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Governance Arrangements for Integrated Water Resources Management in Ontario, Canada, and Oregon, USA: Evolution and Lessons

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Abstract: Guidelines produced by some major international organisations create a misleading impression that Integrated Water Resources Management (IWRM) can be implemented in a standardized fashion. However, contextual conditions vary from place to place, and differences in beliefs, attitudes, customs, and norms sensibly influence interpretation and implementation. Experiences with IWRM in Oregon (USA) and Ontario (Canada) are examined with regard to scope, scale, responsibility, engagement, finances and financing, and review processes and mechanisms. Development of IWRM and the evolution of governance have been shaped by different concerns and beliefs. Oregon has adopted a locally-driven and entrepreneurial approach, whereas Ontario developed a co-operative inter-governmental approach. In both cases, IWRM governance has also evolved due to changes in funding and priorities, which have benefitted some catchments and communities more than others. Both cases provide positive examples of reflexivity and resilience, and demonstrate the importance of review processes and strong cross-scale connections for effective governance. While underlying principles may be relevant for other locations, it would be a mistake to think that either of the two approaches for IWRM could be replicated elsewhere in their exact form. Implementation of IWRM in other parts of those countries and the world should, therefore, start with careful analysis of the local context, and existing governance arrangements and governmentalities.

Keywords: catchment; conservation authorities; governance; governmentality; integrated water resources management (IWRM); watershed councils; Ontario; Oregon

1. Introduction

Integrated Water Resources Management (IWRM) has a long history that began in the early 20th century. Reflecting their times, early examples such as the Tennessee Valley Authority focused on natural resource-based economic development, job creation, and social welfare [1]. In the last 20–30 years, IWRM has been re-cast and is now widely regarded internationally as a key approach for achieving water-related sustainable development goals [2–4].

One unfortunate consequence of the globalisation of IWRM as an idea and ambition is that various major international organisations have produced guidelines, which can create a false impression that IWRM is a single, universal, and relatively straightforward approach that can be applied and transferred in a blueprint and sequential fashion. Examples include the guidelines produced by the Global Water Partnership Technical Committee [5], and the United Nations Educational, Scientific, and Cultural Organisation (UNESCO) guidelines for IWRM at a river basin level [6]. In effect, some

international guidelines send a message, perhaps unintentionally, that if policy makers and water managers do the prescribed things, in the recommended ways, and in a particular order, then effective development and implementation of IWRM is assured. However, practical experience suggests that implementation does not, and cannot, work in such a way.

It is obvious that political, administrative and cultural beliefs, attitudes, customs, and norms vary from country to country, from region to region, and even in some cases, from community to community. Furthermore, the highly dynamic, and at times, turbulent nature of society in the 21st century means that any form of linear, highly structured, and programmed policy approach is unlikely to work equally well in each case where it is applied. This view implies any one approach for IWRM that might be favoured and be possible in a catchment or river basin in one part of the world cannot be assumed to comfortably "fit" and operate effectively in all other places. We believe that the varied, context-sensitive, and nuanced nature of water governance and management has important implications for how we should think about, and investigate, IWRM. Rather than attempting to identify universal "best" practices according to pre-determined performance-related criteria or guidelines, a more productive approach involves examining different meanings and interpretations of IWRM in varied spatial and temporal contexts. This change of focus could lead to deeper and more critical research questions and insights regarding how IWRM has emerged and evolved according to varying political, economic, social, and environmental circumstances and needs in particular places, including stakeholder preferences regarding institutional approaches and styles of decision making (i.e., different governmentalities). We believe that this approach is more likely to produce more meaningful insights regarding the reality of IWRM when compared with the results from evaluation studies that strive to assess effectiveness according to generic measures, indicators, or criteria.

In this paper, we adopt a place and context specific approach by examining the evolution of governance arrangements for IWRM over multiple decades in Ontario (Canada) and Oregon (United States). Thus, our aim is to describe and explain why IWRM emerged and how associated governance arrangements have evolved. Ontario and Oregon were chosen for several reasons. Both have many decades of experience related to IWRM, and both are within countries with established and democratic federal state systems of governance. However, Ontario was an early-adopter of IWRM in the 1940s, whereas Oregon was a relatively late adopter of IWRM in the 1980s. In addition, as some of the findings below demonstrate, the two cases show important differences in general approaches to governance and regarding preferred policy approaches concerning water and catchments. As such, we believe some interesting parallels, similarities, and differences shed some fresh insight on how governance arrangements for IWRM take shape and evolve in different, yet comparable situations.

The discussion is organised as follows. We begin by defining and briefly commenting on the nature of governance, governance arrangements, management, and IWRM. This is followed by a summary of our research approach and methods. Attention then turns to the analysis of the two case studies, focusing on six key aspects of IWRM governance: scope, scale, responsibility, engagement, finance and financing, and review processes and mechanisms. The paper concludes by identifying and describing the main insights regarding how and why governance arrangements for IWRM have evolved in particular ways in the two examples, and the potential lessons for implementation of IWRM in other contexts and places.

2. Governance Arrangements, Management and IWRM

The concept of governance has many interpretations, with scholars from different disciplines using the term to describe various functions and relationships involving stakeholders with responsibilities for public policy. According to Young [7], "governance" refers to systems of rights, rules, social norms, and formal and informal decision-making arrangements used to steer society and move human groups towards particular desired outcomes, whilst also avoiding problems or damage. Reed and Bruyneel [8] consider that governance is fundamentally about how decisions are made, who decides, and who gets what. For others, however, the term has a narrower meaning associated with relatively recent

changes in public policy and administration, and the emergence of new methods of making decisions and steering society [9,10]. Some commentators believe that since the 1980s, government-centered approaches for public policy have given way to alternative arrangements emphasizing market-based mechanisms, public-private partnerships, multi-actor configurations, and highly entrepreneurial approaches for decision making [11,12]. As a result, the term governance also has become a motif for a growth in alternative modes for governing, which include deconcentrated, devolved, poly-centric, collaborative, networked, nested, self-organized, and adaptive arrangements.

There are many examples of the use of such alternative approaches in various areas of public policy, including water [13–17]. Nevertheless, conventional government-based organizations, with accompanying laws, regulations, financial arrangements and partnerships still exist. Those organizations and partnerships often control, or at least significantly influence, decision making [18]. As such, governments and government-based organizations can, and still do, perform governance functions, albeit in some circumstances in conjunction with other stakeholders, organizations, and groups. Given the mixed approaches and varied interpretations in use, we use the following broad definition:

> *"Governance arrangements are the combinations of political, legal, and administrative decision-making structures, processes, and procedures used to establish and apply rules, assign rights and responsibilities, provide direction for action, and assemble financial, organizational, and informational resources, in order to influence the behaviours of people, organizations, and groups, at all scales (i.e., ranging from global to neighborhood)."*

The above interpretation aligns closely with the definition of water governance adopted by the World Bank and Global Water Partnership and reported by the Organization for Economic Cooperation and Development (OECD) [19] (p.29):

> *"Water governance is the range of political, social, economic, and administrative systems that are in place to develop and manage water resources, and to deliver water services at different levels of society."*

Furthermore, the OECD [19] (p.31) has proposed the following definition of multi-level governance:

> *" . . . the explicit or implicit sharing of policy making authority, responsibility, development, and implementation at different administrative and territorial levels: (i) across different ministries and public agencies at central government level (upper horizontally); (ii) between different layers of government at the local, regional, provincial or state, national, and supranational levels (vertically); and (iii) across different actors at a sub-national level (lower horizontal)."*

Using the concepts of governance and governance arrangements can help to focus attention on relationships among multiple actors, the cross-scale nature of decision making, efforts to improve co-ordination, and capacities for resolving problems [20,21]. For example, Warner [14] developed the concept of "multi-stakeholder platforms" to describe arrangements designed to enable organizations and groups operating at different spatial scales and with varied interests to co-operate on inter-jurisdictional issues or problems. Others, including Huxham [22] and Watson [23,24], have examined collaborative governance, while Edelenbos, Bressers, and Scholten [25] (p.7) focused on connective capacity, which they define as "the capabilities of individuals, instruments, and institutions to counter fragmentation in water governance processes by crossing boundaries (structure, organization, language, and so on) and establishing linkages between different actors (on different levels, at various scales, and in numerous domains) in the light of solving water issues".

Regarding key governance capabilities, Termeer and Dewulf [26] have identified: (1) reflexivity, or the capability to deal with multiple frames and understandings found in society and policy; (2) resilience, or the capability to adapt flexibly to frequently occurring and uncertain changes;

(3) responsiveness, or the capacity to respond wisely to changing agendas and public demands; (4) revitalization, or the capability to unblock deadlocks and stagnations in policy processes; and (5) scale-sensitivity, or the capability to observe and effectively address cross-scale and cross-level issues and concerns.

While the terms "governance" and "management" are sometimes used interchangeably and without clear operational definitions, important and yet subtle differences exist. Both terms refer to decision making. However, "management" is concerned with operational procedures, models, principles, and information used to implement policies. In contrast, "governance" is more concerned with the structures, processes, and procedures used for making policy decisions. In reality, the distinction between the two is much harder to discern. At times, managers are able to make policy decisions and people with responsibilities for governance are very often also involved in management.

IWRM gained international traction in the early 1990s, and has been adopted as a key approach for sustainable development by the World Water Council, World Bank, and Global Water Partnership (GWP). In addition, the United Nations has adopted IWRM as part of the Millennium Development Goals and the European Union has incorporated elements of IWRM in its Water Framework Directive. Not surprisingly, a large research literature has developed related to IWRM [3]. The GWP [27] (p.22) defined IWRM as:

> *"a process which promotes coordinated development and management of water, land, and related natural resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital eco-systems".*

As the GWP definition indicates, IWRM is fundamentally a means to achieve management goals. Furthermore, by including the phrase "a process which promotes", the GWP definition identifies an important connection between IWRM and governance. IWRM does not stand alone from governance, and governance arrangements constitute a major part of the process needed to promote and enable coordinated management. However, while the GWP definition refers to a single process, various governance and management processes and procedures (e.g., stakeholder engagement) are likely to be involved in the development and implementation of IWRM policy.

3. Methods

The research framework developed for this study focuses on six key aspects of governance that are acknowledged in the literature and are particularly relevant and important for IWRM, rather than attempting to define particular criteria related to processes, outputs, outcomes, or impacts in order to try to judge success [1,3,4]. The research presented in this paper emerged from several decades of collaboration among the three authors, who realised there were clear similarities in approach and methods, even though the work in Ontario and Oregon had initially been conducted independently. Both investigations had examined the same kinds of issues related to IWRM and governance, and this allowed the development of a new research framework that built on and extended their previous work. The framework includes four elements (scope, scale, responsibility, and engagement), which have been used in previous frameworks and are present in the literature on IWRM, plus two additional elements, which were identified as important when the findings from the two case studies were analyzed and compared (finances and financing, and review processes and mechanisms). When combined as a single analytical framework, the six key aspects serve as entry points and windows that allow observations regarding how governance arrangements have evolved and for considering potential implications for our understanding and applications of IWRM. The six aspects which constitute our research framework are:

- Scope refers to the range and types of resource-related issues and concerns included and addressed. For example, governance arrangements might focus attention on a single water use, problems or conflicts regarding multiple uses of water, connections among uses of land and water, or, at the other extreme, on far broader relationships associated with the water, energy, climate, and food security nexus [1,3,14,28,29].

- Scale concerns the spatial scale or scales at which governance is intended to operate and accommodate relevant interests, jurisdictions, and relationships within decision-making arrangements [30,31]. It would also embrace many of the aspects of multi-level governance [19].
- Responsibility refers to how functions, responsibilities, and powers are determined and allocated among governing institutions, including public, private, civil society, and hybrid organizations and groups [32–34].
- Engagement concerns how organizations and groups are involved in governance arrangements, including their participation through cross-scale and inter-jurisdictional relationships and in addition to involvement in a particular node or single level or scale of governance [35,36].
- Finances and financing refer to how funding is generated and allocated to enable governance arrangements to operate, and to implement policies, programs, and projects for integrated management. This includes taking account of how benefits and costs associated with revenue generation and expenditure affect different groups and communities [23,37].
- Review processes and mechanisms concern the various ways in which governance arrangements might be assessed and potentially adjusted on the basis of experience, learning, and changing circumstances and needs. The dynamic nature of people-environment relationships and the inevitable shifts in values, needs, interests, and priorities mean that flexibility is required so that governance arrangements can be adapted and are able to remain functional and relevant [38–40].

Termeer and Dewulf's [26] five key governance capabilities have potential relevance for each of the six aspects outlined above. As such, in each case study, attention is given to arrangements and developments that appear to demonstrate or imply reflexivity, resilience, responsiveness, revitalization, and case-sensitivity. The six-component framework was applied to the two case study areas. In each case, data collection occurred in phases and included reviews of relevant statutes, policies, programs, and reports, and interviews with politicians, managers, and individuals involved in catchment organizations, representatives for resource use interest groups, and academics with knowledge related to governance and the management of water and natural resources in the two areas. Twenty-four interviews occurred in Oregon during August and September 2014, and over one hundred interviews were completed in Ontario as part of a long-term research programme on Conservation Authorities, which began in the late 1980s and is continuing.

The questions posed in Ontario and Oregon were not always the same, but often were so similar that we believed it was appropriate to draw on both sets of information to explore similarities and differences. Furthermore, the sources of information used, including documentary evidence (annual reports, policy statements, government reviews) and semi-structured interviews (with individuals from government agencies and departments, conservation authorities and watershed councils, municipal and local elected officials and staff, NGOs and stakeholder groups, and landowners) were similar, and created a rich and credible source of data and insights that allowed a detailed comparison and enabled us to identify important similarities and differences. To ensure the information and findings were current, additional analysis of recent key reports, quantitative data, and other relevant documents was undertaken for both case studies in late 2018 and early 2019.

4. Evolution of Governance Arrangements for IWRM

4.1. Case 1: Conservation Authorities in Ontario

Ontario's Conservation Authorities (CAs) are among the oldest catchment-based agencies in the world. Started in 1946, they were established both to provide World War II veterans with employment opportunities and to respond to deterioration of the natural resource base in southern Ontario [41]. There are 36 CAs, 31 of which are located in the heavily populated catchments of southern Ontario (Figure 1). The five in northern Ontario are centered on major cities and adjacent regions. The six founding principles of the CAs—catchment jurisdiction, local initiative, provincial-municipal partnership, a healthy environment for a healthy economy, cooperation, coordination and collaboration,

and a comprehensive viewpoint—have generally served its integrated water resource program well, although ebbs and flows in its practice have occurred [42].

Figure 1. Conservation Authorities in Ontario.

The CA program has evolved through three periods of integrated water resource management. The first, between 1946 and 1987, was characterized by multiple purpose, multiple means strategies, and relatively stable levels of funding from the provincial government and municipalities across a broad range of programs. The Province also provided comprehensive plans (called Conservation Reports) to each CA shortly after it was formed, as well as ongoing technical support, particularly for water engineering. During this period, some CAs were eligible to receive provincial grants of up to 85% of the total costs for approved projects focused on four broad programs: (i) water management (e.g., structural adjustments, land acquisition, flood plain mapping and regulation, flood warning systems, erosion control, water quality monitoring), (ii) water and land-related management (e.g., reforestation, soil conservation, agricultural drainage, wetland acquisition), (iii) recreation, and (iv) community relations (e.g., public information and education programs to elementary and high school students) [41]. This type of broadly based approach was a feature of contemporary water management of that era [28].

The second period (1987–2002) was characterized by reductions in the scope of projects to be funded and the amount of provincial funds provided to the Conservation Authorities. Following the recommendations in a 1987 review of the CA program, the provincial government identified core (e.g., flood and erosion control, low flow augmentation) and non-core (i.e., land and water activities, recreation, education) responsibilities and would only provide funds for the former. In 1995, further reductions in provincial funding transpired—from $33 million (CAD) to $12 million (CAD) in 1996, and to less than $8 million (CAD) by 2002. Municipal funding to CAs was also limited to

core areas, and was confined to structural flood adjustments, and protection of provincially significant lands [42]. The motivations for these changes were largely driven by the need to reduce the province's expenditures and the desire to reduce overlaps among CAs and other provincial agencies.

The third period (2002–present) was prompted by a tragedy in the town of Walkerton that caused seven people to die and thousands to become ill as a result of bacterial contamination of the community's groundwater drinking water supply. The provincial government adopted many of the 121 recommendations from the Inquiry that followed [43], and also passed the Clean Water Act in 2006 and approved associated regulations. For CAs, the statute identified 19 source water protection areas that CAs were to lead in promoting collaboration among stakeholders (e.g., province, municipalities, Indigenous peoples, other stakeholders) when developing source water protection plans. In this regard, CAs were provided funding by the province to support scientific, technical, and administrative aspects of this planning process. Subsequently, 22 source water protection plans were prepared and formally approved, with their implementation being facilitated by municipalities, provincial ministries, and the CAs. Each source protection plan contains policies that recommend or require actions to deal with threats to sources of drinking water. During this third period, the recognized need to bolster three of the CAs founding principles—catchment jurisdiction, comprehensive planning, and cooperation and coordination—to better meet the needs of Ontario's population of the 21st century was a driving force for change.

At present, more than 11 million people (approximately 90% of Ontario's population) live in catchments managed by the 36 Conservation Authorities, which deliver programs and services valued at more $275 million [42]. In 2015, the provincial government completed a review of the Conservation Authorities Act [44] with a view to:

- Strengthening oversight and accountability
- Increasing clarity and consistency in Conservation Authority programs and services
- Increasing clarity and consistency in regulatory requirements
- Improving collaboration and engagement
- Modernizing funding mechanisms.

Based on the recommendations arising from this review, a new Conservation Authorities Act was passed in 2017, followed by a Memorandum of Cooperation between the Province and Conservation Ontario on April 17, 2018. Many of these recent changes have implications for the six themes (scope, scale, engagement, responsibility, financing, and review) identified earlier. The following sections examine experiences in relation to those six themes.

4.1.1. Scope

The Conservation Authorities Act in 1946 identified the mandate for the CAs as the conservation, restoration, development, and management of natural resources other than gas, oil, coal, and minerals [41]. This broad approach is specifically endorsed by one of the founding principles (comprehensive approach), which has often translated to a consideration of both water and related land-based resources, and urban as well as rural areas within a catchment context. Today, the CAs explicitly embrace an integrated water management approach, which they have defined as "the process of managing human activities and natural resources on a catchment basis, taking into account social, economic, and environmental issues, as well as community interests, in order to manage water resources sustainably" [45] (p.1). Through that integrated approach, Conservation Ontario [44], consisting of all CAs and working to advocate on their behalf to the province and promoting the sharing of information and professional development within the CAs, identifies nine priorities:

- Integrated Watershed Management
- Climate Change
- Flood Management

- Science and Information
- Great Lakes
- Planning and Regulations
- EcoHealth
- Green Economy

The above illustrate the high priority given by CAs to both effective and efficient program delivery pertaining to water and related land resources, and the important role of science, monitoring, and educational activities. The Conservation Authorities also consider integrated water resource management within the very broad context of local communities. For instance, conservation authorities are aware of the need to provide land for housing development and maximize the use of urban infrastructure, and recognize that both must be balanced with the need to protect residents from the risks of flooding [46].

The changes to the 2017 Conservation Authorities Act acknowledge and support the flexibility provided in the mandate to respond to local needs. Current regular programming includes:

- Natural Hazard Management
- Flood and Erosion Management
- Stewardship and Conservation
- Planning and Permitting
- Research and Monitoring
- Drought and Low Water Program
- Education, Recreation, and Outreach
- Technical and Advisory Services
- Watershed Plans and Reporting
- Drinking Water Source Protection [47].

As the historical overview above indicated, changes to financial arrangements from the provincial government, limitations placed on where municipal contributions to CAs can be spent, the capacity of the provincial government to fund planning and provide technical staff to CAs, and varying capacities of individual CAs to hire their own (or share) staff have influenced the depth and breadth that CAs have actually achieved regarding this broad mandate.

4.1.2. Scale

The conservation authorities are based, for the most part, on catchment boundaries. In 1946, it was believed that an understanding of the hydrologic cycle was fundamental for effective management of renewable resources. The catchment jurisdiction has also been an important feature of the Muskingum Watershed Conservancy District (Ohio, USA), and the Tennessee Valley Authority (USA), both of which were visited by the founders of the CA program during its formative period. The catchment was also used as the management unit in New Zealand, and England and Wales [41]. Thus, precedents could be identified to justify the choice of the catchment as the desirable administrative unit. In practice, only parts of the province are covered, with CAs established in the populated areas of southern Ontario and in five urban areas in northern Ontario. The 2017 changes to the Act did not deviate from this past practice. A general observation is that achieving a balance among being responsive to local needs (e.g., local initiative principle), achieving a reasonably consistent delivery of programs across all CAs, and being affordable for local residents, has been and remains challenging. A key consideration in establishing a CA is whether there is the prospect of sufficient funding from local governments in a catchment to allow a CA to function effectively.

4.1.3. Engagement

In 1946, the key partnership was between the provincial government (and its Departments) and local municipalities. As noted earlier, those arrangements evolved during the 1950s and 1960s to incorporate landowners, particularly the farming community in a range of stewardship initiatives [41]. Although CAs have always relied on local initiative to request that a CA be formed and for local municipalities to appoint members to the CA Board, the significant provincial funding cuts in the 1990s prompted CAs to enhance this partnership with local governments and ensure that the priority needs of catchment residents were met. In addition, CAs sought partnerships with other provincial and federal agencies in order that resources would be used efficiently and effectively.

Conservation Authorities now facilitate five layers of engagement with their many partners. First, the key partnership remains with the provincial government and local municipalities. The members of the local conservation authority and the administrative arrangement with the Ontario Ministry of Natural Resources and Forestry, which oversees the CA program on behalf of the province, are the cornerstone of this partnership. Second, as funding has become less relative to the desire or need to deliver programs, many conservation authorities have established financial partnerships with other provincial and federal agencies to deliver specific services (e.g., fisheries, monitoring). Third, partnerships have been extended to non-governmental organizations, which provide information and expertise to a Conservation Authority in a specific geographic region (e.g., sub catchment) or on a specific issue (e.g., water quality, habitat rehabilitation). For instance, Mitchell at al. [42] described the partnership network (federal, provincial, local governments, stakeholders, landowners) developed by Halton Conservation to address water quality problems in Hamilton Harbor, as well as the evolution of initiatives by the Grand River Conservation Authority to develop an integrated catchment plan for the Grand River. Fourth, conservation authorities engage the public through a variety of public participation programs and social media in order to obtain input on specific issues as well as strategic advice on management priorities. Fifth, conservation authorities offer education programs or outdoor learning facilities as a way of engaging school children. These are often delivered to K-12 (kindergarten to grade 12) students through arrangements with local school boards.

The 2017 changes to the Act focused considerable attention on the governance aspects of engagement, the heart of the provincial-municipal partnership and corporate aspects of CA operations, as well as establishing minimum levels of expectations for engagement with the public and stakeholders [47]. The recruitment and selection for appointment of members of a conservation authority by municipalities will be more rigorous and professional, including establishment of codes of conduct, requiring meetings of the conservation authority to be public, and enabling the Province and the public to obtain information about programs and financing. Concerning public and stakeholder engagement, best practices are being, and will be, developed for engagement with Indigenous peoples, the public, and stakeholders. There is a desire to enhance current levels of collaboration among conservation authorities, local government, and relevant provincial ministries.

4.1.4. Responsibility

While the broad mandate of the Conservation Authorities Act has allowed CAs to develop and engage in a wide range of renewable resource management activities, concern has emerged that inefficiencies and confusion sometimes arise due to jurisdictional overlaps with provincial agencies that administer narrowly defined but related legislative mandates (e.g., point and non-point source pollution, water taking permits, dredging, fisheries). Previous attempts to ensure various organizations address water and land-related issues in a complementary, mutually exclusive, and simple manner, while achieving administrative efficiency, effectiveness, and public acceptability, have been fraught with difficulty, indicating that some degree of overlap is inevitable. The key is to be able to manage such overlap, and ensure that where overlap does occur it provides desirable and intended redundancy to ensure that if one agency struggles, the actions by another will keep an issue manageable or under control.

In 2012, Conservation Ontario [48] suggested that a more flexible and accountable division of responsibilities be developed with the provincial agency that oversees the CA program, as well as with other provincial agencies responsible for other aspects of water management. For instance, while many CAs have had a long involvement with farmers concerning soil conservation, the provincial agriculture ministry has some similar and competing programs. This flexibility appears to have been maintained in proposed changes to the CA Act and identification of the three types of programs CAs can engage in.

Since 1946, the CAs have engaged with different levels of government and shared responsibilities via a range of partnership arrangements. At first, the key partnership was between the province (and its Departments) and local municipalities. That arrangement evolved during the 1950s and 1960s to incorporate landowners, particularly the farming community, in various initiatives, such as erosion control, fertilizer applications, and manure management [41]. Although CAs have relied on local initiatives to request that a CA be formed and for local municipalities to appoint members to the CA Board, the significant provincial funding cuts in the 1990s prompted CAs to engage more at the local level to ensure priority needs of catchment residents were met.

In addition, CAs sought to share responsibilities with other provincial and federal agencies in order that resources might be used more efficiently and effectively. For example, the North Bay-Mattawa Conservation Authority (NBMCA, one of the five northern CAs) supports some unique programs, which include "sewage system programming, working with stakeholders to restore fish habitat, plant trees, and ensure full compliance of hunting programs. This allows the NBMCA to effectively deliver its mandate while meeting the needs of those within their jurisdiction" [47] (p.14).

By engaging organizations and groups in different forms of partnership, opportunities exist to increase administrative efficiencies and public understanding of the CA program. The broad legislative mandate, combined with the variety of environmental problems and capacity or willingness to fund programs, have led to differences among the CAs about the breadth and depth of programs that should be, could be, and are, implemented. The 2017 Conservation Authorities Act recognizes and supports this reality [47]. On the one hand, the Province wishes to better define the scope of CA involvement in this wide range of programs, as well as achieve a more consistent level of delivery and transparency of program delivery, regardless of financial capacity of different CAs [46]. On the other hand, the Province acknowledged that there will be continued and likely significant differences in the range of programs offered by CAs, when it stated:

> *"While some conservation authorities may choose to largely focus the programs and services that they offer on those programs and services mandated by the Province, conservation authorities that choose to offer additional programs and services beyond those mandated by the Province and municipalities should not be considered to be "exceeding their mandate".* [46] (p.17)

A key to achieving the province's aspirations for a more consistent level of program delivery, therefore, will be found in the nature of financial arrangements and the level of funding.

4.1.5. Finances and Financing

Initially, a 50/50 cost sharing of projects between provincial and partner municipal governments was a cornerstone of the CA program, and was prompted for two pragmatic reasons. First, it was thought that local municipalities should finance a portion of costs in order that priority needs (and not wants) were identified and implemented. One implication is that an adequate municipal tax base must exist to generate the funds needed for a CA to function. Second, the provincial contributions served as an incentive for municipalities to agree to form a CA because these funds would not be available to them unless a CA was created. As the comments above indicate, the division of financing has evolved and has been the subject of ongoing debate, particularly between the Province and municipalities.

A key challenge has been to achieve effective, efficient, and equitable delivery of services. However, since the nature of problems, cost of solutions, and the supporting local tax base are

not evenly distributed throughout the province, the equitable delivery of services will not mean local tax payers are treated equally or bear the same proportion of CA program costs. To illustrate, the per capita levy requested for each CA in 2010 ranged from $2 (CAD) to $35 (CAD) [48]. Nevertheless, the CAs are considered by municipalities and the CAs themselves to be doing "good work and provide good value for money" [49] (p.9). In 2018, the average distribution of funding sources for individual CAs was as follows: municipal levies accounted for 54%, self-generated revenue, 34%, provincial grants and special projects, 9%, and federal government contracts and grants, 3% [50].

The 2017 changes suggested that the formula that determines the apportionment of costs between the province and municipalities be simplified and more transparent. The fee schedule for conservation authorities to recover costs for services rendered (e.g., an application for development on the flood plain) would be reviewed and made more accessible. Finally, the level of funding provided by the province would be assessed for its adequacy and efficiency, and opportunities "to better leverage existing funding envelopes to help finance conservation authority programs and services" would be explored [47] (p.31).

4.1.6. Review Processes and Mechanisms

There have been four reviews of the conservation authority program, two major events and one provincial budget that have significantly influenced the programme. The four reviews were:

- Select Committee on the Conservation Authority Program (1967) [51]
- Report on the Working Group on the Mandate and Role of the Conservation Authorities of Ontario (1979) [52]
- Review of the Conservation Authorities Program (1987) [53]
- The previously mentioned Review of the CA program in 2015 and subsequent changes to the Act [45]

The two events were:

- Hurricane Hazel in 1954, which highlighted the need for flood management and the important role of CAs [41]
- The previously mentioned Walkerton Tragedy and the subsequent public inquiry and introduction of the Clean Water Act [43]

In 1965, a select Committee on Conservation Authorities was appointed to review the program, with particular attention to membership, financial arrangements and the ability of municipalities to pay their share of conservation activities, the power of conservation authorities to acquire or expropriate land, and the administrative practices and methods of conservation authorities. The Committee noted the limited number of conservation authorities outside of southern Ontario and urban areas in northern Ontario. The Committee observed that the limited financial base of many areas was a barrier for the creation of authorities. Under prevailing arrangements, participating municipalities had to raise 50% of the operating costs of conservation authorities. This proportion was prohibitively high in townships with low populations and sparse assessment. Where the local economy was based on agriculture or seasonal wood harvesting or tourism operations, the funding required to support a conservation authority was "simply not available" [50] (p.20), even though it was just such areas in which conservation practices were urgently required. The Select Committee concluded that "the financial base of municipalities making up an authority largely determines its program. Conservation authorities that are predominately rural are less able to support an active program than authorities with large urban centres" [50] (p.53). In response to this problem, the provincial government established a supplementary grant structure. The intent of this initiative was to provide a higher level of assistance to more rural conservation authorities.

The Provincial Budget of 1995, the final major influence, restricted and reduced provincial funding, which also had major implications for the conservation authority program. Collectively, there has

been very strong endorsement for the six founding principles of the CA program. There has been ongoing support for conservation authorities continuing to have primary responsibility for flood and erosion control, low flow augmentation, wetlands, and regionally significant parks, while sharing responsibility for non-point pollution control, urban drainage, water quality monitoring, water supply and Niagara Escarpment Parks. Their role in groundwater management was clarified and enhanced following the O'Connor Inquiry [43]. The desire to have clear and consistent agency mandates across the province has proven an ongoing challenge, given the manner in which water and related natural resources interplay with a vast array of human needs and the range of human geographies in Ontario. The provincial government remains an important contributor to the CA budget, although municipalities have played an increasingly important role, and CAs have found other sources of funding. Two authorities have amalgamated and numerous others share some services in order to achieve better economies of scale. Membership of the conservation authority boards has been reduced, largely by eliminating provincially appointed members and through the amalgamation of municipalities, which occurred after 1995.

4.2. Case 2: Watershed Councils and IWRM in Oregon

Interest in integration and developing a catchment-based approach emerged in Oregon during the late 1980s in response to concerns regarding endangered salmonid fish species. At that time, the Governor of Oregon began to express strong preferences for voluntary and community-based efforts towards river restoration and recovery of salmonid populations, rather than direct government intervention. For clarity, watershed councils in Oregon are catchment-based organizations. In this section, we use the term "watershed councils" when referring to those organizations by name. Otherwise, the term "catchment" is used to be consistent throughout the paper.

Integrated water management and watershed councils have developed in Oregon in three key stages: 1987–96, 1997–2008, and 2009–present. In 1987, Senate Bill 23 approved establishment of the Governor's Watershed Enhancement Board (GWEB) to provide training and financing for private landowners and the 45 Soil and Water Conservation Districts in Oregon in order to improve riparian habitats. In 1993, Oregon passed House Bill 2215, which approved establishment of watershed councils to conduct watershed assessments, develop and implement action plans, and monitor ecosystem health. Watershed councils were conceived as non-government organizations with a mandate for voluntary environmental protection and restoration. By the end of the first stage in 1996, 60 watershed councils had been established and were formally recognized by county-level governments.

The beginning of the second stage in 1997 coincided with the launch of the Oregon Plan for Salmon and Watersheds (or "Oregon Plan") by the State government. The Oregon Plan was central in the State's proposal to the US federal government for a voluntary, community-based, and coordinated response that would avoid "listing" of salmon and other economically important fish under the Endangered Species Act.

Following federal approval of the Oregon Plan, watershed councils became the state government's key mechanism for salmon recovery and river restoration. In 1998, the GWEB was replaced by the Oregon Watershed Enhancement Board (OWEB). OWEB is a government agency with responsibility for prioritizing and coordinating restoration efforts, including the allocation and administration of all watershed restoration funds. In the second stage, approximately US$500 million from federal and state sources was allocated to implement the Oregon Plan, including US$169 million for restoration grants from state lottery funds [54].

In 2009, a third stage began to develop. The Oregon Water Resources Commission published Oregon's first Integrated Water Resources Strategy (IWRS) in August 2012, which included recommendations for place-based integrated water planning, collaboration, and public involvement, and coordinated implementation of natural resource plans [55]. Draft guidelines for place-based integrated water resources planning were published in February 2015 [56] and an agreed IWRS for Oregon was published in 2017 [57]. In parallel with the implementation of the IWRS, local watershed

councils have continued to develop. As of February 2019, there were 89 watershed councils throughout the state that were recognized and approved by county-level government administrations. Sixty of those watershed councils had met OWEB eligibility criteria and were in receipt of funding via OWEB (Figure 2).

Figure 2. Watershed Councils in Oregon.

We now examine the six aspects of governance outlined in the research framework in relation to the evolution of watershed councils and IWRM.

4.2.1. Scope

Watershed councils in Oregon illustrate a tightly focused approach to integrated water management. Under Oregon's Revised Statute (ORS) 541.351 (15), a watershed council is defined as "a voluntary local organization, designated by a local government group convened by a county governing body, to address the goal of sustaining natural resource protection, restoration, and enhancement within a watershed" [58]. The 2018 OWEB Strategic Direction and Principles document [59] defines five key goals:

- Adaptive investment: Restore and sustain resilient ecosystems through programme and project investments that enhance catchment and ecosystem functions and processes and support community needs.
- Local infrastructure development: Support an enduring, high-capacity local infrastructure for conducting catchment and habitat restoration and conservation.
- Public awareness and involvement: Provide information to help Oregonians understand the need for and engage in activities that support healthy catchments.
- Partnership development: Build and maintain strong partnerships with local, state, tribal, and federal agencies, non-profit organizations, and private landowners for catchment and habitat restoration and conservation.
- Efficient and accountable administration: Ensure efficient and accountable administration of all investments.

The above definition and goals could imply a broad ecosystem-based approach for catchment management. However, in practice, the councils and OWEB have focused on riparian land and in-stream environments for fish and wildlife. To illustrate, key accomplishments reported for 1999–2017 include making 9800 km of river habitat accessible for fish, restoring more than 8200 km of streams and assisting riparian landowners to improve more than 4600 km^2 of upland habitat and creating 206 km^2 of wetland and estuarine habitat [60].

Development of the Oregon IWRS also includes insights regarding change to scope. Initially, the policy advisory group created in 2010 to create the original strategy developed a broad 50-year vision [57] (p.14):

> *"Everywhere in our state, we see healthy waters, able to sustain a healthy economy, environment, and cultures and communities. Healthy waters are abundant and clean. A healthy economy is a diverse and balanced economy, nurturing and employing the state's natural resources and human capital to meet evolving local and global needs, including a desirable quality of life in urban and rural areas. A healthy environment includes fully functioning ecosystems, including headwaters, river systems, wetlands, forests, floodplains, estuaries, and aquifers. Healthy cultures and communities depend on adequate and reliable water supplies to sustain public health, nourishment, recreation, sport, and other quality of life needs."*

However, the policy advisory group established to create the 2017 IWRS appears to have had a very different outlook and set of concerns, stating that [57] (p.14):

> *"Water is a finite resource with growing demands; water scarcity is a reality in Oregon. Water-related decisions should rest on a thorough analysis of supply, the demand or need for water, the potential for increasing efficiencies and conservation, and alternative ways to meet these demands."*

These two contrasting statements, written just six years apart, illustrate how the scope of one of Oregon's main IWRM initiatives has shifted from a broad concern for all aspects of water to a much narrower focus on water quantity and supply for human use.

4.2.2. Scale

Interviews conducted in Oregon during 2014 provided insights regarding scale. For example, the attention of the watershed councils is sharply focused on habitat restoration and protection in individual small-scale catchments, which local communities and populations readily identify with. The focus on local-scale action by communities and resource users, facilitated by the watershed councils, reflects the underlying philosophy and approach to resource governance in Oregon. In other words, the State government has pursued a deliberate strategy of governing indirectly and at a distance by establishing OWEB to steer and support watershed-scale management, and by encouraging and incentivizing local communities and stakeholders to join together in creating a watershed council.

In contrast, the IWRS includes water quantity and land-based resources in addition to water quality, and attention is given to relationships within much larger river basins, as opposed to local catchments. Most interviewees believed that each watershed council should stay focused on local concerns within individual catchments in order to maintain public support. Many interviewees also argued that councils would be far less effective if they were organized and operated at a basin scale, or if their scope were increased by adding further responsibilities. Analysis of the contents of the 2017 version of the Oregon IWRS [57] provides useful insights into how a basin scale has emerged as a new and additional focus for integrated management, operating in parallel and separately to local-scale integrated catchment management. Specifically, in 2015, State Senate Bill 266 was passed and made provisions for communities to be solicited regarding their interest in developing an integrated water resources strategy for their area. Of the 16 that expressed interest, four were selected by the State government for funding. All four involve developing a strategy at a basin scale. In two of those cases, a watershed council acts as a co-convener alongside another organization, such as a city or county

administration or court, or a Soil and Water Conservation District. What this appears to show is that IWRM has evolved in Oregon as two distinct and quite separate initiatives, with one focused on local catchments and the other aimed at managing river basins.

4.2.3. Responsibility

Watershed councils in Oregon reflect the Western Governors Association's "Enlibra2 doctrine for sustainable development and balanced ecosystem-based management [61]. Key Enlibra principles include shared responsibility, collaborative problem-solving, use of markets, incentives and performance-based rewards, use of environmental rather than administrative boundaries, reliance on science for evidence, and participatory processes for identifying priorities. Following that orthodoxy, Oregon watershed councils use a bottom-up approach intended to encourage self-organization and direction among local communities. There is no legal requirement at any level of government in Oregon for watershed councils to be formed. However, statutory provisions, institutional structures, and procedures are designed to ensure watershed councils do meet public policy objectives, are governed and managed well, and are accountable for funding received.

Oregon has developed a two-tier system for the approval of watershed councils. State legislation stipulates that the creation of a watershed council must be initiated by a local government group, such as a municipal, city, or county authority with jurisdiction over the catchment area. The Board or Commission of the relevant authority has responsibility for the first level of approval, and may give authorization provided that the watershed council is a voluntary and local organization and represents a balance of affected interests within the catchment. Where a catchment includes more than one county, OWEB requires all of the relevant governing bodies to give their approval before a watershed council can be designated. According to interviews, first-level approval is generally given without difficulty because the concept is popular, local government financing is not required, and watershed councils are likely to attract additional state and federal government revenues.

OWEB is responsible for the second-tier approval process, which is more demanding and is used to determine whether a watershed council is eligible to apply for state funding. To gain recognition at the state level and to access OWEB funding, watershed councils must demonstrate compliance with explicit criteria related to effective governance and management, organizational planning, on-the-ground catchment restoration, and community engagement, in addition to having local government approval.

4.2.4. Engagement

Engagement of multiple interests is a key objective of both Oregon's watershed restoration program and IWRS. For restoration, engagement occurs through OWEB and individual watershed councils. OWEB has a 17-member Advisory Board, which meets four times annually to evaluate grant applications and to provide policy oversight. Eleven members have voting powers and include one tribal representative, five citizen representatives and one representative for each of the state Forestry Board, the Agriculture Board, the Environmental Quality Commission, the Fish and Wildlife Commission, and the Water Resources Commission. The six remaining non-voting members represent federal resource management agencies and the Oregon State University Extension Service. All Board members are appointed by the State Governor and approved by the Senate for four-year staggered terms.

Interviews and analysis of documents related to OWEB-approved councils indicated that board membership included representatives for a broad range of interests related to catchment restoration, but provided more limited involvement of organizations and groups with stakes in other aspects of natural resources use and management. Decision-making procedures varied among the councils, although all operate by consensus and are required by OWEB to adopt bylaws prohibiting the use of litigation to accomplish their mission. Some councils follow procedures indicating the level of consensus. For example, for the McKenzie Watershed Council, board members vote according to seven options: (1) wholeheartedly agree, will take the lead in follow-up; (2) good idea, can bring resources

forward; (3) supportive, but not likely to provide resources; (4) reservations, but will stand aside; (5) serious concerns, but will live with the decision; (6) cannot participate in the decision, will work to block it; and (7) abstain.

Diverse representation and engagement is also a key tenet of the place-based approach advocated for Oregon's IWRS. However, implementation guidelines explain that representation should encompass in-stream and out-of-stream needs, and the quantity and quality of surface and groundwater. Tellingly, watershed councils are not explicitly mentioned as potential participants, although "conservation groups" and other interests, including local and tribal governments, are included. A possible explanation is that the ethos, scale, and focus of the watershed councils do not fit comfortably with the much broader, inter-governmental and place-based approach associated with the IWRS.

4.2.5. Finances and Financing

Financing arrangements have evolved and become more secure. In 1993, Oregon legislators passed House Bill 2215 and approved the use of proceeds from the state lottery for catchment restoration. Following approval of the Oregon Plan in 1997, total funding, including state and federal government contributions, increased from approximately $1 million to $20 million (US) annually. A public ballot in 1998 resulted in legislators committing 7.5% of annual state lottery revenues for catchment restoration, including the resourcing of OWEB. State legislation also dictates that at least 65% of the allocated lottery funds must be used for capital expenditure. In 2010, legislators permanently reauthorized the use of 7.5% of state lottery funds for implementation of the Oregon Plan, and that arrangement is still in effect in 2019.

Between 1999 and 2019, OWEB received a total of US$669 million in funding, comprising US$510 million from state lottery funds, US$154 million from the federal government Pacific Coast Salmon Restoration Fund (PCSRF), and US$5 million from sales of "Salmon" vehicle license plates. Regarding expenditure, by the end of 2017 OWEB had awarded more than 8700 grants to watershed councils, totaling US$566 million. Of that amount, 65.4% was allocated to river restoration programs and projects, 14.5% to building local governance and management capacity, with the remainder used for monitoring and assessment, education and research, and technical assistance [60]. OWEB funding is locally allocated via competitive schemes for on-the-ground catchment improvements, although organizational capacity grants and partnership development grants are provided to eligible organizations on a non-competitive basis.

Interviews with watershed council representatives revealed three main concerns or challenges regarding financing. First, the actual level of funding available in any one year depends highly on state lottery revenues, which fluctuate according to economic conditions. Second, the council resources and staff time required to complete grant applications can be disproportionate to the levels of funding available. Third, some believed the funding regime to be unfair and to favor councils in more populated and developed areas, reflecting more experience and capacity for preparing strongly competitive grant applications. Analysis of county-level data for OWEB watershed investments appears to support their claims. For 1999–2017, total OWEB investment by county ranged from US$1 million to US$35 million. Furthermore, 31% of total OWEB investment was allocated to four of Oregon's 36 counties (Coos, Deschutes, Douglas, Lane, and Malheur counties), which include some of the largest and most populated communities in the state.

4.2.6. Review Processes and Mechanisms

In 2010, following more than a decade of experience with supporting the development of watershed councils, OWEB began a review process. The review was focused on the capacity grant program, which is one of the key support mechanisms available to OWEB when a local group is convened by a county governing body for the purpose of establishing a watershed council. In March 2012, OWEB board members directed staff to examine the outcomes and award process associated

with the capacity grant program. Listening sessions and work groups were organized by OWEB and used throughout the state to gather feedback from watershed council representatives. As a result, a subcommittee of the OWEB Board developed a proposal for revised eligibility and merit criteria with the aim of maximizing the benefits of future expenditure and investment. In July 2013, the Board authorized staff to begin revising the rules for OWEB grants, and in July 2014 new guidance was produced for watershed councils seeking capacity grants. In brief, the revised rules signaled a change of policy from encouraging the formation of new watershed councils towards combining and sharing existing councils, and consequently enabling the total number of grants to be reduced over a 5–10 year period. To reinforce the change of direction, eligibility for grants was limited to a total of 64 existing catchment areas that had previously received OWEB funding. In effect, the rule changes were designed to encourage consolidation and building of stronger local capacity and to avoid increased competition for funding and administrative duplication.

The changes have resulted in some amalgamations of watershed councils and adjustments to areas. For example, on January 1, 2015, four independent watershed councils (Bear Creek Watershed Council, Little Butte Creek Watershed Council, Upper Rogue Watershed Council, and the Stream Restoration Alliance of the Middle Rogue) merged to become the Rogue River Watershed Council. In addition, the North Santiam Watershed Council has expanded its operating area to include areas not covered by another watershed council. Overall, the review led to new phase of consolidation and sharing of established management capacity after a phase focused on initiation of individual watershed councils and expansion of watershed council movement across the state.

5. Discussion, Conclusions, and Lessons

Our comparative analysis of Ontario and Oregon has shed some fresh light on why IWRM might be initiated, and also how different beliefs and attitudes regarding what is appropriate and how things should be done have influenced the development of governance arrangements.

Despite some clear differences in approach, both cases illustrate the importance of problem perception as a motivator for the initiation of IWRM. In Ontario, the initial motivation was provided by the depleted state of natural resources and the desire to provide employment for war veterans. In Oregon, early motivation was provided by threats to economically and culturally important fish stocks. One consequence of these different starting points was that Ontario embarked on a process of developing comprehensive approaches for land and water for entire catchments, whereas Oregon initially moved to develop a narrower and more targeted program focused on improving the management of riparian land and enhancing in-stream conditions and habitats in smaller, local-scale catchments. An important conclusion for both research and for policy is that one approach or interpretation is not necessarily better or worse than the other. Rather, in the two cases examined here, IWRM was grounded in the issues and concerns that mattered most in a particular place and at a certain point in time. This was crucial for gaining political and public support and attracting the investment needed to develop governance arrangements, in the form of CAs and watershed councils. International organizations seeking to produce guidelines and promote effective implementation of IWRM should, therefore, be mindful of the need for flexibility and sensitivity towards different circumstances, and not on promoting one particular interpretation or approach.

A second conclusion concerns the importance of beliefs, norms, and traditions, or "governmentalities", as influences on the choice of governance arrangements for IWRM implementation. It is here that some of the most significant and interesting differences between Ontario and Oregon are apparent. In Ontario, there are strong traditions of co-operation among neighboring municipalities, and co-ordination and collaboration among public organizations operating at the municipal and provincial levels. It is not a coincidence, therefore, that the CAs have developed clear, direct, and accountable systems of governance for IWRM that encourage and depend on effective inter-organizational relationships and procedures. In contrast, traditions and values in Oregon have tended to favor "looser" arrangements between local actors and state-level government departments.

Consequently, IWRM has been driven by encouraging watershed councils to be entrepreneurial and to compete for public funding. In addition, the watershed councils are not government-based organizations and their preferred approaches to IWRM involve voluntary action and land purchases rather than use of regulations. In essence, the CAs illustrate an inter-governmental approach to IWRM, whereas the watershed councils in Oregon demonstrate a more market-based style of governance. Again, the point is not that one system is necessarily better than the other, but that the respective arrangements are specific to the geographic context and prevailing ideas and beliefs about how coordinated management of land, water, and other natural resources can be achieved.

A third conclusion concerns the important role of finances and financing arrangements for steering the development and implementation of IWRM. In many countries, including Australia, Canada, UK, USA, and in Europe, governments and their departments are seeking to be less involved in delivering services and becoming more interested in steering and incentivizing private and non-governmental organizations, and also private citizens, to take more responsibility for action and problem-solving [9,10,18]. Those sorts of strategies are evident in both case studies, where state and provincial government organizations have used both the availability of new funding and the withdrawal of existing funding to re-priorities watershed-related issues and concerns. Returning to our earlier point regarding governance being concerned with "who gets what", it is clear that the use of financing in these ways can have significant implications for equity. In Oregon, a small number of watershed councils from just a few of the 36 counties in the state have received a significant proportion of the available government funding for IWRM, while others have received very little or none at all. In Ontario, municipalities have had to find ways of coping with reduced provincial government funding for CAs, either by reducing services or generating replacement funds through user charges and other mechanisms. In addition, it is a reality that the CA model favors more urbanized areas where more residents can contribute through property taxes. The CAs and watershed councils illustrate different interpretations regarding what might be regarded as equitable financing arrangements to support IWRM. Equity is highly subjective and it is not possible to state unequivocally whether financing approaches used in Ontario are more equitable or better than the arrangements developed for IWRM in Oregon.

A fourth conclusion concerns the governance capabilities proposed by Termeer and Dewulf [26], and discussed earlier in our paper. Both case studies have provided insights regarding reflexivity in connection with IWRM, and the associated challenges of accommodating varied understandings and frames in programs and decision making. Local initiative, strong municipal government representation, and public engagement are core elements in the CA program, helping to ensure that individual conservation authorities maintain a balanced catchment-wide perspective with regards to interests, needs, and concerns. Similarly, governance rules regarding composition of the OWEB board and the requirement for balanced representation for individual watershed councils have helped to ensure that multiple views and interests can be taken into account. Nevertheless, the arrangements developed for Ontario and Oregon are not perfect in that regard. For example, the CA program was designed for areas with a sufficient local tax base to help to fund catchment management. Consequently, compared with their counterparts in the more densely populated southern parts of the province, rural communities in northern Ontario have not had the same kinds of opportunities to address resource-related issues and concerns. Different challenges exist in Oregon, where watershed councils have tended to attract organizations with interests in river habitat restoration. As such, despite having been given broad mandates, the watershed councils have tended to overlook other aspects of catchment management related to land use, water quality, and water quantity. Some of those additional aspects have subsequently been incorporated within the Integrated Water Resources Strategy for Oregon, a government-based program not clearly connected to the arrangements for the watershed councils.

A remarkable feature of the CAs, given they originated more than 70 years ago, concerns their resilience and ability to adapt. In part, their resilience relates to their strong reputation and being valued by local groups, which has helped to withstand calls on occasions from some politicians for the

CA program to be reduced or cancelled. In addition, the shared funding model has meant that the CAs have been able to cope with reductions in provincial government contributions and to re-prioritize their work to focus on matters of greatest importance to the municipalities and local communities that have continued to provide financial support. In contrast, the watershed councils in Oregon illustrate a more rigid management approach, with a narrower set of fixed objectives and dependence on OWEB as their only source of major funding. Although the watershed councils have yet to experience a major test of their resilience, they are nevertheless vulnerable to potential political and economic shifts, which could result in changes to state water policy or legislation.

In both case studies, review processes and mechanisms have been important for ensuring catchment management organizations have responded positively to changing agendas and have revitalized their operations when necessary. For the CAs, the Walkerton Inquiry, and preparation of the 2006 Clean Water Act and the revised 2017 Conservation Authorities Act were instrumental in identifying limitations and gaps in existing arrangements and introducing changes that included improvements to the governance of CAs, greater flexibility regarding the depth and breadth of individual CA programs, and better protection for drinking water sources. On the other hand, the fact that the Walkerton tragedy did happen might suggest that more regular and thorough reviews should be undertaken to ensure the CAs and related organizations maintain their vitality and are able to respond effectively to pressures and new demands, and avoid major crises. In Oregon, the OWEB review process was important in the evolution of the watershed councils, re-directing funding to improve administrative efficiency, and consolidating rather than continuing to expand the overall program. However, while existing watershed councils have benefitted from the changes, one downside is that any new watershed councils approved by county administrations cannot apply for OWEB funding or support.

While the CAs and watershed councils are entities in their own right, the case studies highlight the importance of cross-scale connections with other organizations and layers of decision-making. The CA model has some clear advantages with respect to scale-sensitivity and cross-scale governance and management, since each CA is linked through the membership structure to a group of local municipalities with interests in different parts of the catchment. In addition, links and partnership arrangements with local communities, provincial government departments, and federal government agencies have created other advantages, such as CA involvement in protection of the Great Lakes and contribution to climate change initiatives. However, watershed councils in Oregon do not appear to exhibit the same level of cross-scale connectivity and sensitivity, despite membership rules that require balanced and diverse local representation. In particular, it appears that the watershed councils have very little involvement in the State government's Integrated Water Resources Strategy (IWRS), which is intended to address water quantity and water quality issues and concerns at a basin scale and advocates the development of place-based collaborative management groups.

Turning to more general lessons, we believe it is particularly important to rebuff calls to tighten the definition of IWRM and to provide more exact prescriptions for how things should be done. CAs in Ontario and the development of watershed councils in Oregon are success stories in their own terms, and neither would have been possible if policy makers had been tied to using one particular off-the-shelf governance model or approach. A second lesson concerns the prospect of transferring and up-scaling a successful approach to other locations, in which issues and challenges require integrated responses. While some of the underlying principles and basic ideas may be relevant for other locations, it would be a mistake to think that either the CA model or the Oregon watershed council model could be replicated elsewhere in their exact form. The CAs were designed for, and have evolved according to, the changing political, economic, social, and physical environment of Ontario. The same is true for the Oregon watershed council system. One implication is that any attempts to develop and implement IWRM in other areas need to start with a careful and detailed analysis of the system or systems to be managed. Analysis should give attention to the prevailing governmentalities and existing governance arrangements, as both are of critical importance for determining what may, or may not, be acceptable

and possible in the future. A third lesson to emerge concerns the importance of review processes and mechanisms. Reviews have resulted in significant changes that have enabled the CAs to continue to adapt and remain relevant as conditions within each catchment and management priorities have continued to evolve. Similarly, a major review by OWEB resulted in a transition from an initial phase of watershed council development to a new phase of consolidation aimed at ensuring efficient use of resources and maximizing environmental impacts and benefits. Those experiences imply that review processes and mechanisms regarding governance arrangements can significantly help to improve IWRM implementation, and therefore should become normal practice for IWRM initiatives in other parts of the world. A final lesson for future research concerns the importance of taking a long-term view of IWRM. Short snap-shots can be useful but can also be misleading. By examining the evolution of IWRM over extended time periods of several decades, as we have done here for the two case studies, it is possible to create a deeper and richer understanding of how governance arrangements change in response to external political and economic drivers. In addition, this study has shown how the interpretation and application of IWRM are relational, and dependent on the interplay among key organizational variables that include scope, scale, responsibility, engagement, finances and financing, and review processes and mechanisms.

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