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Water Management and Local Government Institutions: A Comparative Perspective

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Abstract: In early 2006, the Local Government Institute (LGI) at the School of Public Administration, University of Victoria entered into a partnership with the Ministry of Community Services (MCS) to develop an agenda for research on emerging government priorities in the context of the Community Charter for local and community governance in British Columbia. The initial work plan for the steering committee focuses on improving regional performance in the Province of British Columbia. Several papers have been developed as part of this project to consider different aspects of regional performance. The purpose of the paper on Water Management and Local Government Institutions is to consider regional drinking water systems in British Columbia from a comparative perspective and attempt to make recommendations to improve regional performance.

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EXECUTIVE SUMMARY

In early 2006, the Local Government Institute (LGI) at the School of Public Administration, University of Victoria entered into a partnership with the Ministry of Community Services (MCS) to develop an agenda for research on emerging government priorities in the context of the Community Charter for local and community governance in British Columbia. The initial work plan for the steering committee focuses on improving regional performance in the Province of British Columbia. Several papers have been developed as part of this project to consider different aspects of regional performance. The purpose of the paper on Water Management and Local Government Institutions is to consider regional drinking water systems in British Columbia from a comparative perspective and attempt to make recommendations to improve regional performance.

Water distribution systems are an important component of all regional servicing strategies. It is a priority for every community to have a safe and reliable water supply to support residential, commercial, and industrial growth. Water is not only a commodity, but is a necessity required to sustain human life and should be respected as such. Improving water distribution systems can often result in improved overall regional performance. Water systems are often multi-million dollar utilities and reflect economies of scale. Studies have found that higher economies of scale exist in capital costs, outside costs, and material costs. Labor costs and energy costs exhibit lower but still positive economies of scale. These economies of scale suggest that larger systems are better than smaller systems and can obtain lower unit costs.

The Province of British Columbia is made up of a number of functional water regions with their own characteristic constraints. There are currently 4,797 licensed distribution systems supplying water directly to residences and buildings for human consumption in British Columbia. The province can be broken down into five functional regions that include: island areas, the urban west coast, northern BC, the BC interior and the Kootenays. Each of these areas has their own physical, economic, political and logistical idiosyncrasies. Problems in rural areas include limited financial resources and few skilled

drinking water professionals. Urban and built-up areas are more likely to have political problems and inter-municipal disagreements.

The Vancouver Island and New Zealand water management systems have taken different approaches to island wide drinking water servicing. It is recommended that, similar to New Zealand, funding be provided for island communities for studies that consider island-wide water servicing strategies. These studies should consider current drinking water systems, resources that may be exploited in the future, and a methodology for cataloguing current water quality monitoring information in a consolidated database.

The City of Seattle's water utility is operated quite differently than that of the Greater Vancouver Water District (GVWD). The GVWD is led by individuals that are leaders of the member municipalities. Seattle Water Utility's management is independent of its wholesale water customers and strongly motivated to represent the full cost of servicing in the water prices as well as be customer focused. The GVWD does not have the flexibility of being an independent organization and is often at odds with the smaller players within the municipality. A study to consider changing the current management structure of the GVWD and its customer service policies should be considered.

The Skeena Region and the Township of Black River–Matheson are examples of isolated populations with limited financial resources and few trained personnel. The Province of Ontario's Northern Prosperity Plan strategically focuses on these areas and attempts to provide them with the money they need to comply with new regulations. To help supply training to these regions, funding for an independent small water systems municipal association is recommended.

Aboriginal communities, similar to isolated communities, require proper monitoring equipment and certified operational personnel. It is suggested that funding be provided for an independent user association that specifically caters to aboriginal water system operators.

The joint boards of the Kelowna, BC and London, Ontario areas share several commonalties and differences. The London area joint boards are two separate units that share a common administration whereas Kelowna Area Boards are distinctly separate bodies that have done little to co-ordinate their activities. It is recommended that funding be provided to joint water committees for studies to consider merging and integrating their activities with those that share common water sources.

The goal of this paper is to provide practical and innovative recommendations that can be used by the Ministry of Community Services to foster regional cooperation for consideration as input for a workshop on regional economic performance planned for November 2006. As noted, water system management is one of many components critical to improving the regional performance in the Province of British Columbia. The goal of increasing regional performance is significant and through the diligent efforts of members of British Columbia's Ministry of Community Services this goal is in the process of becoming a reality.

1. INTRODUCTION

In early 2006, the Local Government Institute (LGI) at the School of Public Administration, University of Victoria, entered a partnership with the Ministry of Community Services (MCS) to develop an agenda for research on emerging government priorities in the context of the Community Charter for local and community governance in British Columbia. This agenda aims to support the ministry's professional development, strategic learning, and recruitment needs while fostering engagement with other ministries and external stakeholders. The initiative is being led by a steering committee of MSC officials and faculty members from the University of Victoria.

The initial work plan for the steering committee focuses on improving regional performance in the Province of British Columbia. Several papers have been developed as part of this project to consider different aspects of regional performance. The purpose of this paper is to consider a specific regional system and attempt to make recommendations to improve regional performance. The regional water systems of British Columbia have been selected for this analysis. The following paper takes a comparative approach to considering different regional water management initiatives in Canada and around the world. British Columbia will be divided into several functional water servicing regions based on economic, social, and geographic characteristics. The goal of this paper is to generate both innovative and practical recommendations that will allow the Ministry of Community Services to increase regional performance. For the purposes of this paper economic performance will be defined as follows:

“Economic performance is a measure of the combined effect of factors that contribute to the overall economic activity of an area. It contemplates the economic production of the area as well as economic well-being of entities within the area, both in terms of actual and potential performance.”

This definition will be used in order to develop effective recommendations for the province’s functional water servicing regions. The issue of poor water quality on Native Reserves is a growing problem in British Columbia and all areas of Canada. A specific

case study of this issue has not been included in this paper; however, several comments have been made regarding the water servicing problems in aboriginal communities as they relate to the cases considered in the comparative analysis.

2. REGIONAL WATER SYSTEMS

The water requirements of a region are influenced by several factors which include:

- Location (climate),
- Size,
- Characteristics of the population,
- Presence of industry,
- Cost and development pressure,
- Quality of water, and
- Water supply metering.

Water distribution systems begin at a source that can be classified as either a groundwater or surface water resource. The location and quality of the source is of primary concern to those administering regional water systems. The water distribution system may convey the water tens of kilometres before it reaches its final destination, the user's tap. Distribution in a drinking water system tends to account for about 75% of the initial capital costs of a system, while the treatment plant accounts for the remaining 25%[1]. The following section will briefly discuss the economic role of these systems and how they impact regional performance.

2.1. The Economic Role of Water Systems

It is a priority for every community to have a safe and reliable water supply. Regional economic performance can be adversely impacted if water is not provided in sufficient quality or quantity. Providing a high level of water quality at the demanded quantity is a

[1] Ministry of Public Infrastructure Renewal (2005). Water Tight: The Case for Change in Ontario's Water and Wastewater Sector. Province of Ontario: Toronto.

struggle for many communities. The demands for water come from the residential, commercial, institutional, and industrial sectors; however, additional capacity must be built into water systems to provide supplies in fire emergencies. Industrial demand varies substantially from community to community but often ranges from 15-65% (average 40%) of the total water demand[2]. Commercial demand in cities with populations greater than 25,000 is often 20% of the total water demand[3]. Water servicing is often a primary consideration of many forms of industries and commercial operations, so that increasing water system capacity also helps to increase regional performance. Some municipalities like Milwaukee, Wisconsin, specifically target "Wet Industries", such as food processing and pharmaceuticals by providing excess capacity at relatively low costs[4]. A supply of high quality and reliable water is a significant selling point for a municipality and an important component of any industrial or commercial growth initiative.

Water is not only a commodity, it is a necessity required to sustain human life. As detailed by a United Nations Subcommittee on Economic, Cultural and Social Rights, "The human right to water entitles everyone to sufficient, affordable, physically accessible, safe and acceptable water for personal and domestic uses."[5] One may ask the question: Why does government provide potable water servicing? Potable water as a service is both excludable and rival. However, due to the moderately inelastic demand[6] for water and its requirement to support human life, most municipalities choose to provide it as a public service. For urban systems with a large number of users, the marginal cost of additional users is negligible. One could argue that if a competitive market was created for water in urban areas, market failure would occur because these

[2]Frenette, R. (2001). Hydraulics of Water Supply and Sewer Systems: Course Notes. University of Ottawa: Ottawa.

[3] Frenette, R. (2001).

[4] City of Milwaukee (2003). Milwaukee Water Works 2003 Annual Report. City of Milwaukee: Milwaukee.

[5] World Health Organization (2002). Water for health enshrined as a human right. World Health Organization: Geneva.

[6] Parkin, P. (2003). Economics and Canada in the Global Environment. Pearson: Toronto.

uncoordinated markets would be unable to provide water in the desired quantities. Unfortunately, in communities with small populations, the marginal costs of providing water servicing can be very significant. This often results in many small decentralized private systems.

In Canada, treated drinking water may be distributed from region to region and even between provinces; however, massive export of freshwater between Canada and the United States has been prohibited by the federal government. In 1999, the federal government launched a strategy to prohibit the bulk removal of water, including for export, from Canadian watersheds[7]. The federal government's current water export policies state that water shall not be sold on the international market. Large areas of Canada do make up the watersheds of several major rivers in the United States. These rivers provide drinking water to millions of Americans. This paper focuses on regional manmade water distribution systems and will not attempt to address the challenges of international natural water distribution systems.

In most industrial processes, the cost of producing an additional unit of output tends to start out high, when output is low, and then drop quickly[8]. Water systems are often multi-million dollar utilities and when compared with other industries do reflect economies of scale. These economies of scale are present when the average unit's cost of production decline as a water system's size increases. The economic literature on economies of scale in the water sector is limited, in part because prices do not reflect costs very well.[9] Another complicating factor is the uniqueness of each system: even when (as is rarely the case), the same plant design is selected, such intervening variables as customer density, soils, climate, topography, and source water quality have an impact on costs.

[7]Commission for Environmental Cooperation (2001). North American Boundary and Transboundary Inland Water Management Report. Commission for Environmental Cooperation: Montreal.

[8] Ministry of Public Infrastructure Renewal (2005).

[9] Ministry of Public Infrastructure Renewal (2005).

One of the few studies undertaken on the subject of economies of scale in regional water systems was completed by an independent American research group "Resources for the Future". They completed a study examining economies of scale in community water systems based on information from the U.S. Environmental Protection Agency's Community Water System Survey that had a sample size of over 1,200 communities. They found that the total unit cost elasticity for a 1% increase in production reduces unit costs by a statistically significant 0.16%[10]. The study found that higher economies of scale exist in capital costs, outside costs, and material costs. Labor costs and energy costs exhibit lower but still positive economies of scale. These economies of scale suggest that larger systems are better than smaller systems at bargaining and can obtain inputs at a lower unit cost. Bargaining gains and some production economies do not necessarily depend on water systems becoming physically interconnected. The study also found that the cost per thousand gallons of a very small plant is 135% greater than that of a very large plant ($2653/million gallons versus $1128/million gallons)[11]. This provides further evidence that larger systems generally provide a better economic value for municipalities. This study also considered, from a high level, the scenario of giving systems below the median supplied water level the scale economy gains associated with moving their output to the median level. The savings related to this scenario would provide systems below the median an average cost reduction of 14%. Under this scenario, more than 40 of the systems below the median would realize cost savings of more than 50%[12]. Looking at operating costs alone, the scale economies are not as pronounced.[13] This is important for the British Columbia situation, where geography often limits the ability to connect systems physically. Evidence from the United States on economies of scale point to large capital cost savings but modest savings for operations[14].

[10] RFF (2004). Economies of Scale and Technical Efficiency in Community Water Systems. Resources for the Future: Washington.

[11] RFF (2004).

[12] RFF (2004).

[13] Ministry of Public Infrastructure Renewal (2005). Watertight: The case for change in Ontario's water and wastewater sector. Publications Ontario: Toronto.

[14] Strategic Alternatives (2001). Commissioned by The Walkerton Inquiry: Financing Water Infrastructure.

Another U.S. based study, concentrating on smaller, partly rural systems in New York State serving between 2,100 and 57,000 people, focused directly on the joint minimization of treatment and distribution costs.[15] The study indicated that "only in the most densely populated areas would any remaining economies of size in treatment outweigh the diseconomies in transmission and distribution."[16] This data highlights the importance for government to seriously consider the consolidation of small water systems that are adjacent to densely populated areas.

Consolidation of water systems is not always the best solution. Allowing fragmented water systems in isolated rural areas is often necessary from an economic standpoint. Drinking water systems are the most capital-intensive of all utilities[17]. As stated in an Infrastructure Canada water policy paper: "The ratio of infrastructure investment to revenues is almost 5:1 in water and wastewater, whereas it is only 3:1 in electricity and telephone and 2.5:1 in gas. This means that a significantly higher amount of investment is required to fund water infrastructure, yet it generates fewer revenues than other utilities."[18] Due to this low revenue to capital cost ratio, small utilities will struggle to subsidize an investment in consolidating adjacent water systems. This leads to the conclusion that a physical integration of rural systems is often not economically feasible. Other efficiencies, such as consolidating administration and staffing, should be considered in isolated rural areas.

Strategic Alternatives: Toronto.

[15] R. Boisvert and T. Schmit (1997), Tradeoff Between Economies of Size in Treatment and Diseconomies of Distribution for Rural Water Systems. In Agricultural and Resource Economics Review 27, no. 2.

[16] R. Boisvert and T. Schmit (1997), Tradeoff Between Economies of Size in Treatment and Diseconomies of Distribution for Rural Water Systems. In Agricultural and Resource Economics Review 27, no. 2.

[17] Infrastructure Canada (2004). Water Infrastructure: Research for Policy &Program Development. Government of Canada: Ottawa.

[18] Infrastructure Canada (2004).

2.2. Regional Constraints

Regional water systems are often defined by their constraints. The locations of settlements have historically been based on proximity to water sources; unfortunately over time these sources become contaminated by human impact or are unable to adequately service the size of expanding urban centers. Other less apparent constraints also affect the water supplies of certain regions having an adverse effect on regional performance. Often trained personnel can be difficult to attract to rural municipalities meaning that many of these areas have limited labour and human capital endowments. In addition, rural municipalities may be unable to subsidize the cost for equipment upgrades required to meet current provincial water quality standards. These two factors adversely affect the water servicing performance of rural regions.

Large urban centers have their own share of water servicing constraints. Often these centers have the capital required to undertake large infrastructure works; however, there is limited space available to undertake the work. Many urban areas have become significantly built up over time making large scale replacement solutions difficult if not impossible. In addition, these urban centers may be plagued with political problems related to adjacent municipalities. Municipalities are constantly competing for similar businesses and industries; therefore, helping an adjacent municipality to increase their water servicing capacity is analogous to helping a rival company increase its relative competitiveness. Every region has their own forms of physical, economic, and political constraints. The following section will describe the constraints currently faced by various regions in British Columbia that adversely impact regional performance.

3. REGIONAL WATER SYSTEMS OF BRITISH COLUMBIA

3.1. Regions in a Water Systems Context

Drinking water in British Columbia is managed locally by Drinking Water Officers, Public Health Engineers, and Medical Health Officers that work within the province's health authorities. All drinking water systems within the province require both construction permits and operating permits in order to ensure that they are constructed

and maintained in a safe and effective manner. The British Columbia Water Act includes provisions to license water users that wish to use or divert surface water. The act defines several types of individuals, groups, and agencies that can apply for a water license. The various forms of drinking water provider designations provided by the Ministry of Health and Ministry of Environment include:

Water Users Communities: These groups are administered through the Ministry of Environment under the Water Act and represent individual water licensees who have chosen to create a joint system to store or distribute their water. There are currently 107 active Water Users Communities in British Columbia.[19]

Community Watershed Designations: Community watersheds are designated in order to protect drinking water from the impacts of uses including logging, road building, recreation, and agriculture. There are currently 461 active Water Users Communities in British Columbia.[20]

Certificates of Public Convenience and Necessity: Water utilities are defined as "Providers of water services who own or operate equipment or facilities for the delivery of domestic water service to five or more persons or to a corporation for compensation."[21] In order to operate, these utilities require a Certificates of Public Convenience and Necessity. There are currently 178 privately owned water utilities in the Utility Regulation Section of the Water Management Branch[22].

[19]BC Ministry of Environment (2006). Water Stewardship Division: Water Users' Community Query. http://www.env.gov.bc.ca/wsd/data_searches/wuc/wuc_names.htm

[20]BC Ministry of Environment (2006). Water Stewardship Division: Community Watersheds Database: http://www.env.gov.bc.ca/wsd/data_searches/comm_watersheds/index.html

[21] Province of BC (2005). Water Utility Act [RSBC 1996] Chapter 485. Queen's Printer, Victoria, British Columbia, Canada

[22] BC Ministry of Environment (2006). Water Stewardship Division: Water Utilities. http://www.env.gov.bc.ca/wsd/water_rights/water_utilities/index.html

Water Licenses: Individual water licenses are required by any individual or group seeking to divert or use surface water. There are currently 7,582 final licenses issued in the Province of BC of which 4,797 are for distribution systems supplying water directly to residences and buildings for human consumption.[23]

The following sections will consider the functional water servicing regions of British Columbia. For the most part, water servicing administrative areas are coincident with functional servicing regions due to the interconnected nature of water distribution systems. The functional regions have been divided based on their geographic extent and share common distribution, economic, or logistical constraints.

3.1.1. Island Areas

The island areas are characterized by isolation and they often have limited surface and ground water resources. Examples of BC's island areas include Vancouver Island, the Gulf Islands, and the Queen Charlotte Islands. Island areas do not intrinsically have scarce water resources; however, as an island they are isolated and as they become further developed they often have limited options for further water servicing, necessitating a focus on water resource management.

3.1.2. Urban West Coast

The urban west coast of British Columbia is characterized by its dense population and proximity to the confluence of the ocean and major rivers. This area, including Greater Vancouver, is significantly built up and depends on water sources that are at least partially impacted by human activities. This area has access to large financial resources but it is also subject to large space and time constraints. These areas have substantial labour and human capital endowments.

[23] Number of licenses calculated based on the Ministry of Environment's Water Licences: Purpose Definitions and the Water Licences Web Database.
http://www.elp.gov.bc.ca:8000/pls/wtrwhse/water_licences.input

3.1.3. Northern BC

Northern BC is characterized by numerous unspoiled water sources and a large number of small isolated communities. These communities often have high quality water sources that need limited water treatment. Unfortunately, there are few skilled water treatment workers that live and work in these communities. Financial resources are also a constraint in these communities. Often simple chlorination equipment maintained by a competent professional are all that is needed to provide access to good quality water.

3.1.4. BC Interior

The BC interior is characterized by its agricultural resources as well as natural geographic water resource endowments. This region has a varied topography and several distinct micro-climates. Major cities in this area include Kelowna and Kamloops, as well as smaller centers like Vernon and Penticton. Cities in this area have moderate to high financial resources and have a diverse choice of water sources. These areas have a substantial number of qualified water professionals that are available to operate many of the regions water systems.

3.1.5. The Kootenay Region

The Kootenay Region is punctuated by expansive valley and mountain ranges and unspoiled yet isolated water resources. Transmission of water is often a problem through this rocky terrain. The problems in this area are similar to those experienced by Northern BC as they have limited numbers of skilled water treatment workers and financial resource constraints.

4. COMPARATIVE ANALYSIS

The following chapter presents a comparative analysis of specific area characteristic of the regions introduced in the previous sections. Case studies in BC will be discussed and compared with similar situations in Canada or around the world. The recommendations presented in this section relate both specifically to the location discussed and to its region as a whole, and have been developed with the goal of increasing regional performance.

4.1. Methodology

Each of the areas considered in the comparative analysis was strategically chosen based on specific criteria. Each set of comparators was selected based on its characteristics as it relates to the regions outlined in Section 3. The similarities between the locations selected for each regional comparison included geography and topography; availability of human technical resource capacity; local economic and social resources; and their status as a regional center. The following table includes the locations chosen for the comparative analysis and the criteria used to choose them. The primary differences are explored in the following sections. These differences are for the most part based on contrasting regional water system strategies or the use of different government incentive programs.

Region	Comparators	Similarity Criteria	Difference Criteria
Island Areas	Vancouver Island / New Zealand	• Island geography • Level of economic and social development	• Contrasting Regional Planning Approach
Urban West Coast	Greater Vancouver Area /Seattle and King County	• Major urban center • Located adjacent to the Ocean	• Different Regional Servicing Administration Models
BC Interior	Kelowna / London, Ontario	• Large urban center • Adjacent to many small communities	• Dissimilar regional servicing bodies
Northern BC and the Kootenays	Skeena Region / Township of Black River - Matheson	• Isolated rural community • Minimal human and economic resources	• Different provincial incentive programs.

Table 4-1: Comparative Analysis Methodology

4.2. The Islands: Vancouver Island and New Zealand

4.2.1. Vancouver Island

Vancouver Island has a population of approximately 723,000, includes several cities and regional municipalities, and is characterized by rugged mountains, coniferous and old-growth forest, and a variety of unique ecosystems. The island contains the regional districts of Cowichan Valley, Nanaimo, Alberni-Clayoquot, Capital, and portions of Mount Waddington. Most of these districts have their own independent water servicing operations. Each area has completed a water master plan to manage their own regional district; however, there has been little study undertaken considering the island's water servicing strategy as a whole.

An example of one of the regional districts with a comprehensive water management plan it the Capital Regional District. The Capital Regional District Water Services Department supplies water to 320,000 resident's of Greater Victoria. CRD Water Services is responsible for the supply, treatment and delivery of bulk (wholesale) drinking water to its municipal customers and for the operation of the retail water distribution system in the Western Communities and Sooke. The services provided by the CRD include:

- strategic planning,
- watershed protection,
- construction and maintenance of water supply infrastructure;
- disinfection and delivery of bulk water to municipal boundaries,
- monitoring of water quality[24].

At this time little analysis has been completed by the CRD to consider the overall system needs for the bordering districts or the island as a whole.

[24] Capital Regional District (2005). http://www.crd.bc.ca/water/factsfigures/overview.htm

4.2.2. New Zealand

In New Zealand, the Ministry of Health ensures that appropriate infrastructure is present to support the provision of clean and safe drinking-water to communities. Three organizations, one at the local level, one regional and one with a national perspective, are concerned with providing safe drinking-water to the communities of New Zealand. At the local level, the typical supply is owned by a territorial local authority (TLA) such as a district or city council. The Ministry of Health does not monitor the local authorities directly but works at the regional level through the District Health Boards (DHBs). Each DHB is expected to oversee the TLAs in its area and ensure that they maintain appropriate water quality. The water suppliers are responsible for water quality monitoring, whereas the public health service providers carry out surveillance of the management of drinking-water quality in the health district.

In order to manage its water resources on a national scale, New Zealand's Ministry of Health has developed a comprehensive registration system. New Zealand's water supply registration system details over 2,000 community drinking-water supplies. Details are available on a weekly basis from the national "Water Information for New Zealand" database. The Water Information for New Zealand (WINZ) drinking-water information system was developed to be used by local bodies throughout New Zealand. New Zealand has medium and large modern cities; however, many small communities exist, often with limited knowledge and financial resources for improving their local drinking-water supply. The WINZ system provides technical means for identifying, evaluating and recording relevant information and also helps inter-relating parties to work effectively together. WINZ lists the information available to the Ministry of Health for all New Zealand water sources and community drinking-water suppliers. For each supply, the source of the water, the plants where water is treated and the distribution zones are listed, together with concentrations of contaminants. The aim of the registry is to provide easily accessible information about community water supplies to the regulator, the service provider, and the public. The Ministry of Health releases an annual document titled "Register of Community Drinking-Water Supplies in New Zealand" that provides information on community supplies in New Zealand, including their structure and water

quality grading. Entries in the registry include drinking-water supplies serving 25 people or more for at least sixty days a year.

4.2.3. The Islands: Comparative Analysis

New Zealand and Vancouver Island share many similarities; however, they choose to manage their regional water supplies quite differently. The country of New Zealand has taken the approach of an island-wide water management strategy. This has been done for many administrative and logistical reasons and has positively impacted the regional water servicing performance of the country. This strategy achieves increased performance by providing a holistic approach for managing the resources of a self contained and independent water system. The municipalities of Vancouver Island have not yet considered an island-wide approach for water management. Water resources are valuable and often limited in island areas. If the population of Vancouver Island continues to expand at the present rate, some form of an island-wide drinking water master plan should be developed similar to the systems already developed in New Zealand. This does not mean that the entire island will be serviced by a single system but rather a comprehensive plan is in place that best serves all the island's stakeholders. A system similar to New Zealand's Water Information for New Zealand (WINZ) system would aid Vancouver Island in developing a future strategy for smart growth and island-wide water systems management. Most of the information provided in the WINZ system is already available for the more populace regions like the Capital Regional District and from the British Columbia Ministry of Health; however, more work should be done to put this information in a common database in order to develop an island-wide water management program. A study to consider developing an island-wide information system and servicing plan for Vancouver Island will cost in the magnitude of $150,000[25] if undertaken by an engineering consulting company. Smaller islands will require approximately $50,000 for a similar study.

[25] Estimate based on current consulting rates in Canadian urban centers.

4.3. The Urban West Coast: Vancouver and Seattle

4.3.1. Servicing Vancouver: The Greater Vancouver Water District (GVWD)

The Greater Vancouver Regional District (GVRD) is a partnership of 21 municipalities and one electoral area that make up the metropolitan area of Greater Vancouver. The GVRD contains over two million residents, expecting to grow to 2.7 million by 2021. The GVRD's Board of Directors is comprised of mayors and councillors from the member municipalities, on a representation by population basis. Under the umbrella of the GVRD, there are four separate legal entities one of which includes the Greater Vancouver Water District (GVWD).

Through the GVWD, the GVRD performs its role of providing a reliable source of safe, high-quality drinking water to its member municipalities at a reasonable cost[26]. The GVWD is responsible for acquiring and maintaining the water supply, treating it to ensure its quality, and delivering it to the municipalities. The member municipalities are responsible for conveying the water to residences and businesses in their jurisdiction. It is the GVRD's role to serve its member municipalities by providing bulk water to the municipal distribution systems.

The GVWD has outlined its strategy in their report titled "Drinking Water Management Plan for the GVWD and Member Municipalities"(DWMP).[27] This plan provides the direction and priority for drinking water initiatives to promote a "sustainable region" servicing strategy.[28] The GVWD has attempted to link the DWMP with other regional plans such as the Growth Management and Liquid Waste Plans. Based on the information provided in this report, the mandates of the partner municipalities have not been considered as part of the development of the Drinking Water Master Plan. One would characterize the affiliation between the GVWD and the member municipalities as a

[26] GVWD (2005). Drinking Water Management Plan for the Greater Vancouver Water District. GVWD: Vancouver.

[27] GVWD (2005).

[28] GVWD (2005).

partnership rather then a customer/service-provider relationship.

4.3.2. City of Seattle Regional Water Supply

The Seattle Public Utility (SPU) serves more than 628,000 people in the Greater Seattle Area with both retail and bulk water service. The SPU provides retail service to the citizens of Seattle and provides water to 21 wholesale customers, who together deliver water to an additional population of over 850,000. SPU's water line of business is divided into four business areas that are focused on key components of its water system. These business areas include major watersheds, water resources, water quality and treatment, and transmission and distribution.

The SPU provides wholesale water servicing to 70% of the population of King County plus a small population in Snohomish County. Between 2004 and 2006, SPU has entered into new contracts with most of its wholesale customers. These contacts created stronger partnerships between several of the wholesale customers and created more autonomy for others.

One of SPU's key business principles is to focus on the needs of its retail and wholesale customers. SPU has attempted to focus their efforts by fostering improved communication with customers while soliciting their input in order to provide better service. The following policy has been developed by SPU to articulate their drinking water service vision:

Provide retail and wholesale drinking water service that responds to changing customer expectations centered on providing reliable, high-quality water, and guided by asset management principles.

1. *Use retail and wholesale customer-driven service levels to guide SPU's decisions regarding the drinking water services the department provides.*
    a. *Set service levels that are within SPU control based on high priorities to customers or regulatory requirements.*

   b. *Collect and analyze retail and wholesale customer input through a variety of means, and modify SPU's service level targets as needed.*
2. *Provide services with efficiency and fairness across customer classes (e.g., retail/wholesale, residential/commercial), and across all affected communities.*
3. *Maintain appropriate tools and technology for enhancing customer relationships and responsiveness to customers*
4. *Explore potential approaches to enhance retail water service beyond the customer's meter, recognizing that SPU's responsibility for water infrastructure ends at the meter*
5. *Consider expanding fee-based services to wholesale customers and neighbouring utilities.*[29]

This policy reflects SPU's goal to be a customer-centered organization. As an independent organization functioning as a wholesale water seller, SPU has been able to effectively serve its member organizations and maintain a high quality product at a low price.

4.3.3. The Urban West Coast: Comparative Analysis

Seattle and the GVRD have taken two different approaches to delivering water services. Seattle's Public Utility functions as a single utility wholesaling business servicing its surrounding areas with its extra capacity. SPU's approach has several advantages from a regional performance perspective. To begin, most of their business decisions can be based on economic incentives for producing and distributing more supply. In addition, the costs they charge for water are more likely to reflect the actual cost of production. Finally they are motivated to listen and act on the requests of their customers as their operations and capital investment depends on their business.

[29] Seattle Public Utilities (2006). Seattle Public Utilities 2007 Water System Plan. Seattle Public Utilities: Seattle.

GVRD has taken the approach of creating a water servicing partnerships to provide water to its member municipalities. Unlike a single utility provider independent from its customers, the GVRD does not necessarily make decision based on economic incentives. This type of arrangement leads to a price of water that does not accurately reflect its cost. In addition, member municipalities are in effect forced to take part in the partnership which, from time to time, creates an adversarial relationship between the GVWD and its member municipalities.[30] In addition, this approach does not motivate the regional body to generate a customer-centered attitude. In order to achieve this goal it is recommended that the GVRD develop a customer service policy similar to that of Seattle and build into their mandate the ideal of servicing their membership as if they were customers in order to help increase regional performance. Further analysis in the form of an independent study should be completed to consider changing the GVWD's management structure from a regional water partnership to a regionally owned and independently managed utility. The cost of a study to evaluate this option would be in the magnitude of $150,000[31].

4.4. Isolated populations: Skeena Region and the Township of Black River - Matheson

4.4.1. Skeena Region and the BC North

The Skeena Region covers an area of 266,441 km^2 in the northwest quadrant of British Columbia[32]. The region is relatively unpopulated; there are no large urban centers, and few communities are populated by more than 5,000 people. Most of the region's communities are located along the Highway 16 corridor. There are few large water suppliers in the region, and small water suppliers and private water systems serve most of the population. Water is abundant in the Skeena Region, and most drinking water systems use surface water sources. Surface water sources like those used in much of the Skeena

[30] Steblin. P. (2006). Interview with the former City Engineer of Richmond BC. August 30, 2006.

[31] Estimate based on current consulting rates in Canadian urban centers.

[32] British Columbia Ministry of Environment (2006). Drinking Water Source Quality Monitoring 2002-03 Bulkley Valley Surface Water Sources. Province of British Columbia: Victoria.

Region have a higher risk of contamination than groundwater sources. All surface water based drinking water systems should employ some form of basic disinfection treatment.

The Bulkley Valley is a representative portion of the Skeena Region that lies approximately 200 km inland from the Pacific coast. The Town of Smithers is located in the middle of the valley with a population of approximately 6,000. Agriculture occurs on the valley floor, and mineral exploration, timber harvesting, and outdoor recreation are the primary land use. Many residents live in rural parts of the Bulkley Valley, where infrastructure like sewage and water distribution systems are not available. These residents obtain their domestic water from small water systems which they may have built and maintained themselves. The abundance of surface water, combined with the cheap cost of installing a surface water intake, has resulted in a large number of people drinking water from surface sources. Surface water is commonly consumed in the Bulkley Valley with little or no treatment. Recent drinking water quality studies have noted source quality concerns at the Smithers Lakes and Bulkley River tributaries[33].

4.4.2. Township of Black River-Matheson and Ontario's Northern Prosperity Plan

The Township of Black River-Matheson is located in the District of Cochrane in the northeastern part of Ontario. The municipality contains four main town sites: Ramore, Holtyre, Val Gagne, and Matheson which is the largest. The municipality has a population of 2,925 and functions as a regional center for mineral exploration, forestry, and agriculture and is attempting to build on existing industry. The municipality has a series of small drinking water supplies that do not currently meet provincial drinking water standards.

In February 2006, Black River – Matheson was awarded funding by the Province's Northern Ontario Heritage Fund Corporation through their Drinking Water Protection Program. The funding, over $100,000, was earmarked for five drinking water supply systems projects in the township. The upgrades will bring these systems into compliance

[33] British Columbia Ministry of Environment (2006).

with the provincial Drinking Water Systems Regulation and will benefit approximately 800 households within the municipality.

Ontario's Northern Prosperity Plan includes initiatives aimed at stimulating economic growth and job creation for individuals residing in northern Ontario. The plan has four goals:

- Increasing economic prosperity for Northern Communities,
- Improving government communications with northern communities,
- Focusing on economic initiatives that can help northern communities to compete globally, and
- Providing opportunities to a wide range of groups.

The Northern Ontario Heritage Fund Corporation (NOHFC) is a component of the Northern Prosperity Plan which aims to work with northern entrepreneurs and businesses to foster private sector job creation as well as support infrastructure and community development projects. The NOHFC offers seven programs to promote economic opportunities to northern communities. The Drinking Water Protection Program provides capital assistance to enhance drinking water protection in Northern Ontario. This program allows municipalities with drinking water infrastructure deficiencies to apply to receive provincial funding to cover up to 50% of project related capital costs.

4.4.3. Small Water Users Association of British Columbia

The Small Water Users Association of BC is a non-profit society committed to serving the interests of small water systems (1 to 300 connections) in British Columbia. The group was created out of concerns that existing water associations in BC were primarily serving the interests of larger water systems. The goal of this organization is to provide municipalities with small water systems access to information on the topics of emerging technology, regulatory requirements, government assistance programs, and operator training and certification. The association received limited financial assistance from the BC government to enable it to set up, establish a website, and undertake a membership

drive. The mission of the Small Water Users Association of BC is:

- To foster cooperation and information sharing amongst small water systems throughout BC in order to improve system operations and reduce costs; and
- To represent the concerns and interests of small water systems before all levels of government.[34]

The Small Water User's Association is currently a small organization with a limited scope of services. Their current membership stands at 210 water systems ranging in size from 1 connection to 340 connections and include 39 Improvement or Irrigation Districts, 31 Water Users' Communities, 41 regulated utilities, 2 Regional District systems and 97 private systems. The association is currently developing a series of technical workshops; however, they are all located in southern BC. The association has also generated a guide to online resources for small water systems available on their website.

4.4.4. Isolated Populations: Comparative Analysis

The problems experienced by isolated populations are common among all of Canada's northern communities. These areas are generally sparsely populated and water systems are rarely monitored. In addition, there is a lack of certified operators to run these water systems. Due to the nature of this widespread problem it is often difficult to develop strategies to increase regional performance. Economic development requires safe water supplies in the quantity demanded by the areas residents and by industry. These areas often have limited economic and technical resources to deal with existing water quality problems. The funding provided to the Township of Black River-Matheson is an example of a strategic funding initiative that focuses on the problems of limited economic resources in northern communities. Developing a similar program in British Columbia would help those in isolated northern areas maintain safe water systems. If this strategy is to be successful in BC, it is recommended that a similar 50% allocation of funding be provided in the magnitude of $10,000,000[35] to be reassessed in following years. This

[34] Small Water Users Association of British Columbia (2006). http://www.smallwaterusers.com/index.html

[35] Similar to the magnitude of funds provided by the Province of Ontario for a similar program.

money could be redirected from the Province's current Municipal Rural Infrastructure Fund, the B.C. Community Water Improvement Program or the Canada/B.C. Infrastructure Program, but be specifically earmarked for water systems in northern and isolated areas.

The Small Water Users Association of British Columbia is an example of a group that has helped to foster educational opportunities for operators of BC's small water systems. An organization like this one could provide a wide array of opportunities to small water systems in isolated areas. A Small Water Users Association that served members of Northern BC and the Kootenays would provide members with information on government programs as well as information regarding government application procedures. A funded organization such as this would collect and distribute information regarding local suppliers, new technology, and consulting engineering expertise. Another benefit of this type of organization is that it would provide advice to small utilities on how they can comply with the new Drinking Water Protection Act and its regulations. This form of organization would also create a forum for small municipalities that may not otherwise exist, and helps to build regional cohesiveness leading to improved regional performance. This type of forum allows custodians of isolated systems to exchange ideas and information about common issues and other matters related to the operation of their water systems. If this organization is to be effective at a provincial scale, it is recommended that its current funding be increased by $225,000[36] per year to further subsidize their membership dues. If a new organization is established from scratch, the estimated start up costs would be approximately $150,000[37] and would require a similar yearly investment of $225,000.

Many aboriginal communities have similar problems managing water quality monitoring programs and employing properly trained water systems operators. Analogous to the

[36] Cost based on the association present membership fee ($25 +$1 per number of connections) for covering the cost of approximately 3000 small water users in the province for the first 50 connections.

[37] Includes startup costs related to setting up and equipping a small office, establishing a website and undertaking a membership drive.

isolated populations outlined above, aboriginal communities require modern monitoring equipment and trained operational personnel. In other provinces, organizations like the Aboriginal Water and Wastewater Association of Ontario foster technical self reliance of aboriginal peoples and promote the importance of proper certification and licensing of operators[38]. Developing a users association that specifically caters to aboriginal water system operators in British Columbia may be prudent and should be explored in more detail.

4.5. The BC Interior: Kelowna and London

4.5.1. Kelowna Joint Water Committee and Westside Joint Water Committee

The City of Kelowna is serviced by the Kelowna Joint Water Committee which consists of the city's five major water suppliers. The Kelowna Joint Water Committee is a coordinating organization that develops a cooperative water management strategy to promote efficient water use within the region. The KJWC was formed to promote standardization of methods and materials, improve communications, and to provide an integrated approach to water supply within the city boundaries[39]. In addition to the City of Kelowna, the water in the region is supplied by the Black Mountain Irrigation District, South East Kelowna Irrigation District, Glenmore Ellison Irrigation District and Rutland Water Works. The sources for these areas include the Valley Lakes (i.e. Okanagan Lake); Upstream Watersheds; and groundwater. The water distribution system services approximately 94,000 domestic customers and irrigates 6,170km^2 of agricultural land.

The Westside Joint Water Committee is made up of the Westbank Irrigation District, Lakeview Irrigation District, District of Peachland, Westbank First Nation and Regional District of Central Okanagan. The sources for these areas include the Valley Lakes (i.e. Okanagan Lake); Upstream Watersheds west of Okanagan Lake; and groundwater. These

[38] Aboriginal Water and Wastewater Association of Ontario(2006). AWWAO Mission Statement http://www.ofntsc.org/AWWAO-Mission.html

[39] Kelowna Joint Water Committee (2006). 2005 Strategic Water Servicing Plan. Kelowna: Kelowna Joint Water Committee

groups have come together based on the recommendations of the Trepanier Landscape Unit Water Management Plan (TLUWMP). The Trepanier Landscape Unit includes approximately 100,000 hectares on the west side of Okanagan Lake directly across from the City of Kelowna. This area includes the watersheds of five major creeks that drain into Okanagan Lake. The goal of the committee is to champion improved water management and implement the recommendations of the TLUWMP. Currently the committee functions only as a public education partnership providing resources to the community to help citizens make informed decisions on water issues.

In 2005, the KJWC updated the long-range water-servicing plan for Kelowna. The report explored a number of water-related issues, including a review of source capacity; the major water supply components; plans for capital improvements for all five utilities; and a plan for future water service boundaries for all lands within city limits.[40] The KJWC report reflects the City of Kelowna's Official Community Plan, which was last updated in 2000, and is a comprehensive planning framework for providing water service to the city to the year 2020. One of the recommendations outlined in the report included:

The KJWC should continue to develop common policies for water supply in the Kelowna area. Meeting occasionally with the Westside Joint Water Committee should yield benefits including the creation of common objectives, shared contributions to public education on water, shared advertising, common policies for water management, and common standards and practises;[41]

To date little has been done to coordinate activities between the two joint boards.

[40] Kelowna Joint Water Committee (2006).

[41] AQUA Consulting (2005). Kelowna Joint Water Committee Water Servicing Plan. AQUA Consulting: Kelowna.

4.5.2. Lake Huron and Elgin Area Primary Water System Joint Boards

Approximately 6000km^2 of the greater London area of southwestern Ontario is supplied by two water treatment systems. The Lake Huron Primary Water Supply System services the London area and municipalities west of London from a water treatment plant located approx. 60 kilometers away. The water treatment plant currently serves a population of approx. 325,000 people. The Elgin Area Primary Water Supply System services the communities of London and areas east of London including St. Thomas and Aylmer. The plant is located approximately 40 km from London and currently services a population of approx. 94,400 people. The City of London receives its treated water from both the Lake Huron Water Supply System (approx. 85% of daily consumption) and the Elgin Area Water Supply System (15% of daily consumption).

The respective Joint Board of Management for the Lake Huron and Elgin Area Primary Water Supply System owns and governs the area water systems using the City of London as the Administering Municipality. Accordingly, the City of London provides all associated administrative and management services on behalf of the Joint Boards. The area water systems are operated and maintained by American Water Services Canada Corporation under contract to the respective Joint Board of Management. The basic guiding principles for the administration and operation of the Boards' water systems are:

- Quality of Service: The Operator must meet or exceed the level of water quality currently delivered to our customers as stipulated in the Contract, which surpasses the Ontario Drinking Water Standards; and
- Operating Flexibility/Innovation, Efficiency: The Joint Boards wish to encourage performance improvement throughout the Joint Boards' System. Changes that have major implications on the Joint Boards' System will require the approval of the Joint Board. Where financial gains are made from improved efficiency, it is anticipated that such gains will be shared between the Joint Boards and the Operator.[42]

[42] LHPW and EAPW (2006).http://www.watersupply.london.ca/system_operation.html

4.5.3. BC Interior: Comparative Analysis

There are several similarities and differences between the joint water boards discussed in the previous sections. To begin, the Kelowna Joint Committee fulfills mainly the role of an administrative and master planning body. The Westside Joint committee has a minimal administrative role and serves its members by strictly providing public information by undertaken public awareness programs. The two Ontario Boards also function to provide system wide administrative and public awareness initiatives; however, they also manage the general operations of their system. As well, the two boards share the same administrative employees and are linked by a common administering municipality, the City of London, which provides the Board's administrative employees with facilities and human resources services. Unlike the Kelowna and Westside Boards, the Huron and Elgin Boards do not share similar water sources. The Kelowna and Westside Boards have the opportunity to develop a water source-centered partnership. This form of partnership would allow both boards to manage irrigation and drinking water resources within the Okanagan Lake Watershed more effectively. It is recommended that a study be undertaken to consider a master-servicing plan for municipalities using Okanagan Lake and its tributaries as a source. In addition, this study should consider developing a single joint committee that manages the drinking water infrastructure and uses the City of Kelowna as its administering municipality. An estimated order of magnitude cost for a study of this scope is $250,000[43].

5. RECOMMENDATIONS

The following recommended initiatives summarize those provided throughout this report as applied to each functional region. The goal of these recommendations is to provide practical and innovative suggestions that can be used by the Ministry of Community Services to foster regional cooperation and increase regional performance:

- Provide funding for island communities for studies that consider island-wide water servicing strategies. These types of studies should consider current drinking

[43] This cost was estimated based on the cost of the City of London 2003 water master plan update.

water systems, future resources that may be exploited in the future, and a methodology for cataloguing current water quality monitoring information in a consolidated database. A study such as this will cost in the magnitude of $150,000[44] for a large island, and $50,000 for a small island if undertaken by an engineering consulting company.

- Provide provincial funding for regional water organizations, like the GVWD, to undertake studies to consider making regional management independent of its member municipalities. The study would consider modifying the management structure of regional water organizations to aid in increasing regional performance. The recommended management structure should be developed with a mandate to promote the ideals of increased regional effectiveness and efficiency and the vision of the organization as a catalyst for regional performance improvement. The cost of a study to evaluate this option is in the magnitude of $100,000[45] per region.

- Develop a Northern Drinking Water Protection Program that strategically helps those in isolated northern areas maintain safe water systems. It is recommended that 50% funding be provided to selected projects and funding be provided in the magnitude of $10,000,000[46] to be reassessed in following years. This funding could be redirected from the provinces current Municipal Rural Infrastructure Fund, B.C. Community Water Improvement Program or Canada/B.C. Infrastructure Program but be specifically earmarked for water systems in northern and isolated areas.

- The Province should consider providing funding to the Small Water Users Association of British Columbia or develop a similar group that will provide education and technical advice to small water systems and isolated populations. If

[44] Estimate based on current consulting rates in Canadian urban centers.

[45] Estimate based on current consulting rates in Canadian urban centers.

[46] Similar to the magnitude of funds provided by the Province of Ontario for a similar program.

this organization is to be effective at a provincial scale, it is recommended that its current funding be increased by $225,000[47] per year. If a new organization is established from scratch, the estimated start up costs would be approximately $150,000[48], and would require a similar yearly investment of $225,000

- Provide funding for municipalities that share a common water source to form joint servicing boards. These studies should consider developing a single joint committee that manages the drinking water infrastructure of the region and uses a single urban municipality as an administrative center. An estimated cost for studies of this magnitude and scope would be $200,000[49].

6. CONCLUSIONS

Water Distributions systems are an important component of all regional servicing strategies. As discussed above improving water distribution systems can often result in improved regional performance. Water distribution systems are complex pieces of infrastructure that are often subject to a number of constraints. These systems consist of a source (either ground or surface water), a treatment system, and a storage/distribution network.

It is a priority for every community to have a safe and reliable water supply to support residential, commercial, and industrial growth. Water is not only a commodity but is a necessity required to sustain human life and should be respected as such. Water systems are often multi-million dollar utilities and reflect economies of scale. Studies have found that higher economies of scale exist in capital costs, outside costs, and materials costs. Labor costs and energy costs exhibit lower but still positive economies of scale. These economies of scale suggest that larger systems are better than smaller systems and can

[47] Cost based on the association present membership fee ($25 +$1 per number of connections) for covering the cost of approximately 3000 small water users in the province for the first 50 connections.

[48] Includes startup costs related to setting up and equipping a small office, establishing a website and undertaking a membership drive.

[49] This cost was estimated based on the cost of the City of London 2003 water master plan update.

obtain lower unit costs.

The Province of British Columbia is made up of a number of functional water regions with their own characteristic constraints. There are currently 4,797 licensed distribution systems supplying water directly to residences and buildings for human consumption in British Columbia. For discussion purposes the province has been broken into five regions that include: island areas, the urban west coast, northern BC, the BC interior and the Kootenays. Each of these areas has their own physical, economic, political and logistical idiosyncrasies. Problems in rural areas include limited financial resources and few skilled drinking water professionals. Urban and built-up areas are more likely to have political problems and inter-municipal disagreements.

The Vancouver Island and New Zealand water management systems were discussed and their different approaches were explored. It was recommended that an island-wide assessment be undertaken on Vancouver Island similar to the one used in New Zealand.

The City of Seattle's water utility was contrasted with the Greater Vancouver Water District. The GVWD is led by individuals that are leaders of the member municipalities. Seattle Water Utility's management is independent of its wholesale water customers and is strongly motivated to represent the full cost of servicing in their water prices and is motivated to be customer focused. The GVWD does not have the flexibility of being an independent organization and is often at odds with the smaller players within the municipality. A study to consider changing the current management structure of the GVWD should be considered.

The Skeena Region and the Township of Black River–Matheson are examples of isolated populations with limited financial resources and few trained personnel. The Province of Ontario's Northern Prosperity Plan strategically focuses on these areas and attempts to provide them with the money they need to comply with new regulations. To help supply training to these regions, funding for an independent small water systems municipal association was recommended.

Aboriginal communities, similar to isolated communities, require proper monitoring equipment and certified operational personnel. There is currently an opportunity to provide funding to create an independent user association that specifically caters to aboriginal water system operators.

The Joint Boards of the Kelowna, BC and London, Ontario areas share several commonalities and differences. The London area Joint Boards are two separate units that share a common administration whereas Kelowna Area Boards are distinctly separate bodies that have done little to co-ordinate their activities. It has been recommended that funding be provided to joint water committees for studies to consider merging and integrating their activities with those that share common water sources.

The goal of this paper was to provide practical and innovative recommendations that can be used by the Ministry of Community Services to foster regional cooperation for consideration as input for a workshop on regional economic performance planned for 2006. As noted, water system management is one of many components critical to improving the regional performance in the Province of British Columbia. The goal of increasing regional performance is significant and through the diligent efforts of members of British Columbia's Ministry of Community Services this goal is in the process of becoming a reality.

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