

IWRM In Practice: Lessons From Canadian Experiences

Bruce Mitchell

University of Waterloo, Waterloo, Ontario, Canada

In Canada, IWRM has evolved from comprehensive river basin management in the 1940s, as an explicit way to integrate economic, social and environmental considerations, to incorporate the perspectives of stakeholders. IWRM is also designed to overcome ‘edge’ effects (overlap of responsibility and authority between two or more public agencies) as well as vertical and horizontal fragmentation.

In this article, highlights from Canadian experience are provided, based on a review of international experience with IWRM to be published by the World Meteorological Organization in 2007 (Mitchell, in press).

Context

In Canada, the roots or predecessors of IWRM are based on at least two initiatives: Ontario Conservation Authorities, and comprehensive river basin planning and management.

Ontario Conservation Authorities

The Ontario Conservation Authorities were established through legislation in 1946. Conservation Authorities were created to be river basin organizations, based on a partnership of municipalities and the provincial government (Ontario 1967, 1987, Richardson 1974, Mitchell and Shrubsole 1992). The motivation came from an appreciation that individual municipalities did not normally have the resources or authority to undertake basin-wide initiatives, such as construction and operation of upstream dams and reservoirs for flood damage protection, to benefit an individual municipality as well as other downstream communities. In 2006, there were

36 conservation authorities in Ontario, covering areas in which over 90 percent of the people in the province live.

The following principles underlie the Conservation Authorities: (1) the watershed as the management unit, (2) local initiative is essential—a Conservation Authority can be established only when two or more municipalities in a watershed agree to collaborate with each other and the provincial government, (3) provincial-municipal partnership is a core aspect, (4) a healthy economy based on a healthy environment, (5) a comprehensive perspective is required, and (6) coordination and cooperation are to be pursued. For more than 60 years, the Conservation Authorities have operated under these principles to manage land, water, and related resources within river basins, and have accumulated considerable experience in facilitating collaborative and cooperative approaches as well as overcoming vertical and horizontal fragmentation.

Comprehensive River Basin Planning and Management

The Canadian federal government and several provincial governments initiated “comprehensive river basin planning” in the late 1960s in order to (1) enhance experience in using river basins as the basis for planning and management, (2) explicitly incorporate environmental considerations into planning, and (3) incorporate public participation in a systematic manner. Five comprehensive river basin plans were completed, which in turn were followed by implementation programs (Mitchell and Gardner 1983).

Assessment of the experience with the federal-provincial basin plans revealed: (1) basin plans

often took three to four years to complete, resulting in some people wondering about their practical value and whether the time to complete them could be reduced, (2) recommendations usually were numerous and unprioritized (further exacerbated because, once a plan was completed, the team which had prepared it dispersed, leaving few people who could provide insight about priorities), and (3) insufficient attention was given to implementation. The last point was particularly noticeable because planning teams normally did not engage in systematic and ongoing dialogue with the agencies and others responsible for taking action regarding the recommendations.

Starting from the experience with the Ontario Conservation Authorities, and from the federal-provincial comprehensive basin plans, combined with other initiatives across the country, reflection led to lessons learned. These lessons now provide a foundation for IWRM in Canada.

Lessons Learned and Their Implications for IWRM

Importance of a Vision

IWRM is a means to an end. Consequently, it is important to have a clear vision or direction about a desired end state for a catchment or river basin. IWRM then becomes one means to assist in achieving the desired end state.

A vision identifies a future state believed to be more desirable than the present state. Without a vision or direction, it is difficult to determine which parts in the basin need to be brought together into a whole, and who should be working together.

Developing a shared vision is normally challenging because many values, interests and needs that exist in a river basin or catchment need to be reconciled. Notwithstanding this challenge, if there is no sense of direction or well understood ends, IWRM will not be able to create one. Thus, planners and managers have learned that IWRM will not be effective without a vision. Worse, IWRM may be discredited because it did not generate a vision, something it was never intended to do.

In developing a vision, it has been learned that we need to distinguish among what is probable, desirable, and feasible because the most probable

future may not be the most desirable future. In addition, a desirable future may not be feasible. It is exactly in order to determine the desired and feasible future condition that planners and managers create a vision.

Sharpening Focus

The long time taken to complete comprehensive river basin and similar plans led to rethinking about how to interpret a systems, ecosystem or holistic approach. The value of looking at the system represented by a river basin, its component parts, and the relationships among the parts was always understood so that the connections among water, land, and other resources could be addressed systematically, with attention also given to economic, social, and environmental aspects of the watershed. However, it was learned that it was unnecessary to examine every component and every relationship, since each was not significant in accounting for variability in system behavior. And certainly, each was not amenable to being managed.

As a result, while the value of a systems, ecosystem, or holistic approach continued to be appreciated, it was learned that it was neither necessary nor desirable to take a comprehensive perspective if that meant studying every component and relationship. Instead, it was learned that greater value would occur if attention focused on the key components and relationships accounting for the greatest variability in system behavior, provided these are also amenable to management interventions. It was this lesson that led to increasing reference to an “integrated” rather than a “comprehensive” approach because the former maintained the benefits of a systems approach (considering the watershed as a system, its parts and their interrelationships), but was more selective by focusing on only those parts and relationships judged to be most significant from a management perspective.

This shift in interpretation and approach directly addressed the concerns that arose in the 1970s about comprehensive river basin plans striving to undertake too much by examining all variables and relationships. Negative consequences of the comprehensive approach include inordinate amounts of time needed to complete studies and

develop basin plans. The tighter focus of an integrated interpretation, it is believed, increases the likelihood that analysis and planning can be completed in a shorter period of time, and generate a smaller set of more relevant and prioritized recommendations.

Significance of Spatial Scale

Consistent with taking an integrated interpretation, analysts, planners and managers have learned that different levels of detail should be sought, depending on spatial scale. This is exemplified by the approach that emerged in Ontario as a result of assessing catchment and subcatchment planning experiences in that province (Credit Valley Conservation, Grand River Conservation Authority, and Toronto Region Conservation Authority 2002). The conclusion was that planning and management should focus on one of four different scales: watershed, subwatershed, tributary, and site. In moving across scales, the kinds and amount of data to be collected should change, “with the level of detail increasing as the size of the planning area decreases.” Ideally, what is done at each stage provides “direction and information” for the next lower level.

The four spatial levels of planning, reflecting different levels of detail for information, are:

1. *Basin or catchment plans:* Covering large areas, these plans include goals, objectives, and targets for the entire basin, and document resource and environmental problems. They also provide catchment-wide policy for protecting surface and ground water, natural features, fisheries, open space systems, terrestrial and aquatic habitats, and other important features. If resources are degraded, restoration needs are addressed. These plans usually also specify who will do what by when, how it will be done, and what reporting will occur.
2. *Subcatchment plans:* Relative to basin plans, enhanced detail is provided to allow local environmental issues to be addressed. Goals, objectives, and targets to manage the subcatchment are identified. In addition, plans give attention to the form, function, and linkages of the natural system; environmentally sensitive or hazard lands;
3. *Tributary plans:* These are prepared to guide proposals for significant land use changes such as proposals for subdivisions, intensive agriculture or industrial estates. These usually cover an area between 2 to 10 sq km. Ideally, the boundaries of a tributary plan match the drainage basin of a tributary, but in practice this does not always occur. Tributary plans normally document the environmental resources; establish environmental protection targets for ground and surface water, aquatic and terrestrial communities and stream morphology; identify Best Management Practices, including those for stormwater management; define or refine areas to be protected and/or restored; identify locations for future stormwater management facilities; and identify future site-specific studies and monitoring needs. Recommendations from tributary plans usually appear in secondary land use plans, and in official land use plan amendments.
4. *Environmental site plans:* These provide details on proposed environmental and stormwater measures, and are usually submitted along with other plans for grading, erosion/sediment control and site servicing. Typical features are detailed designs for stormwater management facilities; detailed designs for environmental restoration works (e.g., stream protection works); identification of constraints such as significant wood lots, wetlands or hazard lands; sediment and erosion control plans; detailed geotechnical and water resource reports; delineation of grading limits and

areas where development may be permitted; Best Management Practices such as aggregate extraction, development servicing of wood lots for agriculture; direction and consistency for approval of development for municipalities; cumulative impacts of changes on the natural environment; and, implementation and monitoring plans. Subcatchment IWRM plans are custom-designed for local conditions and concerns. Recommendations may subsequently be incorporated into official land use plans, secondary plans, growth management plans, or other municipal planning instruments.

tree preservation plans; revegetation and landscaping plans; and landscape features including trails and other recreation facilities.

Recommendations from site plans normally appear in engineering design drawings for draft plans for a subdivision or industrial estate.

The progression from basin to site plans is ideal. However, various constraints can lead to subbasin or subwatershed plans being prepared before basin plans, which then later have to be integrated into a basin or catchment IWRM plan. In a similar way, tributary plans may be completed before the subcatchment plans. Nevertheless, the differentiation among four spatial scales has helped to avoid collecting inappropriate data for a given scale.

Partnerships

As already noted above, IWRM is intended to ensure a holistic or ecosystem approach, and to facilitate the coordination of initiatives by different stakeholders. With regard to the latter, a strong motivation is to break down the “silo effect,” or the tendency of agencies to take decisions with regard only to their own mandates and authority. By using partnerships to overcome the silo effect, there is a reasonable expectation that IWRM will be more effective and efficient relative to a non-integrated approach.

However, in promoting a holistic approach, IWRM can experience tension with arrangements for including participatory mechanisms. Many individuals, communities, or stakeholder groups do not consider the entire system, but rather focus only on the subpart related to their own needs and interests. Thus, individuals often concern themselves with the impacts of catchment management on their own property, and municipal governments frequently worry only about the area under their jurisdiction. As a result, if participatory methods are to be a key component of IWRM, care has to be taken to understand not only the strengths and limitations of IWRM, but also those of participatory approaches.

Collaboration allows stakeholders to come together to share views regarding different aspects of a problem, and then explore differences and search constructively for solutions. This way, they can share resources, enhance each other's capacity

for mutual benefit and achieve a common vision by sharing risks, responsibilities, and rewards (Gray 1989, Himmelman 1996).

To achieve effective partnerships, Mitchell (2002) and Gunton and Day (2003) note that the following attributes deserve attention: (1) shared vision; (2) compatibility between participants based on integrity, mutual trust and respect, as well as patience and perseverance by all partners; (3) adaptability and flexibility; (4) inclusive representation; (5) benefits to all partners; (6) equitable power for partners (not the same as equal power); (7) clear ground rules; (8) process accountability; (9) sound process management; (10) clear communication channels; (11) realistic time lines and (12) well articulated implementation and monitoring processes.

In addition, Gunton and Day (2003) highlight that it is essential to determine if a collaborative approach should be pursued in a specific situation. To determine when participatory approaches are appropriate, they identified five pre-conditions: (1) commitment of decision-making agencies to a participatory approach; (2) commitment of all stakeholders; (3) urgency for resolution of an issue or issues; (4) absence of fundamental value differences; and (5) existence of feasible solutions. In their view, the challenge is whether pre-conditions are met sufficiently to allow a participatory process to begin.

Conclusion

Canada has accumulated significant experience with what is now called IWRM. Key lessons learned, if IWRM is to be a useful tool to help facilitate effective action, are the necessity to prepare a shared vision for a desired future, to interpret an ecosystem or holistic approach in a focused manner to ensure planning and implementation occur in a timely manner, to recognize the importance of various spatial scales in determining the kind and amount of data to be collected, and to develop robust partnerships among the many stakeholders in a catchment.

Author Bio and Contact Information

BRUCE MITCHELL, Ph.D., is Professor of Geography and Associate Provost, Academic and Student Affairs, at the University of Waterloo. He has over 35 years

of experience conducting research in Canada and in developing countries related to integrated water resources management. He is a Fellow of the Royal Society of Canada, a Fellow of the International Water Resources Association, and a Past President of the Canadian Water Resources Association. He can be contacted at: Needles Hall, University of Waterloo, 200 University Avenue West, Waterloo, Ontario, Canada, N2L 3G1, or at mitchell@uwaterloo.ca.

to 1970. University of Toronto Press: Toronto.

References

- Credit Valley Conservation, Grand River Conservation Authority and Toronto Region Conservation Authority. 2002. *Watershed Management in Ontario: Lessons Learned and Best Practices in Watershed Planning, Implementation and Monitoring in the CVA, GRCA and TRCA*. Credit Valley Conservation: Mississauga, Ontario.
- Gray, B. 1989. *Collaborating: Finding Common Ground for Multiparty Problems*. Jossey-Bass: San Francisco.
- Gunton, T. I., and J. C. Day. 2003. The theory and practice of collaborative planning in resource and environmental management. *Environments* 31(2):5-19.
- Himmelman, A. T. 1996. On the theory and practice of transformational collaboration: From social service to social justice, Pages 19-43 In: E. Huxham (Ed.). *Creating Collaborative Advantage*, SAGE Publications: Thousand Oaks, CA.
- Mitchell, B. 2002. *Resource and Environmental Management*. 2nd edition, Prentice Hall: Harlow, England.
- Mitchell, B. in press. *Guide to Hydrological Practices*, Sixth Edition.
- Mitchell, B., and J. S. Gardner (Eds.). 1983. *River Basin Management: Canadian Experiences*. Department of Geography Publication Series No. 20. University of Waterloo: Waterloo, Ontario.
- Mitchell, B. and D. Shrubsole. 1992. *Ontario Conservation Authorities: Myth and Reality*. Department of Geography Publication Series No. 35. University of Waterloo: Waterloo, Ontario.
- Ontario, 1967. *Report of the Select Committee on Conservation Authorities*. Queen's Printer: Toronto.
- Ontario, 1987. *A Review of the Conservation Authorities Program*. Ontario Ministry of Natural Resources: Toronto.
- Richardson, A. H., 1974. *Conservation by the People: The History of the Conservation Movement in Ontario*