

**Integrated Watershed Management in
Ontario:
Current Practice and Future Directions**

**Summary and Commentary for a Workshop on
Integrated Watershed Management in Ontario
Black Creek Pioneer Village
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Executive Summary

Integrated Watershed Management (IWM) continues to evolve in response to an expanding spectrum of physical, chemical, biological, social and economic interests linked to water and its use by humans. To assess the current status of IWM in Ontario, the Ontario Chapter of the Canadian Water Resources Association sponsored a workshop in May 2008, focusing on Lake Simcoe as a case study. This report, prepared by Dr. Isobel Heathcote, is her summary of, and commentary on, workshop presentations and discussions.

The leadoff presentation by Dr. Heathcote described the uneven history of IWM in Ontario. Once a leader in IWM, Ontario experienced drastic cuts in budget and highly-trained personnel in the Ministries of the Environment and of Natural Resources in the 1990s and lost this status. More recently capability for IWM has been reviving slowly with much of the current competence now residing with consulting firms, NGOs, Conservation Authorities, and university researchers rather than with provincial or other levels of government.

Important implications of this change include: (1) inconsistency in scope, cost and duration of IWM activity; (2) lower funding, leading to slow progress and a reliance on multiple partners with varying competence and level of commitment; and (3) lack of central leadership with the responsibility to deal with problem areas (1) and (2). IWM partnerships are typically created in an *ad hoc* fashion for each project. This reduces the opportunity to build trust, learn from mistakes, refine and improve IWM strategies, and find and retain effective leadership. Transparency and accountability are therefore significant challenges in IWM as it currently exists in Ontario.

Subsequent presentations and discussion at the workshop confirmed that most presenters and participants regarded IWM as a potentially important tool. To reach its potential, IWM should incorporate linkages to existing programs; deliver highly credible science clearly linked to public policy decisions; be done by experienced IWM practitioners; and result in timely action, effective administration, and equitable access to data to facilitate monitoring and appropriate adjustment to management policies and actions

Participants expanded on the important attributes of IWM as they responded to four questions.

Question 1: *How useful is IWM in meeting Lake Simcoe water management objectives?*

Participants concluded that IWM is very useful to bring multiple disciplines and stakeholders together to meet priority concerns about water quality and sustainable ecosystem function. As currently understood IWM is valuable but not essential in balancing land uses, managing water supply for planned development or in protecting public access to shoreline.

Question 2: *How feasible is IWM for Lake Simcoe?*

Participants agreed IWM is feasible for Lake Simcoe if opportunities are seized and barriers overcome. Opportunities include building on experience; creating a more coordinated administrative framework; clarifying roles and responsibilities of stakeholders; integrating all available science; and achieving a more efficient and predictable regulatory system. Barriers include lack of adequate funding for both planning and implementation; jurisdictional complexity and overlap; and hard-to-manage administrative complexity.

Question 3: *What next steps are needed for Ontario to adopt IWM?*

Participants concluded that the Province should prioritize watershed systems for IWM activity, and build a broad planning/reporting/implementation framework with water management nested within it. The structure should ensure IWM is inclusive; goal-oriented; responsive to local conditions; adequately funded; efficiently administered; transparent and accountable; and incorporates full-cost accounting.

Question 4: *What are the strengths and weaknesses of IWM?*

Strengths: IWM facilitates discussion and consensus building across stakeholder groups, agencies, and disciplines. It can incorporate consideration of science from many disciplines covering a wide suite of issues and impacts. It transcends the constraint of political boundaries building social capacity for decision making.

Weaknesses: IWM has the potential for time delays, cumbersome management systems, high costs, and limited accountability for expenditures or progress.

Despite the generally favourable view of the *potential* of IWM some participants were sceptical about the willingness of government and ultimately the people of Ontario to provide the money and skilled practitioners needed to allow IWM to make a difference in the watershed. Primary responsibility rests on the provincial government to establish sustainable social and institutional capacity for effective water management; to ensure adequate funding for watershed assessment, analysis, planning, and infrastructure; and to create an integrative administrative framework for IWM.

Four feasible options likely exist for such an integrative administrative framework. These are: (1) Restore an IWM function as a unit within an existing government agency; (2) Embed and enforce a requirement for IWM in law or policy;(3) Establish a standalone IWM board or commission; or (4) Establish an arm's length advisory board or panel without delegated powers.

Given the interest in expanding the role and effectiveness of IWM displayed at the workshop the timing seems right for the province to undertake a structured assessment of the role of IWM in Ontario and how best to support the activity and make it fully successful. This would be a key element in a more general review of water policy in the province if one was undertaken.

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Introduction

The ideas and the activity packages that constitute Integrated Watershed Management (IWM) have evolved over many decades. This evolution has been driven by growing recognition among water planners of the need for a comprehensive approach to water management; an approach that deals adequately with the many interactions of interests and processes that are inextricably linked to water and its use by humans.

The designation IWM describes a coordinated decision-making framework that includes both a comprehensive examination of water within the hydrologic cycle and full consideration of those activities of the human social and economic systems that connect through water, land, air, and biota to drive decisions on water use. IWM uses a systems approach to view water in its ecological and social context.

IWM strives to set management goals, and choose implementation strategies, that are appropriate, feasible, and sustainable for a given location and its culture. IWM is thus more than a technical exercise in planning and decision-making. It is a process that allows communities of local and regional scale to set water- management goals, and developing strategies for achieving those goals. It is, in other words, a framework designed to allow human societies to gauge the distance between current and ideal water conditions, and work together to narrow that gap.

Interest in Ontario in the concept and practice of Integrated Watershed Management has expanded greatly in the last decade as the Province comes to grips with significant threats to water quantity and quality and with conflicting expectations regarding the extent and types of water use. The Canadian Water Resources Association (CWRA) has published several studies of options for water management in the last few years, all of them pointing to a watershed basis for water management.

In early 2008 the Ontario Branch of the CWRA decided that a workshop to review the current activities in Ontario related to IWM could help to consolidate knowledge and potentially provide guidance for the evolution of water management in Ontario. The imminent introduction in the Ontario Legislature of legislation specific to the management of the Lake Simcoe watershed was a specific focus of interest.

The workshop was held in May 2008 at Black Creek Pioneer Village in Toronto. At the request of the Ontario Branch of CWRA, I prepared this report, which comprises a background review of IWM, a commentary on the presentations made at the meeting, and a summary of a discussion on IWM in Ontario that followed the presentations.

I have made every effort to convey the highlights of the presentations and discussions at the workshop without distortion. The commentary I have provided and the conclusions I have reached are my own and do not convey a position adopted by the workshop participants or a position of the CWRA and/or its Ontario Branch.

Three sections make up the main body of this report. The first section provides a background on IWM. In preparing this section I have drawn on my previously published reviews of IWM and on my experience over the last thirty years in Ontario as a civil servant and subsequently as an academic. The next section is a summary of the material presented on aspects of IWM in Ontario by the presenters at the workshop and of the discussion on IWM in Ontario that followed the presentations. The final section contains my reading of the major questions that were raised at the workshop that pertain to the applicability of IWM in Ontario and a set of possible approaches, supported by many workshop participants, which address the important questions.

Current Understanding of Integrated Watershed Management

Water lies at the very centre of the human experience and is the source of all life. We drink it, eat food grown with it, travel on it, use it to wash away wastes, and enjoy its natural beauty as an aesthetic resource. Humans have been managing this vital resource for thousands of years, diverting water into conveyance systems for irrigation, industry and household supply, and controlling floodwaters. Human disputes about water are equally old, and are reflected in documents from Mesopotamia, Rome, Egypt, China, and other ancient civilizations. But *integrated* water management is a newer concept, attempting to bring together water quantity and water quality, water uses and water users, in a systematic and coordinated framework.

What sets integrated water management (IWM) apart from more traditional approaches? To begin with, IWM looks beyond water itself – the hydrologic cycle – to connections with the land, air, and biota, and the human social and economic systems that drive water use. IWM uses a systems approach, for example to examine questions of the cumulative impact of wasteful or polluting water use. By viewing water in its ecological and social context, IWM strives to set management goals that are appropriate for local conditions, and that are feasible and sustainable for a given culture. IWM, therefore, is more than a technical exercise in planning and decision-making. It is a process of setting local and regional water- management goals, and developing strategies for achieving those goals. It is, in other words, a framework for human societies to gauge the distance between current and ideal water conditions, and work together to narrow that gap.

Great and positive change has been accomplished through IWM. One of the earliest and most complete examples is the Tennessee Valley Authority, a multi-objective water management project that has developed into a framework for regional economic growth. Multi-national management of major river systems including the Rhine, the Danube, and the Canadian Great Lakes fall within the scope of IWM. Multi-stakeholder management of Canada's Fraser River is a provincial-scale example. At the local level, Ontario's conservation authorities have for more than 60 years have been the foundation of water management partnerships between local interests, local and regional municipalities, and senior governments.

The scholarly literature today contains hundreds of articles on the application of IWM around the world, reporting on the success of various strategies in the context of a particular culture, climate, and geography. There are literally hundreds of such studies, from every region of the United States and Canada, and from dozens of other countries. Most applications involve relatively small watersheds (river basins).

There seems little debate that IWM is an appropriate framework for water management and, indeed, is the approach with best opportunities for success in meeting the objective of long-term sustainable water use. The major question still being addressed is how best to accomplish it in a given place and time.

Published studies provide fascinating insights into the differences between human cultures and the unique features of particular ecosystems. But they also convey several important and very consistent messages. Almost without exception, authors argue that effective stakeholder involvement, characterized by collaborative and inter-disciplinary learning, is not (as is sometimes thought to be the case) a waste of time and money, but is in fact essential for managing watersheds, with their complex physical, chemical, biological and social interrelationships, in a truly integrative fashion. These studies demonstrate that effective public engagement is not a luxury, but lies at the very heart of successful water management.

Again and again, the literature also demonstrates that IWM offers significant advantages over traditional water management approaches. Parallel management strategies, for example one plan for fisheries, another for water abstraction, a third for biodiversity protection, and so on, are much less effective than truly integrated management efforts, because they fail to integrate the knowledge base necessary for effective management of any one resource. As a result, they may create, rather than resolve, obstacles to effective co-delivery of jointly-agreed solutions.

The proliferation of individual case studies in the literature also reflects the fact that IWM is not a single, simple concept but rather an evolving body of practice. As we humans continually invent, test, and revise our water management strategies, we are laying a foundation of water management experience upon which future societies can build. Continued evolution is essential because water management today and tomorrow must deal with complexities and uncertainties unknown in past decades. Effects of climate change and continually enlarging concerns about water quality are two examples of the increasing complexity.

Early strategies for water management concentrated on single-concern action plans; concerns such as control of the point sources contributing to serious, visible water pollution, and provision of flood protection for rapidly-urbanizing basins. These strategies, in large measure, were successful, at least in the short term. They left unresolved some more difficult-to-resolve problems and were not capable of responding to newly identified threats. For example water managers today remain challenged by the deleterious effects on water quality of nonpoint rural and urban pollution and the long-range transport of airborne pollutants – pollutant sources that “belong” to no-one.

In the United States and Canada changes in government structures and support since the 1970's have put barriers in the way of effective IWM. Compared to 30 years ago, the relative priority given to environmental management has declined appreciably. In Ontario, for example, there is far less IWM expertise in provincial Ministries and far more sharing – some might call it “downloading” – of responsibility for water management with local governments. This reallocation of the primary responsibility for IWM is not necessarily harmful but without provision of adequate financial and human resources it is a definite barrier to success.

Our society has also changed dramatically over the last thirty years. The decades of rapid population growth and urbanization near major water bodies; the establishment of a global economy; and the prevalence of instantaneous communication have created a new context for management. The Canadian public is richer, more highly educated, and less trustful of government than it has been anytime in its past. The “commodification” of water as a saleable good highlights growing tensions between commercial interests and environmental quality, especially as development pressures intensify.

Growing awareness of the physical uncertainty inherent in a changing climate brings an extra layer of uncertainty and anxiety. Will there be more or less rain? Will we have sufficient water, or drought? – and will we realize and respond to the critical need for social and institutional capacity for effective water management, including drought planning and management? We need new tools, not only technical tools like accurate models of surface and groundwater flows, but also new approaches for collecting, sharing, analyzing, and storing data, and communicating results with our water management partners.

And we need to do these things at multiple scales: at the local level, where land use planning and water taking decisions are made; at the regional level where cumulative impacts may be more apparent; and at the provincial and federal level, to ensure consistent approaches and to share knowledge across regions. We are encountering new challenges as we do this. Interested agencies may not have the necessary authority to take on new management roles, may encounter varying political influences, or may simply not work very well together in managing water resources. In periods of operational concern, with narrowly-focused mandates, agencies that in the past were central players in water management are declining to become involved. Answers to central questions such as “who does what?”, and “who should pay?” are no longer as clear as they once were. The answer is increasingly “anyone and everyone”.

This then is the general context in which the present review of recent IWM experience in Ontario is set. Before proceeding with the examination of the specific case studies presented at the CWRA May 2008 workshop I have included some further material on the evolutionary stages of development of IWM against which the case studies can be viewed.

The roots of modern integrated watershed management

As noted in the previous section, humans have managed water systems for thousands of years, but it is only since the 1930's have they begun to attempt to do so in an integrated fashion. "Integrated" water management implies the bridging of disciplinary, political, and sectoral boundaries, and consequently larger scale, multi-stakeholder, multi-purpose projects.

The true origins of modern IWM lie in the establishment of the TVA in the 1930s and the establishment of conservation authorities in Ontario in the 1940s, but it can be argued that recent IWM practice really began in the 1960s and 1970s, when several key forces came together. Those decades were a period of urgent, visible water management challenges in Ontario and in the developed world. By the late 1960s, Lake Erie was declared by the popular press to be "dead": dissolved oxygen depletion and thermal pollution had led to the extirpation of major invertebrate prey species such as the mayfly, and these factors together with extensive habitat alteration had virtually eliminated major commercial and sport fish such as the lake whitefish and burbot. Lake Erie's shoreline, and those of other lakes and streams in urbanized areas, were blanketed with algae. Fish kills were common.

Public mistrust of government also grew steadily through the 1960s and 1970s. Rachel Carson's *Silent Spring*, published in 1962, was openly critical of regulatory approaches to managing the environment, especially chemical pollutants. Meticulously researched and eloquently argued, the book caught the public's attention and prompted a radical reevaluation of the use of chemical pesticides in modern society. Carson's legacy reached far beyond this, however. Her message implied to the public that government could not be trusted to act in the public good, and that ordinary citizens must be vigilant in protecting human and ecosystem health. By the 1970s, it was apparent that Carson's warnings had come true, with the evidence in eggshell thinning and reproductive failure in predatory birds, including iconic species like the bald eagle, and significant deformities in fish, and fish-eating birds and wildlife.

But water quality was not the only concern. Throughout the 1950s and 1960s, rapid post-war population growth had increased demand for affordable housing, often in suburban areas, and for road and highway networks to serve those areas. The result was rapid growth in impervious cover and significant alteration of natural hydrologic regimes. While occasional flooding had always been a fact of life near major rivers, rapid urbanization meant that water now flowed more quickly off roads and rooftops. Flood waters in cities rose more quickly and did more damage than they would have even 50 years previously.

These highly visible and quite alarming issues, and the public's increasing skepticism about government, were major forces underlying the creation of new "umbrella" environmental agencies, where complex environmental issues could be handled under one roof. Most of today's major Canadian and US agencies have their origins in this era, including US EPA (1970), Environment Canada (1971), Fisheries and Oceans Canada

(1971, under the then-Department of the Environment), the Ontario Ministry of the Environment (1972), and so on.

The final factor in the development of modern IWM was the evolution of digital computing tools in the early 1960s. Until that time, water managers had designed and situated water infrastructure based largely on example (“design”) storm data – essentially information about typical storms for a given area. Advances in digital computing through the 1950s and early 1960s made it possible to simulate watershed hydrology in a much more realistic and dynamic fashion, tracking rainfall and recalculating the resulting runoff and streamflows on an hourly basis, or even more frequently. This allowed water managers to test design assumptions with “real world” scenarios, a feature that was especially critical for the evaluation of extreme events, such as very large or protracted storms, or two or more consecutive major rainfall events. With dynamic simulation, a water manager could forecast the extent and duration of flooding much more accurately than with a single design-storm calculation. These technological advances therefore equipped water managers with powerful tools to test “what if?” scenarios before costly infrastructure was built in large or complex river basins.

Today, there is little debate about the major components of IWM in Canada and In Ontario specifically. Most IWM strategies follow these main steps:

- Reach social consensus on ideal conditions
- Evaluate the current condition and determine the distance from the ideal
- Develop and test alternative management strategies
- Choose a preferred course of action
- Assign roles, responsibilities, timelines, and costs
- Implement preferred actions
- Monitor resulting conditions, and repeat the exercise if necessary

Most current discussion regarding IWM therefore relates not so much to *what* has to be done, but rather *who* should do it, and *how* that work should be conducted.

Why is there so much debate about this? For one thing, IWM is rooted in trust, and requires thoughtful, respectful administration across a range of stakeholders and disciplines. Today, that experience is in very short supply. My assessment, admittedly biased by my experience as a staff scientist in the MOE, is that from the mid- to late 1970s through to the mid-1980s, the Ontario Ministry of the Environment was a world leader in the planning and administrative aspects of watershed management expertise.

MOE’s leadership through that time derived from its extensive work on most of the Province’s major river systems, including the Upper and Lower Thames, the Grand, the

Avon, the Rideau, the Don, the Humber, the Rouge, Mimico Creek, among others. MOE's River Systems Unit comprised a multi-disciplinary team of experts in open channel hydrology, urban water systems (sewers and sewage treatment plants), urban point and nonpoint source pollution control, groundwater, water quality, and computer simulation. This close-knit group rapidly developed expertise not only in the technical areas of investigation, but also in team-work and interdisciplinary communication. Working closely with partner agencies, especially conservation authorities and the Ministry's regional offices, the River Systems Unit was able to analyze watershed conditions, select and adapt appropriate modeling technology, and conduct scenario testing in much less time than would have been the case if the work were divided among several participating agencies or groups.

Today, such in-house expertise is almost unheard of. Extensive government "down-sizing" through the late 1980s and especially the 1990s resulted in significant loss of in-house expertise and the transfer of that knowledge base to the private sector, where many former MOE staff now work as consultants. These changes were prompted by concerns about the time and cost of the major watershed planning exercises like those conducted through the 1970s and 1980s, and the notion that sharing the task of water management with external partners would reduce the fiscal burden on any one agency, while building capacity for watershed management in the community.

Less obvious to the public eye, however, was the point that the most urgent and conspicuous of the Province's straightforward flood control and point-source pollution problems had been largely resolved by the mid-1980s. What remained were difficult, diffuse pollution sources such as contaminated urban runoff and agricultural drainage. Pollution from these sources could not be tracked to a clear "owner", so it was difficult to assign blame and responsibility for cleanup costs. In addition, data on the performance of nonpoint source pollution control strategies were scarce, and the technical tools necessary for estimating impacts were still in their infancy. Even the most well-intentioned non-government organizations simply did not have the technical or fiscal resources to conduct these studies, and with few success stories to demonstrate, resources for the work slowly dwindled. Not surprisingly, progress slowed and eventually halted on these issues.

The most devastating loss of human capital in government occurred in the mid-1990s, with deep cuts to the budgets of the Ministries of the Environment and of Natural Resources. Since that time, informal IWM networks have been quietly and steadily growing, this time not primarily with or between governments, but rather between private contractors, NGOs, conservation authorities, and university researchers. In contrast to the 1970s and 1980s, today government has a secondary, support role, rather than leading and financing the initiative. But these networks are still emerging, and challenges continue to exist

Today, the Ontario government has very few experts in the technical aspects of water management, such as hydrology, pollution control, and computer simulation, although

some very recent revival in coverage has occurred. Perhaps more importantly, the Ontario Government has lost, through attrition and “downsizing”, its former strength in technical teamwork – the ability to work within a multi-disciplinary team on a shared problem – and this capacity has not yet been restored.

Most technical expertise now resides outside government, mainly in NGOs, in consulting firms or with retired individuals working as independent contractors. Research partnerships fostered in the 1970s and 1980s continue to bear fruit in university research, and in university-community partnerships. But government, especially the Ontario Ministry of the Environment, is now conspicuously absent from many IWM activities. And while some agencies, notably the Ministry of Natural Resources, remain active in water management activities, the role of government as a centre of IWM expertise has now virtually disappeared.

There are several important implications of this change. The first is that there is now little consistency from one IWM activity to another. Some IWM projects may be very simple, “back of the envelope” exercises, while others are multi-year, multi-million dollar initiatives. The quality of the work ultimately depends on the experience of water managers, the degree to which they can marshal funding for the work, and the availability of external consultants. Without a template or central “quality control”, IWM activities in the Province therefore now vary widely in quality and impact.

A second implication relates to the burden of costs. Thirty years ago, the Ontario government took responsibility for oversight of watershed management activities and assumed most or all of the costs. In some cases, for example in the Grand River Basin Water Management Study, conservation authority staff contributed to technical studies, but the costs – which were often in the millions of dollars – were largely or entirely borne by the Ministry. Today, this is far from the case. Total expenditures now are generally smaller or spread over a longer time period (to make annual costs more manageable) than would have been the case in the heyday of IWM. In addition, the burden of costs is often now shared among partners. So, for example, the recent upgrading of the Grand River Conservation Authority’s Grand River Simulation Model (the basis of the MOE-led basin study that ran from 1978 to 1982) was a special project undertaken by the Authority with funding from basin municipalities and the Province. While this approach helps to share the load, it creates a climate of uncertainty and political vulnerability that can be an obstacle in effective long-term water planning and management.

A third implication is the question of trust and team-building. One advantage of a highly-centralized framework for IWM is the stability it affords, and the opportunity to forge and maintain long-term working relationships within and between stakeholder groups. In the absence of central leadership, IWM partnerships must now be created in an *ad hoc* fashion for each project. This reduces the opportunity to learn from mistakes and to gradually refine and improve IWM strategies across a region. There is little opportunity for sharing of data, technology, or know-how among IWM projects; rather, there may in fact be incentives *not* to share, so as to reduce competition for scarce fiscal and human

resources. Today, especially following the Walkerton contaminated drinking water tragedy, there is a widely-held perception that the provincial government has abdicated its role as a guardian of the environment on behalf of the public. The public no longer trusts government to act fairly and responsibly, and now insists on a high degree of transparency and accountability in public decision-making. This expectation is enhanced and facilitated by the Ontario Environmental Bill of Rights, which enshrines in law the public's right to know, to comment, and to challenge public policy about the environment.

Today, we can reflect on almost 40 years of intentional water and watershed management, and derive some key lessons for the future. The following discussion summarizes conclusions from the keynote presentations at the workshop and places them in the context of IWM experience over the last several decades.

There were six presentations at the workshop. I led off with a review of the history and context of IWM; much of this presentation is contained in the preceding discussion. Theresa McClenaghan of the Canadian Environmental Law Association provided an overview of some of the many regulatory and institutional activities currently underway in Ontario that bear on IWM. There were four additional presentations of which three were specific to Ontario: (1) Sandra George of Environment Canada described her experience with watershed management as it relates to management of the Canadian Great Lakes, (2) Sonya Meek of the Toronto and Region Conservation Authority presented a case study of the Rouge River water management plan; and (3), Mike Walters of the Lake Simcoe Region Conservation Authority outlined the approach being used to develop the Lake Simcoe Environmental Management Strategy. The final presentation was by Mark O'Donohue, Director, Urban Water Research Alliance, South East Queensland. He provided a comparative international perspective based on his involvement with on water management in Southeast Queensland (Australia).

Review of Workshop Presentations and Discussion

The changing role of government and the growing importance of stakeholder networks

One of the clearest and most important messages from the CWRA workshop was that the role of government in IWM has changed profoundly over the last thirty years. On the surface, this observation seems trite, but its ramifications reach well beyond governance and into the relationships between decision-makers and the public, the flow of information, and expectations of transparency and accountability. In the 1970s, the Ontario government maintained Canada's best, if not only, expertise in IWM, and used it wisely and well to advance major watershed planning exercises in most of the Province's major river systems. Today, IWM expertise is dispersed among a wide network of players, in government, NGOs, universities, and the private sector. As a result, current studies are being undertaken by formal or informal consortia of interests. The transition to this approach has not been easy, and the consortia involved face difficult questions.

Where will the necessary money come from? How much money is necessary to do a good enough job? If a computer simulation model is necessary, what kind of model should be used? Who knows how to obtain and use it? And so on.

In her presentation, Theresa McClenaghan observed that Ontario's conservation authorities are the obvious institutions in which to establish and build IWM capacity. They are usually well linked to existing programs and already have much of the administrative capacity and networks necessary to support IWM. On the other hand, their mandate is currently limited to an individual river basin, and this may not be the best or only approach for IWM; in some cases (as with Mark O'Donnell's example in South Queensland, discussed below), an integrated regional approach may be preferable. (Theresa did point out, however, that the conservation authorities' current mandate could be expanded in law.) Data sharing may also be a challenge, especially with respect to municipalities and their data. Conservation authorities are funded by municipalities but do not necessarily share their perspectives or priorities in water management. Knowing this, municipalities may be reluctant to share their water management data with conservation authorities or other IWM partners.

Sandra George, in her presentation on watershed planning for Great Lakes water-quality and ecosystem issues, noted the difficulty Environment Canada has encountered in trying to build local stakeholders' understanding of downstream consequences and encourage their support for adequately broad and in-depth analysis. Local participants tend to be highly focused on local issues and are generally less aware of regional challenges – and the implications of local actions in the achievement of regional Great Lakes water management goals.

The difficulty Sandra outlined bears out experience over the last thirty years about the attributes of a successful stakeholder network. These include:

- **Linkages to existing programs of all kinds**, including routine monitoring (provincial government, conservation authorities); municipal programs (e.g., infrastructure planning; sewer use controls); research (e.g., universities, private industry); local non-government organizations; and public engagement programs. Effective linkages ensure that all available data are brought to the table, that the widest possible review of options and implementation issues occurs, and that public awareness and acceptance of the ultimate plan is high.
- **Highly credible science, clearly linked to public policy decisions.** Current IWM networks are fragile even though they have taken years to develop. All parties expect rigorous science and implementable, sustainable outcomes. Weak science betrays this trust and lessens the likelihood that costly plans will be successful.
- **Experienced IWM practitioners.** Because time and fiscal resources are almost always at a premium, water managers do not have the luxury of

learning as they go in IWM. Seasoned practitioners, especially seasoned teams, can guide project participants in the choice and use of data, computer simulation tools, public engagement strategies, and similar activities, so that available resources are used in the most efficient way possible.

- **Equitable access to available data.** Again, this point relates to the importance of trust and trust-building. Partners in an IWM initiative must agree to share available data freely and fully among all participants. To do otherwise implies that some groups have more power in the planning exercise, or even may benefit more from the outcome. Power imbalances, reflected in unequal access to information resources, erode trust and must be avoided wherever possible.
- **Timely action and effective administration.** Even if the cost and effort are shared among a number of participants, there must be strong and capable central administration of the plan. Numerous studies have shown that smooth and capable administration builds trust among participants and is essential for IWM success.

Sandra George also highlighted the need for coordination of science and monitoring activities across all partners – something that would have been much less important in the days when the plan was administered by a single lead agency. Proposed water management actions should ideally be endorsed by all partners, but this can be a major challenge where different sectors or partners have different priorities. Scale is also an important issue, especially in large watersheds like the Great Lakes Basin, where the physical, jurisdictional, and policy complexity of interagency complicates planning, and where a wide range of issues compete for limited resources. As a result of this complexity, priorities in a large basin are continually changing and evolving and, as noted previously, actions with regional impact may be of little interest to citizens who do not benefit from them directly. This can make it hard to engage the public locally when the issues seem distant or “somebody else’s problem”. Sandra’s findings are consistent with reports in the water management literature, which suggest that IWM is most effective when it has a local focus, is locally responsive, and is appropriate to local social and environmental conditions.

These observations underscore Mike Walters’ assertion, based on experience with Lake Simcoe, that there must be full agreement among participants on a single shared mission, or goal, for the plan. All stakeholders – and it may be a diverse group – must endorse this goal and the specific project objectives that flow from it. An effective plan, Mike argued, converts project objectives to an explicit “business plan”, with annual work plans, agreed-upon tasks, and budgets sufficient to accomplish each year’s work. As the number of participants increases, this challenge becomes greater; it is greater still in the absence of experienced administration and project leadership.

The challenge of effective leadership

Sandra George's and Mike Walters' observations lead to another conclusion: that plan success is contingent upon effective leadership. Ideally, a single agency takes the lead and provides administrative support for the planning exercise. (Mike Walters argues that this remains the ideal condition; in the past, in Ontario, the expectation was that a Provincial Ministry would fill this role. Today it is not clear where the responsibility for leadership rests.) Even so, however, it is important to have a single individual within some agency who provides clear and charismatic guidance, ongoing conflict resolution, and personal bridges to external partners.

Clearly, it is important to choose the right project manager. Sonya Meek emphasized this point in her presentation on the Rouge River study. In that exercise, a charismatic environmental lawyer was voted by the group (i.e., not appointed by an agency) to chair the management plan. His outstanding interpersonal and conflict resolution skills allowed him to establish fair and respectful processes quickly and effectively. As a result, what might have been a difficult and adversarial process in other hands became a rewarding team experience for participants.

The key here once again lies in a trust-based relationship. An effective leader creates not only the perception but the reality of a strong, confident hand on the tiller, ethical and equitable treatment of participants, and efficient, transparent administration. He or she can provide stability and continuity as the plan evolves and adapts to changing external conditions, whether financial, regulatory, or environmental. Personality is at least as important as, if not more important than, technical expertise in such situations. Mike Walters extends this discussion by noting that leadership also involves making sure that the right people – those empowered to make decisions on behalf of their constituencies – are appointed to project committees.

Also challenging is the issue of accountability for plan implementation. In the absence of a single lead agency, and with many cooks stirring the IWM pot, who is accountable for plan success? Who is to be blamed if the plan fails? Australia has addressed this problem through formal partnership programs funded by senior governments. Mark O'Donnell described the Southeast Queensland Natural Resources Management (SQNRM) program, in which a formal partnership agreement has been established among the national Healthy Waterways program (a public engagement strategy), the federal government (the SQNRM program is part of a national system of 56 regional natural resource management groups), and the Urban Alliance, the largest urban water research program in Australia, which links the state (Queensland) government with two universities and the Commonwealth Scientific and Research Organization (CSIRO), Australia's national science agency.

The SQNRM partnership is built around an integrated research framework intended to coordinate research activities in the target watershed, and thus creates a foundation for the science/policy interface necessary to deliver the plan and continually update research findings. Funding is provided not only for infrastructure renewal but also for

resource assessment, support of ongoing programs, and capacity building in the community. The accountability here rests with the regional project team itself; if the process fails, funding is withdrawn by the state and federal governments, and work cannot continue. In this case, the incentives to advance IWM are created by the federal government, with project oversight at the regional level and implementation of specific measures by local government.

Speaking about the Lake Simcoe Region Conservation Authority's Lake Simcoe Environmental Management Strategy, Mike Walters stressed the need for dedicated resources for the duration of the project, ideally administered by a neutral lead agency. Consistent with the approach taken in South Queensland, he recommended that partners make a formal commitment to the plan, including commitment of human and financial resources, in a signed agreement. All partners should contribute something (although not necessarily equally) to the initiative, thus creating an incentive to stay at the table and sustain their commitment in a meaningful way. In exchange for this commitment, participants should have equitable access to information and should share in project decision-making.

Whatever the administrative arrangements for the work, there is no question that there must be clear designation of roles and responsibilities, timelines, and financial obligations. Who will do the technical work such as modeling? Who will keep the books? Who will store and manage the data? And so on. Jurisdictional responsibility should also be clarified early in the process, to avoid confusion and bad feeling later on. In many, perhaps most, watershed management initiatives, several levels of government are legitimately involved, and clarity about roles and responsibilities early in the process can avoid confusion and recriminations later on.

As Mike Walters observes, effective administration is fundamental to project accountability, and that accountability is especially critical when the project must answer to a range of funders or stakeholders, or both. This, indeed, was Sonya Meek's point when she observed that an effective multi-stakeholder oversight committee, charged with tracking progress, expenditures, and technical quality, was key to the success of the Rouge River Management Plan. Yet managing an interdisciplinary team is in itself a challenge, requiring more time, more meetings, and more questions, than would have been the case if a single agency planned and led the initiative.

At the same time, Sonya Meek observed that interdisciplinary studies can foster better science and lead to a more rigorous end product. When the team's technical work must be subject to scrutiny by experts in a variety of disciplines, there is a much better chance that errors of logic or fact, weak assumptions, or inadequately tested tools will be caught and corrected early. Interdisciplinary work also requires that the team come to an agreement on technical vocabulary (avoiding the jargon of specific disciplines); on units and monitoring techniques; and on the format, storage and management of data. If these tasks can be accomplished, however, the benefits for the team are enormous. Indeed, it is precisely this collaborative learning that many authors identify as the most important

outcome of successful IWM, and which becomes the foundation for successful implementation of the watershed plan, and for the success of future studies in their own or other basins. Sandra George commented that she believes that watershed planning at the regional scale is important, but no agency currently has the capacity to do it. Collaborative learning through successful IWM initiatives helps to build this capacity.

Sandra George reminded us also of the critical importance of planning for conflict resolution as part of project governance. In addition to clear articulation of roles and responsibilities, participants must have a clear idea of how disputes are to be resolved, in advance of problems arising. Sandra suggested that a new institutional model may be needed to achieve the necessary administrative stability, but in fact it may be the case that the administrative model may instead need to be tailored to the needs of each project. The attributes of that leadership, on the other hand, may be consistent from project to project.

Expectations of transparency and accountability

Dozens of studies over the last thirty years clearly demonstrate that early and substantive involvement of the public, especially in plan scoping and goal-setting, is critical to the success of an IWM initiative. As noted previously, many authors point to IWM as a collaborative social learning process, a capacity-building process, rather than simply a technical exercise. Viewed in that light, effective public participation can be seen to be an essential element for plan success. If the plan is successful in establishing a common mission and goal, effective public engagement, including public education and communication programs, is essential for consolidating and enhancing that consensus.

A striking conclusion of several presentations, including those by Sandra George and Sonya Meek, was the current importance and utility of “social marketing” approaches to community engagement. In the past, public involvement might have been limited to a handful of information sessions or open houses, geared more to delivering information than to listening to and responding to public concerns. Social marketing is a relatively new approach for public engagement, applying traditional marketing concepts and techniques to achieve desired changes in human behaviour, usually for the public good. Social marketing has been used successfully for smoking cessation, nutrition and exercise campaigns. The exercise-promotion ParticipACTION program, familiar from television and radio advertising, is an example of a successful social marketing campaign. In comparison to traditional public information approaches, social marketing takes a much more deliberate approach to engaging the public in discussion about the benefits and pitfalls of proposed approaches. In an IWM context, it can have the goal of identifying key barriers to adoption of proposed measures, so that the project team can develop strategies for overcoming those barriers and thus facilitate implementation.

As noted previously, in the absence of strong provincial leadership in IWM there is a need to link a variety of partners and bridge existing activities with new initiatives. And with more agencies and organizations potentially involved, there is an increased need

for clear and consistent messaging about the project and its outcomes. For example, Sonya Meek reported that TRCA chose to focus its entire Rouge River communication plan around several key messages: the need to increase natural (pervious) cover; the importance of building sustainable communities (both new and retrofit); and the need to manage water balance and promote sustainable community practices within the watershed. These simple messages are easy to understand, and are based on credible science, including the project's impressive modeling of future build-out and climate change scenarios.

Several speakers emphasized the point that when multiple partners are involved in an IWM initiative, project credibility cannot automatically be assumed. There is a need to demonstrate, clearly and consistently, the impeccable quality of science used in the project, and in policy recommendations that flow from it. Not only project participants but also external observers, including funding agencies, must be convinced that the work is rigorous and the policy proposals well-founded. Furthermore, project actions are likely to be costly, while available resources are scarce. The project team must be able to demonstrate for themselves and for outsiders clear expectations about contributions of time, expertise, and money, and the staging and timing of those contributions, and must be willing to acknowledge publicly each party's contribution to the whole.

Today, the expectation of transparency and accountability in IWM is vastly greater than it was thirty years ago. Effective public engagement cannot be left to chance. Most successful IWM initiatives now develop comprehensive communications strategies in advance of the project, both for stakeholder engagement and for internal project communications. Several speakers described the need for transparent and timely reporting of progress, through written reports, web-based material, presentations, meetings, and similar measures.

"Report card" systems, providing regular and easily-understood updates on the impact of water management actions and expenditures on the quality of the aquatic environment, are now widely used as a communication tool. In addition to providing a level of accountability to the public, they also have the benefit of increasing community and political support. Australia's Healthy Waterways program (www.healthywaterways.org), for example, has a national system of freshwater and marine report cards. Toronto and Region Conservation Authority has a similar system of annual watershed report cards that keep public awareness of TRCA's water management activities high. TRCA also sponsors an annual Saturday Forum to report on water management progress in the region and identify priorities for the next year.

Several speakers, and numerous papers in the literature, emphasize the need for adaptive water management planning, as part of an ongoing commitment to accountability to the public and to funding agencies. This makes intuitive sense on many levels. If actions are undertaken on a partial or pilot basis, their effectiveness can be determined before additional resources are expended. Regular reporting of progress and impact assures the public and funding agencies that proposed measures have in fact

been implemented, their timing, their cost, and the impact they have had (if any) on watershed conditions. If statutory or regulatory requirements exist, regular reporting also allows demonstration that required targets have been met, and reveals areas where enhanced remediation may be required.

From a research perspective, one of the most difficult challenges of IWM is the paucity of data on the effectiveness of individual actions. Periodic reporting of plan progress and watershed conditions therefore also provides an opportunity to gather and report information about how specific measures have actually performed in the watershed, and provides a factual basis for the replacement or alteration of ineffective measures. And of course the watershed environment itself is changing: population is growing, land use is changing, droughts or floods occur, and environmental quality varies over time and space.

The watershed management plan must keep pace with these changes or it will quickly become obsolete. Ideally, review of the plan should occur at predetermined intervals, as part of a regular reporting framework. This keeps the process fresh in the minds of the public and decision-makers, and allows water managers to take advantage of emerging planning, engineering, and communications technologies. If the plan is kept reasonably current, it will lessen the need for and shorten the time required for subsequent studies, regulatory approvals, and so on.

Discussion by Participants

The discussion portion of the workshop began with short presentations from a panel who were asked to react specifically to the question of whether application of IWM is feasible in the Lake Simcoe watershed.

Mr. Gary Gregoris, from the Mattamy Development Corporation, spoke from the perspective of the land-developers sector. Gary said that he regarded IWM as an additional layer of planning and regulation. In his view, the current provincial and municipal planning and regulatory structure was adequate to ensure all significant aspects of water management would be dealt with in a sustainable fashion. He stressed the need for predictability in expectations and performance requirements for efficient operations by land developers.

Ms Claire Malcolmsen, representing the NGO Environmental Defence, presented her experience as a community mobilizer on environmental issues. She highlighted the important role of environmental activists in raising public awareness of specific environmental hazards and deficiencies in current practices and thus providing the motivation for politicians to give proper priority to environmental issues. For example, groups involved in promoting the health of the Lake Simcoe ecosystem had been pivotal in advancing the current Federal-Provincial initiatives for the Lake Simcoe watersheds. Like other speakers, Ms Malcolmsen noted that planning and implementation of IWM must include a carefully chosen approach to public involvement that ensures full engagement of interested members of the public in all stages of the process. Effective

public engagement, she stressed, is effective in continually enlarging public understanding of the diversity of issues involved and the consequences of alternate policy options.

The Challenge Questions

Following the formal presentations and the panelists' comments, workshop attendees were challenged to address four main questions, using the Lake Simcoe watershed as a case study. The questions were:

1. How useful is IWM in meeting objectives for water management?
2. How feasible is IWM in the Lake Simcoe watershed?
3. What next steps are necessary for Ontario to adopt IWM?
4. What are participants' views of the strengths and weaknesses (advantages and disadvantages) of IWM in Ontario?

These questions were discussed in breakout groups, with each group having the opportunity to discuss each question. The responses are summarized under each question below.

Question 1 How useful is IWM in meeting objectives for water management for Lake Simcoe?

Participants identified nine main objectives for water management in Lake Simcoe. These were:

1. Meeting Provincial Water Quality Objectives
2. Harmonizing diverse policies on water quantity, water quality, and biodiversity
3. Protecting recreational uses on land and water, and navigation uses (maintaining lake level)
4. Establishing a sustainable cold water fishery
5. Controlling or eliminating invasive species
6. Restoring the shoreline and nearshore ecosystem
7. Achieving an appropriate balance of land use, for example forestry vs. wetlands
8. Ensuring that water supply is adequate to sustain development
9. Ensuring public access to the lake, for example in support of tourism

The results of the breakout group discussions revealed that participants believe that IWM is an essential tool for meeting objectives where there are multiple disciplines or

stakeholders involved. In other words, IWM provides a useful framework for discussing values and expectations, and for balancing tradeoffs in water management. All four breakout groups believed that IWM is an essential framework for making progress toward Provincial Water Quality Objectives (objective 1). It provides the ability to link land-based practices with environmental outcomes, especially lake-water quality. IWM was also seen to be vital for harmonizing diverse water quantity, water quality, and biodiversity policies (objective 2), for supporting land- and water-based recreational activities and navigational uses (objective 3), and for achieving specific management goals, such as a sustainable lake trout fishery (objective 4). Finally, IWM provides a mechanism to engage the full spectrum of stakeholders and activities in the restoration of the shoreline and nearshore ecosystem (objective 6), and for that reason is an essential tool there also.

IWM was perceived to be a useful option but not essential for achieving an appropriate balance of land use (objective 7) and in managing water supply to support planned development (objective 8). In part, participants' caution about these points related to their view that these activities may be handled through other decision-making frameworks, for example Official Plans. Nevertheless, IWM was seen as very useful, especially with respect to evaluating the impact of planning decisions on lake health. IWM was also considered to be important for protecting valued features related to tourism (objective 9), especially public access to the lake shoreline. More generally, IWM was seen as helpful in balancing interests and outcomes in a transparent fashion.

Interestingly, the breakout groups disagreed about the utility of IWM for the control or elimination of invasive species (objective 5). One group felt it was an essential tool in this context, while two other groups did not view it as a process that should be required.

Question 2 How feasible is IWM for Lake Simcoe?

All participants believed that IWM is either entirely or probably feasible for Lake Simcoe. Opportunities and barriers exist, and the latter must be overcome if IWM is to be implemented successfully in that basin.

Opportunities include the potential to build on IWM experience in other lakes and to create an administrative framework that would provide better coordination among agencies and other stakeholders. A comprehensive, inclusive approach helps to clarify the roles and responsibilities of participants, can help make trade-offs explicit, and increases the probability of successful management and flexible, cost-effective implementation. At the same time, an IWM approach can facilitate the integration of available science and bring it to bear on policy decisions. (There may even be the potential for independent "blue ribbon" science panels to evaluate the body of literature on a given ecosystem such as Lake Simcoe, and make policy recommendations based on available science.) As an integrative framework, the IWM "systems" approach can make the necessary regulatory process more efficient and predictable than if individual studies were conducted separately. Finally, participants pointed out that public and government interest in effective water management is now high, and development

pressures are providing strong incentives to plan effectively for current and future water uses. These are promising factors for the promotion of IWM regionally or across the Province.

The barriers to successful IWM were also seen as significant. Some actions recommended by an IWM plan, for example acquisition of green space, are likely to be costly, and sufficient resources may not be available for this purpose. Indeed, participants felt that environmental management in general receives too little provincial and federal funding, and the goals of IWM may be frustrated if adequate funding cannot be found for data acquisition, monitoring, analysis, and infrastructure. (Note that all of these elements are present in the federal funding provisions for the Natural Resources Management system in Australia.)

Participants also pointed to specific institutional obstacles that may prevent effective IWM. These include the separation or compartmentalization of municipal services. For example, water and wastewater services are handled separately from land use planning in most cities. The two functions have separate staffs, separate resources, and little experience in working together; in many cities, they compete for the same pool of resources and have little incentive to collaborate.

Jurisdictional complexity and overlap – a common problem in Canadian water management, as noted previously – can also interfere with successful IWM. Issues here could include gaps in problem “ownership”, or conflicts, for example between municipalities, who have one perspective on water management and growth, and conservation authorities, who have a different mandate and different goals. Municipalities currently fund much or all of the work of conservation authorities, and if their perspectives are at odds with an IWM approach, they may be in a position to block the work of conservation authorities by withdrawing funding. In some cases it is not clear who has the duty of care for an issue, for example control of invasive species, or whether indeed any group or agency at all has been given this responsibility explicitly.

Finally, participants were concerned about the administrative complexity of a multi-disciplinary, multi-stakeholder, multi-objective planning exercise. How would conflicts and trade-offs among competing issues be managed? (On the other hand, participants observed that conflict brings stakeholders to the table, and if managed well could be a useful platform for IWM discussions.) How will the exercise be sustained (and made sustainable) over the long term? Who will take responsibility for this? And, finally, participants expressed concern that the administrative burden imposed by ongoing IWM activities is likely to be costly, complex and demanding, and may be beyond the capacity of existing institutions, including the Lake Simcoe Region Conservation Authority.

Question 3: What next steps are needed for Ontario to adopt IWM?

Participants' responses to this question clearly reflected a lack of confidence in social and institutional capacity to conduct IWM processes effectively. Numerous responses suggested that the provincial government could and should establish water management

planning objectives and priorities for water management, and should provide guidance on appropriate IWM approaches, jurisdictional responsibilities, and management roles. Some participants went farther than this, suggesting that IWM requirements could be enshrined in law, either as a formal requirement (for example, for infrastructure funding) or as guiding principles in support of sustainable water management. While some responses suggested that it would be sufficient for the Province to establish provincial or regional objectives for water management, with IWM results delivered locally, others felt that it would be desirable for the Province to establish a centralized, arm's length agency with a clear mandate to promote and oversee IWM. Participants articulated the following core principles that should underlie any IWM strategy in Ontario. It should be:

- **Inclusive**, with all interested stakeholders involved meaningfully and early in the process, and regularly engaged thereafter, and with the ultimate goal of building social and institutional capacity for effective water management
- **Goal-oriented**, with targets established early in the process, in consultation with stakeholders
- **Adaptive**, responsive to local conditions and to changes in those conditions as the planning exercise proceeds
- **Adequately funded**, provided with adequate financial resources both for technology/infrastructure, and for project administration, including human resources
- **Efficiently administered**, transparent and accountable, and appropriately equipped for necessary communications, data acquisition, and knowledge sharing capability
- **Incorporating full-cost accounting**, that is, recognizing the real costs of water and sewerage services, and reflecting those costs in the pricing of those services

Aside from institutional questions, participants felt that several additional steps were important in encouraging adoption of IWM in Ontario. The first was to determine which watershed systems would benefit most from IWM. It is a complex and potentially resource-intensive process, and not one that is appropriate for all systems. The Province could show leadership by guiding practitioners in determining where and when IWM is an appropriate management approach.

This kind of role for the Province had been hinted at earlier by Theresa McClenaghan, who observed that some current policies, for example source protection requirements under the Clean Water Act, and to some extent provisions under the Safe Drinking Water Act, are consistent with some of the IWM principles listed above. For example,

- These statutes set out specific objectives for some aspects of water management, and clearly assign roles and responsibilities to various individuals and agencies. But other aspects are less clear, for example who will bear the

costs of source protection planning, and how conservation measures of various kinds under various legal frameworks will or could be integrated across a region.

- Drinking water source protection plans are intended to include a technical assessment of the status of the watershed, including current and prospective drinking water sources, sources of contamination, and water use issues.
- Some monitoring and reporting of progress, and some types of public education and other communication are required under the Clean Water Act and the Safe Drinking Water Act, but these are not at the level or in the integrated form that would be expected for IWM. For example, the Safe Drinking Water Act requires the Chief Drinking Water Inspector and the Minister to report to the legislature on drinking water conditions, and indeed the first Minister's report incorporated a broader range of issues than just drinking water alone. But these are minor and isolated tools in what should be a much broader and more ambitious project of public engagement.
- Periodic review and revision of water management plans is required under the Clean Water Act, and some is also incorporated into the Great Lakes Charter Annex amendments in that governments are required to review and revise their plans as additional empirical data is obtained, for example on climate change.
- Funding provisions are contained in the Safe Drinking Water Act and some other legislation, and should include the costs of source water protection as well as infrastructure renewal. However these provisions do not extend to aspects of water management beyond drinking water protection. For example, protection of recreational, navigational, or fisheries uses of water would not be covered by these funds.

Theresa emphasized, however, that while some elements of IWM are present in some domains and in some legislation, the fundamental issue is the lack of integration of those laws and provisions, across not only drinking water but a wide range of water management concerns. Ontario has no overarching strategy for tying this patchwork of policies together nor for mandating broader watershed planning and management beyond drinking water under the Clean Water Act. This is short-sighted and unfortunate.

In his commentary on the Walkerton tragedy, Justice O'Connor recognized that watershed based (drinking water) source protection planning can and should be nested within a broader planning strategy. The same is true for the monitoring and reporting of implementation success. While some such monitoring is now required under drinking water legislation, there is no broader requirement for reporting across a wider range of water management concerns or in a framework that would allow comparison across initiatives and interests.

Question 4: What are your personal views of the strengths and the disadvantages of IWM?

Strengths

Participants had many and varied comments on the strengths and benefits of IWM. Generally speaking, IWM was seen as a very effective framework for **facilitating discussions across stakeholder groups, agencies, and disciplines**. As such, it can encourage consideration of a much wider suite of issues and impacts than might be possible with a more traditional water management approach. For example, whereas traditional municipal engineering plans might focus on stormwater management and flood protection in an urban area, an IWM approach would permit broader evaluation of fisheries, erosion concerns, and recreational and navigational impacts, in addition to stormwater issues. Furthermore, an IWM approach could and probably should reach beyond political boundaries (in this case, the urban area) to the larger watershed, which may be an important source of flows and pollutants to the urban area.

Several groups spoke about the power of IWM in **building social capacity for decision-making on water issues**. As an intentionally inclusive process, IWM provides a good mechanism for public engagement, and is attractive to individuals who have the skills and interest to advance community-wide initiatives such as those involved in IWM. Decisions taken within an IWM framework tend to be more balanced and reflect better societal knowledge and understanding of water issues. The process of repeated discussions and joint evaluation of data and management alternatives, undertaken over an extended period of time, engages interest, builds trust and creates a sound foundation for collaboration across a range of activities. And if stakeholders are involved in problem definition early in the process, they are more likely to “buy in” to decisions about management strategies, and facilitate the implementation of those actions. As a result, IWM decisions are often more robust and implementable than those taken in a more directive, unilateral fashion, for instance by a regulatory agency. Ideally, IWM can be used to provide and continually update and refine a **durable set of policy choices**. It must, however, be noted that to be successful in this regard, IWM requires sustained political and financial commitment from partners, and experience to date has shown that this is seldom the case.

IWM **reduces the potential for bias** in water management decisions, by allowing for open and transparent assessment of benefits and costs across a range of stakeholder groups. An effective IWM process can make explicit the trade-offs involved in water management decisions. And where trade-offs become a source of conflict among participants, the common water management vision and trust that are hallmarks of a successful IWM strategy provide an excellent foundation for conflict resolution.

IWM was also seen as an **excellent framework for assembling strong scientific knowledge and bringing it to bear on a given water management issue**. More to the point, the inclusive nature of IWM ensures that there are many cross-checks on the range and quality of science included in the planning exercise, and how that science is

interpreted as a basis for public policy. Where the science on a particular issue is incomplete, an IWM approach can help to identify knowledge gaps and suggest ways of filling them. An inclusive process also ensures that every proposal has broad and careful scrutiny by a range of stakeholders, and therefore encourages consideration of a full range of options. As a result, IWM approaches can help to ensure that the most cost-effective management actions are selected, thus minimizing necessary expenditures, and that the potential for technical errors is reduced.

Most IWM initiatives incorporate analysis of future scenarios, including population growth projections, build-out scenarios, and climate-change projections. An integrated approach, incorporating not only water considerations but also habitat, biota, and social systems, allows the analysis of cumulative effects in the present case and in these future scenarios. For example, a traditional analysis might estimate water use based on population growth projections 20 and 50 years into the future. By contrast, an IWM approach could examine the cumulative impact of rapid population growth, high surface imperviousness resulting from residential, commercial and industrial development, and higher evaporation rates caused by a warmer climate. Such an approach would reveal particularly sensitive watershed features or uses that might not have been evident in a more traditional analysis.

Ideally, IWM is a long-term, adaptive, iterative process. As such, it should **extend beyond the limits of political terms of office** and thus should **reduce the potential for impact of short-term political decisions**. Indeed, clear and early determination of a common water management vision for the target watershed provides a powerful foundation for long-term policy discussions. Some participants noted that IWM is the only water management approach that explicitly acknowledges a requirement for sustainable use of water resources. As a long-term process, IWM also facilitates the administrative stability and network building that is necessary to secure the necessary long-term funding from multiple sources, especially if it is successful in incorporating all aspects of the water environment, water users, and water uses, and is thus truly integrative.

Successful IWM therefore creates a body of experience in multi-stakeholder, multi-disciplinary, multi-objective water management that can benefit decision-making in other watersheds and indeed in other environmental contexts. But an iterative process may also be essential to keep abreast of changing watershed conditions, especially land use and population changes, and emerging analytical and abatement technologies. Sonya Meek emphasized our need to improve our ability to plan and assess watershed conditions under uncertainty, for example under climate change scenarios. An iterative, adaptive planning framework allows water managers and other participants to update key information and take advantage of new tools and technologies as they become available.

Sonya also stressed the opportunities afforded by IWM to identify strategic issues and opportunities within the watershed. These might include more integrated solutions that

have multiple benefits, and the incentives necessary to implement those options. An IWM approach also provides a framework for careful growth planning, especially at the urban fringe or in “green field” areas. The type of information in a typical IWM plan is in fact required under the Oak Ridges Moraine Conservation Plan, the Niagara Escarpment Plan, and is recommended under other legislation and policy, including the Greenbelt Act, the Places to Grow plan, and associated provincial policy statements. In rural and other undeveloped areas, an IWM plan can assist watershed managers in making decisions about the location and form of new development; in older areas, it can identify opportunities for intensive (re)development, and can be helpful in optimizing (and indeed finding sources and mechanisms for) expenditures on infrastructure maintenance and replacement.

In principle, then, the strength of IWM is that it provides an effective framework for the setting of basin-wide water management goals, the sharing of information related to those goals, and the development of robust, cost-effective management strategies for the watershed.

Weaknesses

Participants felt that the weaknesses of IWM related mainly to the potential for **time delays, cumbersome management systems, potentially high costs** (higher than would be the case with unilateral decision-making), **and limited accountability** for expenditures or progress. There was also concern that if a single partner withdrew support, or a single activity was omitted, the IWM process could or would fail. Successful IWM requires the setting aside of individual agendas, to permit collaborative analysis of issues, data, and potential management strategies. Participants pointed out that this requires a level of trust and maturity of judgment that is not always evident in current water management activities.

Accountability – or rather the lack of it – was raised as a major weakness of IWM as currently practiced in Ontario. Accountability implies regular reporting to participants, to funding agencies, and to the general public, but also mechanisms for identifying and correcting gaps and omissions. It means sound and defensible science, and creative, cost-effective solutions that respond to specific watershed conditions. Ideally, an IWM initiative has an atmosphere of constructive and collaborative problem solving; it should not be a structure in which grievances are aired or blame is laid. And it cannot be (or be seen to be) a rote exercise in which stock solutions are applied without careful consideration of the watershed environment, water uses, and water users. There must be appropriate and meaningful incentives for continued, thoughtful, ethical involvement in an IWM initiative.

Despite IWM’s conceptual emphasis on adaptive management, it has been difficult to sustain public and agency engagement in IWM initiatives, with the result that implementation is sometimes incomplete, and intended follow-up and review of plan success is lacking. (Participants did however note that widely distributed political responsibility may not be entirely a bad thing, if it encourages weaker or less confident

partners to become engaged in an IWM initiative.) Mike Walters suggested that accountability also includes the ability to enforce existing laws and policies, and to influence the development of new legislation. Viewed in that light, accountability also implies accountability to the public through the legislative process; or, in a sense, leadership in society on matters relating to water and water management.

The Way Forward for IWM in Ontario: Questions and Possible Answers

In large part, the uncertainty of workshop participants about the viability of IWM in Ontario relate to the lack of adequate **institutional and social capacity** to undertake complex water planning and management initiatives. Thirty years ago, consistent, centralized administration and technical coordination enabled the Ontario Ministry of the Environment to complete massive watershed planning projects relatively efficiently. And although those projects were sometimes costly, much of that expenditure was directed to the development of computer simulation tools, sometimes “from scratch”. Today, this difficulty is much less significant since most of the necessary modeling tools are either readily available or readily adapted from existing work. What Ontario lacks is the capacity to manage these complex projects efficiently and to move seamlessly from planning to implementation.

Without centralized administrative support, each IWM initiative must re-invent a governance structure, and begin the long process of learning to work within it. Many participants commented on the time delays and cost implications caused by this lack of capacity; some noted that the complexity involved may be sufficient to deter some participants altogether. If an IWM project is slow and cumbersome, it may miss crucial opportunities for funding or may drop off the political agenda altogether. Worse still, ineffective governance can prevent an IWM team from responding appropriately following an emergency such as a major drought or flood. Participants reported perceptions of low productivity, high costs, and “top-heavy” bureaucracy associated with recent IWM efforts – perceptions that, even if inaccurate, may make future initiatives more difficult to mount. Expectations of the speed at which change can occur, the degree to which individual agendas can be accommodated, and similar considerations may also be unrealistic, and must be managed carefully to avoid loss of support and public enthusiasm.

Effective governance means more than simply keeping the books up to date and scheduling regular meetings. It also means **effective conflict resolution** when a stakeholder group feels marginalized or not well served by the process. Issues like these must be identified and resolved as early as possible in the process, to avoid damaging the trust-based relationship among participants. Effective governance also means transparency, including regular and comprehensive reporting in a format that is accessible to all participants. Too often, IWM reports are lengthy technical documents that are costly to produce and difficult for most stakeholders to understand. And when

one or more participants fails to fulfill a promise to the project, an effective governance system will ensure that the omission is caught and rectified early, either by the original participant or in some other manner. Such an omission must not be allowed to slow the whole process or bring it to a stop.

Discussion at the workshop demonstrated that public and agency perceptions of IWM generally reflect **optimism about the *potential* of the approach, but cynicism about the willingness of government and ultimately the people of Ontario to provide the resources needed to overcome the costs in money and time and, hence, ambiguity about the ability of IWM to make a difference in the watershed.** And yet IWM remains a very powerful framework for managing water. We have been successful in the past in Ontario, and jurisdictions elsewhere in the world – South Queensland is one example – continue to use IWM effectively. So what will it take for IWM to succeed in Ontario in the current day? Three main conclusions can be drawn from the discussion at this workshop. These conclusions, posed here in question and answer format, provide some guidance about possible future directions for water management in the Province.

What is needed to make IWM into a fully effective tool for water management in Ontario?

There is a need to establish a sustainable social and institutional capacity for effective water management

The close-knit, coordinated IWM capacity built by the Province in the 1970s and 1980s was lost in the cut backs of the 1990s. While technical expertise, for example in fisheries management, hydrology, and computer simulation of surface and groundwater processes, certainly exists, particularly in conservation authorities and in consulting firms, we currently lack adequate capacity to administer complex multi-objective water planning and management initiatives. Most if not all plans are undertaken on an *ad hoc* basis, with plan management by trial and error. Results vary widely, and may fall far short of participants' expectations. **If IWM is to succeed in Ontario, this capacity must be rebuilt, not necessarily in the same fashion, but intentionally and consistently across the Province.**

The workshop revealed that two elements will be important in this regard. The first is technical support, including a clearinghouse for IWM experience, both from Ontario and from elsewhere in the world, and for technical knowledge such as the choice and use of computer simulation models, the filling of data gaps, and a mechanism for sharing water management data and related information (sometimes called "meta-data"). Ideally, this support should be collegial and free of judgment, and could include activities such as technical-training sessions, annual conferences on Ontario IWM experience, and so on.

Funding for watershed assessment, analysis, planning and infrastructure must be increased

Largely as a result of the loss of centralized oversight of IWM activities in Ontario, funding for watershed assessment, analysis, planning, and infrastructure (and indeed the environment in general) is now significantly less than it was thirty years ago, and well below levels necessary to support effective planning across the Province. **Effective water management will require additional investments** in human resources, either in staff positions or in advisory roles; research funding; and infrastructure grants and subsidies where effective water management planning can be demonstrated.

Ontario needs an integrative administrative framework for IWM

In Canada the primary responsibility for the stewardship of water is assigned to provinces. Most provinces have legislation that clearly sets out the provincial responsibility for management of water as a public good. Ontario has not yet attained this clarity of purpose but the Ontario Water Resources Act does explicitly identify Provincial authority for allocation of water and protection of water quality. Based on this allocation of authority the Province has a responsibility for providing support and guidance for an effective structure for water management. IWM is a very important part of such a structure.

Discussion at the workshop demonstrated that **while Ontario has a relatively strong and effective legislative framework for water management, that framework is not well integrated and does not effectively support the goals and objectives of IWM.** Existing laws and policies work well for the control of individual sources of pollution, and for the protection of specific beneficial water uses, especially drinking water. But they do not provide a coordinated framework to support integrated monitoring and analysis of water and water-related issues, and they are not backed by regulatory requirements for public accountability for IWM expenditures of public funds, nor for failure to implement promised actions under and IWM plan.

For a considerable period of time, enforcement of existing regulatory requirements has been less rigorous and comprehensive than it might have been twenty years ago, and certainly less than would be ideal. As a result, IWM plans lack the necessary “backbone” to ensure that the plan has real impact on conditions in the target watershed. A likely consequence is that plans may remain only a paper exercise, with little action undertaken and little improvement seen in the local environment.

What are the Options for Best Management of IWM in Ontario?

Options for the future

One of the key issues identified in the workshop discussions is accountability for the quality and implementation of IWM plans. The challenge of accountability could be answered in several different ways and may require a pattern of actions that involve

several different scales of management. Ultimately, as stated earlier it is the responsibility of the Province to select and support a successful structure for best management of IWM.

Various options are possible. Theresa McClenaghan suggested, for example, that the mandate of Ontario's conservation authorities could be expanded to include an advisory or even regulatory role in IWM. However this option could be difficult to implement. Conservation authorities are a logical choice in many situations because of their watershed-basis. However, as Theresa pointed out, a regional approach may be preferred for some IWM strategies. For example, management of major aquifers must acknowledge the connectivity of groundwater across the subterranean side boundaries of watersheds.

In addition, conservation authorities vary widely in the number and expertise of their staff. While some, such as the Toronto and Region Conservation Authority, the Credit Valley Conservation Authority, and the Grand River Conservation Authority, are well-staffed and have considerable experience in the biophysical, social and economic aspects of major watershed studies, the same cannot be said for smaller authorities elsewhere in the Province. The current governance of conservation authorities, with stakeholder interests almost entirely represented by municipal appointees, is a weakness. Furthermore, northern regions of Ontario are not served by conservation authorities and would therefore be excluded from such an approach.

Some jurisdictions have attempted to manage water through formal inter-institutional partnerships. Examples include the Interagency Commission of the Panama Canal Watershed, the International Commission for the Protection of the Danube River, the Mekong River Commission (Thailand, Laos, Cambodia, and Vietnam), and various interagency committees (for example, the Council of Canadian Ministers of the Environment). However the work of such groups is often hampered by a lack of clear accountability and delegated power. More frequently, they provide forums for discussion and information sharing, rather than for substantive planning and action.

Experience in Ontario and elsewhere has clearly demonstrated that water management is most effective when it has a local focus and responds to local social, economic, and ecological conditions. Sandra George noted the immense challenges of attempting to manage the entire Great Lakes Basin as a single watershed. Even management of a smaller basin such as the Grand River is challenging if upstream residents have different needs and perspectives than those in downstream reaches. For sustainable management with an ecosystem perspective the effectiveness of locally-focused management must be partnered with a larger integrative, comprehensive and long-term perspective

Four feasible options likely exist within the current Ontario system. These are:

1. **Restore an IWM function as a unit within an existing government agency,** probably either the Ontario Ministry of the Environment or the Ontario Ministry of

Natural Resources. This option would mimic the River Systems Unit that existed in the former Water Resources Branch of the Ministry of the Environment. While technically feasible, this option would have significant fiscal implications because of the requirement to create new positions. In addition, it may be difficult to find sufficient expertise at an appropriate level of experience to make this a viable alternative. For both reasons, this option is not likely feasible at present.

2. **Embed and enforce a requirement for IWM in law or policy**, for example as a basis for infrastructure grants and subsidies, or through a linkage to land use planning approvals under the Planning Act. Theresa McClenaghan indicated that such options might be feasible without extensive regulatory reform. However, regulatory reform will be of little use without effective oversight and enforcement. For that reason, this may not be an option that can be undertaken independently of other actions, as indicated in options 3 and 4 below.
3. **Establish a standalone IWM board or commission with delegated powers of enforcement and dispute resolution**, along the lines of the Ontario Energy Board. The OEB was established under separate legislation, the Ontario Energy Board Act, in 1998. It has extensive powers over the regulation of natural gas and electricity utilities and marketers, and is responsible for setting just and reasonable energy rates for the Province. The Board also has a collaborative alternative dispute resolution function and develops innovative regulatory tools such as performance-based regulation. Finally, the Board develops and implements codes of conduct for those involved in energy utilities, and administers a complaints resolution process. A watershed management board or commission (like the expert-based Murray-Darling Basin Authority in Australia, or the French Water Parliament), could have delegated powers over the regulation and enforcement of water planning and management, water pricing, and infrastructure maintenance and renewal. This option is certainly feasible, and already exists in Ontario in the form of the OEB. But it will require formal delegation of regulatory authority, and this may be a step that the Province is unwilling to take at present.
4. **Establish an arm's length advisory board or panel without delegated powers**, to advise the Ontario government through one or more cabinet ministers about appropriate IWM practice, and to evaluate IWM plans produced in the Province. Ontario has used such boards and panels many times over the last several decades, either as standing boards (e.g., Provincial Forest Policy Committee and Provincial Forest Technical Committee (both MNR); Pesticides Advisory Committee; Ontario Drinking Water Advisory Council (all MOE)) or as *ad hoc* advisory committees (e.g., Endangered Species Act Review Advisory Panel (MNR); "blue ribbon" panel on the regulation of adsorbable organic halides (AOX) in pulp and paper effluents, Industrial Pollution Action Team (both MOE)). An advisory board or panel provides a flexible, low-cost mechanism for the expert review of plans or policy proposals, but its recommendations would need

to be supported by a regulatory backbone such as the Environmental Protection Act or the Planning Act. It could, however, be a useful sounding board for the identification and testing of new analytical approaches and technologies. (Note that Source Protection Planning Boards are intended to have some of these functions, but again would not be responsible for all water-related activities within the watershed.)

These options have varying implications for human and fiscal resources, but all have potential for creating a stronger platform for IWM in Ontario, provided sufficient resources are available to support them and the activities that flow from them.

Several Canadian Provinces have undertaken, or are undertaking now, a comprehensive review of provincial water policies and structures of management. It would greatly benefit Ontario to undertake a review with the objective of developing an integrated water strategy for the Province. In such a review the development of a suitable Province-wide structure for undertaking IWM planning and implementation would have a prominent place.

Concluding Remarks

Effective watershed management is much more than a technical exercise, to be accomplished in the most efficient fashion and then set aside. Rather, it is, as many authors have suggested, a process for creating social change, a framework for collaborative social learning. It is, first and foremost, about people learning how to become actively engaged in the management of a precious shared resource. Effective IWM is an ongoing dialogue, respectful and inclusive. If we in Ontario can establish effective mechanisms for IWM – if we can learn to bring our collective knowledge and experience to bear on a common water management problem – we will create the foundation for ongoing collaboration in social and environmental change with broad benefits for the successful functioning of our society.