water quality, protection of aquatic animal and plant life and protection of water for irrigation and livestock. These guidelines form the basis of site specific guidelines used in the water quality index.

This national, integrated approach has allowed Canada to identify the best ways of managing water and to ensure that that experience is shared by water managers across the country.

The Canadian Water Quality Index could be an effective tool in support of Millennium Development Goal 7: *Ensure environmental sustainability* and WSSD commitments related to the environmental aspects of water and sanitation and the centrality of ecosystem approaches in water management. Its particular contribution is that it allows the science behind water quality measurement to be readily understood and used by policy and decision-makers. It provides a useful assessment tool in support of UNEP's *Science Initiative*, with activities that are critical for effective monitoring in support of international environmental governance.

The index, as a scientific measure, also contributes to implementation of UNEP water policy and assessment activities such as the Global Programme of Action on the Protection of the Marine Environment from Land-based Activities and the GEMS/Water Programme.

MAINSTREAMING / SUSTAINABILITY

As part of a small set of Environment and Sustainable Development Indicators in a federal government budget context, the Canadian Water Quality Index will be used to report regularly on a national and regional basis starting in 2005. This is in support of the Government of Canada's commitment to sustainable development by incorporating environmental indicators into national economic decision-making.

The WQI has been used specifically for reporting water quality management issues in the Province of British Columbia, for agricultural issues in Alberta, and locally by Conservation Authorities in Ontario for reporting to the public and addressing water management issues such as municipal wastewater treatment.

REPLICATING THE INITIATIVE

The Canadian model for the WQI could be applicable to other developed countries as well as in developing countries and economies in transition, which are interested in developing their scientific water information infrastructure. It is Canada's intention to share the methodology and web-based calculation tools it has developed for the water quality index through the Canadian Information System for the Environment (CISE) website (<http://www.cise-scie.ca/>).

LESSONS LEARNED

A range of lessons have been learned during the application, testing and subsequent assessment of the Canadian WQI results at the local, provincial and national level. Some examples include:

- The WQI has been shown to be an effective communications tool for summarizing complex water quality data into understandable, high profile information for the public and decision-makers, which can identify issues and problem areas;
- In the development stages, it is critical to do as much testing, on as many diverse datasets as possible, and across as many different institutions as possible;
- The WQI can identify problems, but decision-makers must then use more detailed water quality information for water quality management;
- A long-term, dedicated ambient water quality monitoring network is needed to guarantee consistent monitoring over time of the necessary parameters at the appropriate frequencies;
- The most credible index results will be achieved if site-specific water quality guidelines are developed for each monitoring station;
- An agreed upon range of parameters should be measured to ensure consistency of reporting with the WQI; and
- Care must be taken in communicating the strengths and limitations of the WQI to policy-makers and the public.