Final Report
A Regional Approach to Drinking Water Management: NL-BC Comparative Water Systems Study

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Yaffle Summary

Water is critical for all communities and regions, particularly drinking water, which relates to quality of life (e.g., health), economic development, and environmental quality. Management of drinking water involves many aspects, including not only building and operating treatment and distribution infrastructure, but management of aspects like source water protection, conservation, as well as planning and policy making. While drinking water management poses challenges across Canada, rural areas can experience particular challenges and issues, from multi-use watersheds to high costs and a lack of economies of scale and beyond. These are not only challenges in the present, but can act as barriers to future community and regional resilience.

Several fields of study offer potential avenues for not only addressing challenges and issues, but for helping to build and strengthen resilience. This project focused on the potential of a new regionalist approach to drinking water management. **Key characteristics of our proposed approach are:**

1. **A self-identified working region**
2. **Collaborative efforts**
3. **Flexibility in institutional and governance structure**
4. **Inclusive participation**
5. **Tailor made approaches**
6. **Integrated decision making**
7. **Innovation and creativity**
8. **Adaptation**

In particular this project looks at the potential feasibility of a new regional approach for rural regions. Using a comparative case study approach, **the research objectives were to:**

1. **Examine and compare the current approach to drinking water management in two case study regions.**
2. **Compare existing approaches against indicators of new regionalism.**
3. **Seek feedback from the case study regions on the feasibility of the proposed new regionalist approach and how such an approach might (or might not) address existing challenges.**

Past research found similarities in drinking water challenges between the Kittiwake region of Newfoundland and Labrador and the Kootenay region of British Columbia, as well as some initial successes in working as a region, including some sporadic examples of approaches that exemplify characteristics of a new regionalist approach. However, what we found was not a definitive response with respect to the feasibility and benefits of a new regional approach to drinking water management. First, there appears to be a disconnect between our literature based approach and existing rural capacity and practice. Second, challenges were encountered in terms of presentation of the proposed approach, as well as field data collection. As a result, questions remain as to the extent that a new regional approach may be able to assist in addressing drinking water management challenges and whether the proposed approach can contribute to rural regional resilience. What is clear is that a cookie cutter approach to drinking water management will not work in either of the case study regions. Also clear is that the creation of new policies,

programs, or regulations without matching capacity undercuts seemingly well-intentioned and purposeful ideas.

In terms of future application to Newfoundland and Labrador, it was found that the province could benefit from water related programs driven by regional actors, such as the Water Smart Program led by the Columbia Basin Trust in the Kootenay region of British Columbia. Regional scale agencies can play key roles in creating networks, integrating data, and developing capacity in relation to drinking water management. However, changes to the institutional structures surrounding management of drinking water systems are needed and, above all, regional capacity needs to be developed.

A better understanding of new regionalism, and the opportunities and challenges of the proposed approach, can contribute to future policy design for regional water and watershed management. There is a need for continued research into how regional approaches can aid in place specific drinking water management. While it seems as though provincial officials in Newfoundland and Labrador would like to see a push for regionalization, according to our new regionalist approach regional development must involve not only a top down, but a bottom up perspective, where capacity building and local buy in are priorities. In terms of next steps and future research the authors have identified source water protection and infrastructure as specific target areas on which to focus for further research related to regional approaches.

Executive Summary

Introduction

Water is recognized as a basic human right, a critical service, a fundamental for sustainability, and a building block for resilience. In Canada, rural areas face unique challenges when it comes to drinking water management (e.g., multi-use watersheds, low population density, lack of economies of scale). Not only are these challenges in the present, but these unique issues are also important in terms of future adaptation and can act as barriers to future community and regional resilience. Research indicates that while managing drinking water is a critical issue for rural Canada, current management approaches appear to be ill equipped to address this issue, particularly in the context of regional resilience. In this report we propose a new approach to managing drinking water, using the regional scale and incorporating best practices related to regional development, new regionalism, regional resilience, water management, and sustainable infrastructure. **Key characteristics of our proposed approach are:**

1. **A self-identified working region**
2. **Collaborative efforts**
3. **Flexibility in institutional and governance structure**
4. **Inclusive participation**
5. **Tailor made approaches**
6. **Integrated decision making**
7. **Innovation and creativity**
8. **Adaptation**

The future feasibility of this approach was explored in two rural case study regions on opposite ends of Canada where drinking water has been highlighted as a key local issue: the Kittiwake region of Newfoundland and Labrador and the Kootenay region of British Columbia. **Our research objectives were to:**

1. **Examine and compare the current approach to drinking water management in two case study regions.**
2. **Compare existing approaches against indicators of new regionalism.**
3. **Seek feedback from the case study regions on the feasibility of the proposed new regionalist approach and how such an approach might (or might not) address existing challenges.**

Methods

We used a comparative case study approach to gather, synthesize, and compare data between two rural regions. The case study approach allowed us to develop and test our proposed new regional approach to drinking water management in a complex, real time situation and to identify and match drinking water challenges and potential solutions using multiple sources of information. Specific methods include a literature review, content analysis of documents related to drinking water (e.g., plans, policies, regulations), as well as focus groups and key informant interviews.

Results and Discussion

Past research found similarities in drinking water challenges between the Kittiwake region of Newfoundland and Labrador and the Kootenay region of British Columbia, as well as some initial successes in working as a region, including some sporadic examples of approaches that exemplify characteristics of a new regionalist approach. Through our case study investigation

what we found was not a definitive response with respect to the feasibility and benefits of a new regional approach, but rather an additional gap between theory and practice. However, what is clear from our research is that, while the case study regions are at opposing ends of the country, and despite governance and regulatory differences, the Kootenay and the Kittiwake regions share common experiences and challenges related to the management of drinking water. Common local level challenges between the two regions included: engineering issues; data management; infrastructure issues, and capacity issues, particularly human and financial. Beyond issues of management, in both regions there were also issues with perceptions surrounding drinking water and health, chlorinated water, the use of untreated water sources (e.g., roadside springs), and sometimes friction or a lack of strategic coordination between the local and provincial level actors. What is less clear is the applicability and feasibility of applying the proposed new regionalist approach to address these challenges.

Our proposed approach takes a holistic, and coordinated perspective. It recognizes links and interdependencies within a larger scale system – a single community drinking water system not only relates to the surrounding environment and development of that community, but to the surrounding region as well. From a theoretical perspective, taking such an approach to managing drinking water that acknowledges and thoughtfully considers these links has the potential to address many of the existing challenges in drinking water systems and rural regions more generally by improving efficiencies, fostering collaboration, and helping to build regional resilience.

Our proposed new regionalist approach was not initially well received in the case study regions, suggesting a failure on our part to portray the information in a sufficiently comprehensive and tangible fashion. The complexity and diversity of the institutional structures and individual systems also played a part in the approach's reception. However, further discussion of the purpose and ideas within our approach were met with recognition and interest. In some cases we found that certain elements included in our approach currently exist in practice, albeit in a largely uncoordinated fashion. For example, there are knowledge sharing networks for specific practitioners, however these networks are rarely integrated, despite the potential benefits of doing so. Many facets of our proposed approach were acknowledged in both regions as important to the management of drinking water systems. These facets include collaborative and inclusive governance; the need for databases and integrated data management with straightforward and open access; the need for knowledge sharing venues; and the need for sustained funding and more accurately priced water fees.

Despite these encouraging results, envisioning these elements i) together as a coordinated approach, and ii) at a deliberately undefined regional scale appeared difficult for key informants to conceptualize, particularly where different elements were applicable in different contexts and at different scales. For example, sharing a drinking water operator may be of interest to small systems, while large systems may be more interested in a consolidated data sharing agreement or source water protection plan. Furthermore, where regional scale actions offered a possible solution it was noted that current institutional structures often have not explicitly supported, or have even actively blocked this type of approach. The concept of 'regional' itself presented an issue as a result of multiple, overlapping, regions. For example, our case study regions may be too large for some proposed elements (e.g., a regional water operator), but fine for other

elements (e.g., knowledge sharing networks). Though the need or potential for regionalization was recognized in many cases, issues relating to equity and bad experiences in the past with regional efforts remain a stumbling block.

Finally, and perhaps most importantly, it was found that there appeared to be a number of steps missing between the current state of and context surrounding the single system management of drinking water and the proposed new regionalist approach. The information gathered from participants in both regions was important in identifying i) the gap between current realities and our theoretically informed new regionalist approach and ii) the potential to build on our initial conceptual design. It was by in large agreed upon that the current approach to drinking water management has challenges. However, while our proposed approach included a variety of possibilities, we failed to accurately capture two critical stages: i) the need to build a solid foundation of knowledge and understanding surrounding drinking water systems across the regions in question (e.g., the need for treatment, watershed dynamics and so on), and ii) the benefit of building the case for a regional approach, including specific, relevant examples prior to a more coordinated new regional approach.

Conclusions

Ultimately, the gap between the current and the proposed approach was simply too large to allow us to determine the potential or feasibility of a new regionalist approach to managing drinking water. A revised approach would have to include the necessary foundation building as well as various initial targeted regional-scale actions leading up to a coordinated, system-focused new regionalist approach. The challenge is the creation of an approach that is open and flexible enough to allow for it to be tailored and transferred across different places, but clear and concrete enough to be understood. We saw a need for flexibility, consideration of place, and mechanisms for adaptive governance. Overall, we need to develop more practical and tangible ways of outlining the proposed new regionalist approach. It was suggested by participants that it would be helpful if regional approaches were outlined in a scenario-based manual, which had different regional options depending on local needs. Furthermore, the approach must have mechanisms to deal with communities at different starting points and coming from different perspectives, while also maintaining an overall umbrella approach. In short we need to revise our approach in a way that is both flexible and open, but easily understood and applied to different regions. Is a new regionalist approach to managing drinking water feasible for rural regions? We have no definitive answer, but rather an indication that this is worth pursuing.

Acknowledgements

We would like to gratefully thank all of the people who volunteered their time to help with this project, in particular the Kootenay and Kittiwake participants. We also owe a great deal of thanks to the organizing committees of the 2014 Association of Kootenay Boundary Local Governments Annual General Meeting and the 2014 Municipalities Newfoundland and Labrador Symposium for allowing us to participate in their events. Furthermore, without the support of the Harris Centre's RBC Water Research and Outreach Fund we would have been unable to complete this project – thank you. Thank you to Sean Markey (SFU) for his guidance and support throughout this project. Finally, we would like to thank Kelly Vodden (MUN) for her guidance and support throughout the project, and editing of this report.

Acronym List

ACOA	Atlantic Canada Opportunities Agency
AKBLG	Association of Kootenay Boundary Local Government
BC	British Columbia
BWA	Boil Water Advisory
CBT	Columbia Basin Trust
CGDWQ	Canadian Guidelines for Drinking Water Quality
CWT	Centreville-Wareham-Trinity
DBP	Disinfectant By-Product
DOEC	Department of the Environment and Conservation
EOCP	Environmental Operators Certification Program
IBEC	Indian Bay Ecosystem Corporation
IHA	Interior Health Authority
IWRM	Integrated Water Resource Management
KEDC	Kittiwake Economic Development Corporation
LSD	Local Service District
MIGA	Municipal and Intergovernmental Affairs
MNL	Municipalities Newfoundland and Labrador
MUN	Memorial University of Newfoundland
NCC	Nature Conservancy of Canada
NL	Newfoundland and Labrador
NLBC	Newfoundland and Labrador British Columbia Comparative Study
POE	Point of Entry
POU	Point of Use
PWDU	Potable Water Dispensing Unit
SFU	Simon Fraser University

1. Introduction

Drinking water has always been important to communities and regions. However, a heightened awareness of the potential threats to, and consequences of, drinking water systems has elevated drinking water as a focal issue (de Loë & Kreutzwiser, 2005). This, combined with other factors, makes management of drinking water a complex and challenging topic. For example, as with much of the infrastructure across Canada there is a deficit of water infrastructure (i.e., distribution and treatment systems), which continues to grow as systems age and funding and investment structures change (Federation of Canadian Municipalities, 2012; Mirza, 2007). Complications around drinking water are influenced by a variety of direct (e.g., change in water quality regulation) and indirect (e.g., climate change, links with development) factors. To further complicate the situation, rural communities face unique challenges related to factors like geography, economies of scale, and capacity, which can make dealing with change and increased levels of responsibilities difficult (Breen, 2013; British Columbia Water and Waste Association, 2013; Ivey, de Loë, & Kreutzwiser, 2006; Robins, 2007).

Critical drinking water issues related to water quality and water infrastructure have been highlighted in Newfoundland and Labrador (NL). Past research projects, such as the study conducted by Ziegler, Butt and Husain, have been exploring drinking NL specific water research gaps including cost effective technologies and issues surrounding disinfectant by-products (2009). Furthermore, previous studies done by Municipalities Newfoundland and Labrador (MNL) provide examples where regional approaches have been applied to the management of drinking water systems (Vodden, 2005a, 2005b, 2005c, 2005d, 2005e, 2007). Currently, a NL based drinking water project led by Dr. Kelly Vodden is examining issues related to rural drinking water systems in NL, including source water protection and municipal water infrastructure (Dolter, 2014; Minnes, Collins, Will, & Lightfoot, 2014; Minnes & Vodden, 2014). These challenges are not exclusive to NL, but extend across the country (Christensen, 2011; Mirza, 2007). Past and current research in rural British Columbia (BC) has identified similar situations and challenges to those found in rural NL (Breen, 2013; Ministry of Health Planning & Ministry of Health Services, 2002; Return on Insight, 2012, 2013).

This paper presents research which is based on two existing research projects, i) the *Canadian Regional Development*[1] project, a cross country examination of regional development in rural Canada providing the basis for an east-west comparison of two rural regions, and ii) the *Exploring Solutions for Sustainable Rural Drinking Water Systems*[2] project, an interdisciplinary review of drinking water systems in NL. The objectives of this project were to:

1. Examine and compare the current approach to drinking water management in two case study regions.
2. Compare existing approaches against indicators of new regionalism.
3. Seek feedback from the case study regions on the feasibility of the proposed new regionalist approach and how such an approach might (or might not) address existing challenges.

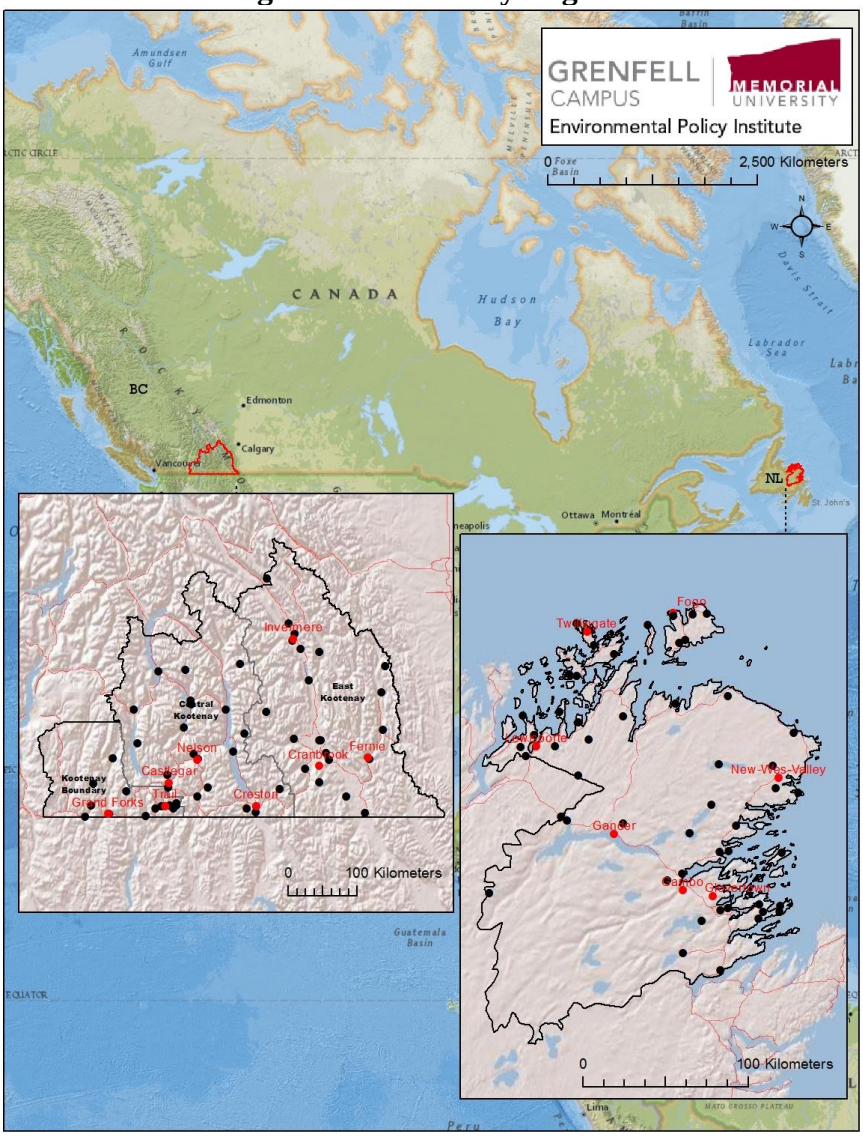
[1] For more information please see: http://cdnregdev.ruralresilience.ca
[2] For more information please see: http://nlwater.ruralresilience.ca

As this report details we encountered several challenges over the course of this research. For example, there was inadequate data to fully test the feasibility of our new regional approach as we found that the approach itself needed significant revision. As a result what we found with respect to the feasibility of this approach to drinking water management was not a definitive response, but rather the identification of an additional gap between theory and practice. The following report presents our findings, framed with a focus on application and lessons learned for rural NL.

2. Case Study Regions

Two case study regions were chosen for this project: the Kittiwake region of NL (the Kittiwake) and the Kootenay Development Region of BC (the Kootenays) (see Figure 1).

Figure 1: Case Study Regions



Map Credit: Myron King, Environmental Policy Institute, 2014

The two regions were the focus of previous research where drinking water had been identified as a key topic (Breen & Minnes, 2013; Breen, 2013; Minnes & Vodden, 2014; Vodden, Markey, Douglas, & Reimer, 2015). These past projects provided a solid foundation of knowledge of both regions. This section provides a general overview and comparison of the two case study regions, an overview of each region's drinking water systems and management, and a discussion of key challenges. Successes in each of the two regions and experiences to date with regional approaches to drinking water management were also examined throughout the research and are discussed further below (see Section 4.6). Additionally, transferable actions and ideas and are put forward as potential opportunities for other rural communities and regions (see Appendix 1).

2.1. Case Study Overview

The case study regions share similarities in history, as well as similar eras of provincial development. Both regions meet a set of rural criteria developed by the *Canadian Regional Development* project: clear delineation with multiple overlapping jurisdictions; remote relative to decision making centres and urban influence but connected by road; historic staples based economies; and low population density (Vodden et al., 2015). The history and culture of the regions are briefly introduced below, followed by a general regional comparison.

2.1.1. The Kittiwake Region

The Kittiwake region is located on the northeastern coast of Newfoundland. The region is defined using the recently disbanded late Regional Economic Development Zone 14- Kittiwake region and the Gander – New-Wes-Valley region of the provincial Rural Secretariat (Gander-New-Wes-Valley (these boundaries closely overlap). There are an estimated 119 communities in the Kittiwake region, including approximately 30 incorporated municipalities, as well as local service districts, and unincorporated communities (Skeard, Daniels, Gibson, & Vodden, 2013). There are also two Qalipu Mi'Kmaq First Nation Band electoral wards located in the Kittiwake region: Gander Bay and Glenwood. Both of these wards have Band Council representatives (elected councillors) who sit on the Qalipu Mi'Kmaq First Nation Band Council (Qalipu, 2011). Aboriginal peoples can be traced back to the region as far as 5,000 years ago in areas such as Bonavista Bay (Skeard et al., 2013). It has been found that the Kittiwake region itself has several functional regions, as determined by commuting data, and defined by how people behave in the region rather than the administrative region (Simms, Freshwater, & Ward, 2013).

Development in the Kittiwake region as a whole is diverse and varies from community to community, but has been heavily influenced by the fisheries industry. After joining confederation in 1949, came the Smallwood Era of leadership in the province which saw many changes in rural NL such as centralization, resettlement of communities, and a strategic shift toward industrialization and substantial educational and public works reform programs and improvements (Daniels, Vodden, Minnes, & Breen, 2013). During this time there was also a great deal of Federal funding and policies providing subsidies and assistance with the fishery industry (Baker, 1994). Premier Smallwood's resettlement program (1954-mid 1960s) is one of the most controversial programs of this era. Resettlement policies pushed smaller remote communities into more centralized communities in order to cut down on public expenditures as well as provide hydroelectricity and other basic services to residents. Resettlement was prominent in the Kittiwake region with the resettlement of many Bonavista Bay island communities (Baker, 1994). Amalgamations were also encouraged in the 1970's as well as other less formal joint councils were created (Vodden, Hall, Freshwater, & ResearchTeam, 2013).

Following the economic recession of the early 1980s, tighter fiscal policies led to more rural restructuring. This included more regional structures focused on economic and labour market development such as the Atlantic Canada Opportunities Agency and regional tourism associations. This was followed in the mid-1990's by the establishment of Regional Economic Development Boards, of which the Kittiwake was one, as well as the Community Business Development Corporations and other regional health initiatives (Vodden et al., 2013). Though the Community Business Development Corporations and regional health initiatives are still active in the region, the Kittiwake Regional Economic Development Board has been closed (Skeard et al., 2013). Currently, the region is dealing with developing new industry, youth out migration, population decline and public infrastructure degradation (Daniels et al., 2013; Goldenberg, 2008). Furthermore, funding cuts to regional organizations and the provincial closure of the Regional Economic Development Board's has impacted the strength of the region (Skeard et al., 2013).

2.1.2. The Kootenay Region

The Kootenay region is located in the south-eastern corner of BC and follows the boundaries of the Kootenay Development Region, one of eight development regions in the province. The region is comprised of three regional districts[3]. These three regional districts are comprised of 22 unincorporated electoral areas that are home to a number of communities, as well as 26 incorporated municipalities (Regional District of Central Kootenay, 2012; Regional District of East Kootenay, 2012; Regional District of Kootenay Boundary, 2011). Different First Nations have lived in and moved throughout the region for over 10,000 years (Columbia Basin Trust, 2011; Parks Canada, 2009). Presently, there are five First Nations listed within the region: ?Akisq'nuk, Shuswap, St. Mary's, Tobacco Plains, and Lower Kootenay (Aboriginal Affairs and Northern Development Canada, 2014). In addition to First Nations culture, European exploration and settlement brought a variety of people to the region. The Kootenays are known to some extent as an area of counter culture. For example, the region is home to Doukhobor people fleeing persecution in Russia, as well as home to draft dodgers fleeing conscription into the Vietnam War. Independence and self-sufficiency continue to be pillars of Kootenay culture.

Both the post-contact history and present day economy of the Kootenay region is closely tied to natural resources (Breen, 2012). Beginning in the 1800s European exploration was closely followed by settlement tied to prospecting and mining (Stevenson et al., 2011; Turnbull, 1988). Development of the forestry industry followed in the early 1900s (Stevenson et al., 2011). Following world war two the Bennett era in BC saw a boom in investment in rural BC, including the Kootenays, as Premier Bennett focused on developing the infrastructure required to expand natural resource industries in BC (Barman, 1996). In the 1960s the Columbia River Treaty and subsequent dams saw hydroelectricity rise in importance to the region, while changing the landscape. The recession of the 1980s, followed by rural restructuring, job loss, rural out migration, and so on all impacted the Kootenays along with BC as a whole. Many efforts were initiated in the 1990s to facilitate local level development, arguably the most important for the Kootenays being the establishment of the Columbia Basin Trust (CBT), an organization dedicated to supporting the social, environmental, and economic well-being of the area (Columbia Basin Trust, 2007). Currently the Kootenays continues to see efforts toward economic

[3] A regional district is a form of local government in BC.

development and diversification, including building on existing amenities. For example, due to the physical setting and environmental amenities, recreation has, and continues to be important.

2.1.3. Regional Comparison

Both case study regions are defined by pre-existing provincially established economic development regions. Table 1 illustrates a general comparison between the case study regions.

Table 1: Regional comparison

	Kootenay BC	Kittiwake NL
Size	57,786.6 km^2 6.2% of BC	14,000 km^2 3% of NL
Population (2011)	146,264 3% of BC Aging demographic	46,850 9% of NL Aging demographic, declining birth rate
Largest Centre	Cranbrook ~18,000	Gander ~11,000
Population Growth (2006-2011)	Positive (2.9) Slower growth than provincial average	Negative (-3.6) Greater decline than provincial average
Average Income (2011)	$30,637 Lower than provincial average	$25,000 Lower than provincial average
Unemployment Rate (2011)	7.3% Higher than provincial average	24.1% Higher than provincial average
Economic Drivers	70% Services (trade, health care and social assistance, accommodation and food) 30% Goods (construction; forestry, fishing, mining)	52% Services (health, education, sales & service, management, office and related) 40% Goods (primary/natural resource, construction & related, processing & manufacturing) 8% Other
Education Facilities	2 public colleges 9 registered private career institutions	3 private colleges 1 public college
Transportation / Access	Ground (major highway) Ferry (free) Public and private bus service 3 major airports Multiple municipal air fields	Ground (major highway) Ferry (pay) Gander International Airport Private bus service
Physical Landscape	Montane Cordillera (mountains, interior plains, inland rainforest) High biodiversity	Boreal shield (forested), exposed bedrock, lakes, rivers and forests Continental climate with a great biodiversity of mammals and birds
Watersheds (all or part)	Elk River, Kootenay River, Bull River, St. Mary's River, Columbia River, Kootenay Lake, Lower Arrow Lake, Slocan River, Kettle River, Upper Arrow Lake, Duncan Lake, Kicking Horse River	Unnamed River, Indian Arm Brook, Ten Mile Lake, Gander River, Ragged Harbour River, Deadman's Brook, Pound Cove Brook, Unnamed River, Indian Bay Brook, Traverse Brook, Middle Brook, Gambo Pond, Northwest Brook, Terra Nova River, Wings Brook, Southwest Brook, Northwest River

Sources: (BC Stats, 2012, 2013a, 2013b; Bell, 2002; Breen, 2012; Community Accounts, 2012; Department of Environment and Lands, 1992; Kittiwake Economic Development Corporation, 2011; Regional Workforce Table Kootenay, 2012; Skeard et al., 2013; Statistics Canada, 2012a, 2012b; Work BC, 2014)

The Kootenay region is larger in area, however each regional district is roughly the size of the Kittiwake. Both regions have small, low-density populations relative to the province, with an aging demographic. In terms of economic statistics (e.g., income and unemployment), both regions fall below their respective provincial averages. Both regions are largely service and natural resource dependent and are economically sensitive to the boom/bust resource cycle. While different in terms of physical geography (coastal versus inland mountains), both regions are rugged in terms of terrain and are physically isolated. Both regions experience challenges commonly found in rural areas (e.g., lack of economies of scale, limited financial and human resources etc.) (Vodden et al., 2015). As mentioned, the boundaries of both case study regions are economic in origin. The Kootenay Development Region has the same boundaries as the Economic Regions observed by Statistics Canada (BC Stats, 2011). The Kittiwake region is an economic development region determined by the province of NL (Skeard et al., 2013). These basic similarities provide the basis for our comparison between the two.

One difference to note between the two regions is the local government governance structure. While both regions have incorporated municipalities, the Kootenays also have regional districts, which act as local governments to unincorporated areas as well as serving as a forum for regional collaboration (Bish & Clemens, 2008). The Kittiwake has municipalities, Local Service Districts (LSD), and unincorporated communities. LSDs and unincorporated communities are comparable to BC's electoral areas (a subdivision of regional districts) and BC's community water systems (e.g., single service areas like Water User Communities) (Bish & Clemens, 2008).

In NL, it has been found that there is a culture of exploitation (Vodden, 2009), which could perhaps have an impact on water conservation. Due to the late start of municipal government in the region, public water systems were also late to come. It was found in a recent study that generally in rural NL, that conservation and awareness of water issues is not prevalent (Minnes & Vodden, 2014). This is seen in the preference for spring water in the Kittiwake region, rather than municipally supplied tap water (Holisko, Speed, Vodden, Sarkar, & Moss, 2014).

British Columbia is increasingly reputed as placing emphasis and value on the environment, although this has, and continues to, occasionally conflict with the importance of natural resource development within the province. While conservation is generally well accepted within the province, this can pose a challenge relative to water in those areas that are naturally water rich. Additionally, alternative or counter culture can pose a challenge surrounding the necessity for water treatment, something exemplified in the Kootenays.

2.2. Drinking Water Overview

Table 2 is an overview of the existing institutional and regulatory structure surrounding drinking water in both provinces, as well as an overview of the drinking water systems within both regions, followed by a comparison between the two.

Table 2: Drinking water comparison

	Kootenay Region	Kittiwake Region
Pertinent provincial authorities	• Interior Health Authority (IHA) • Ministry of Health • Ministry of Community, Sport, and Cultural Development – Local Government Division • Ministry of Environment *Includes: Forest Lands and Natural Resource Operations, Water Stewardship Division, Environmental Protection Division*	• Department of the Environment and Conservation (DOEC) • Department of Municipal and Intergovernmental Affairs • Department of Health and Community Services • Department of Service NL
Pertinent provincial legislation and regulation	• Water Act (Water Sustainability Act) • Public Health Act • Drinking Water Protection Act • Drinking Water Protection Regulation • Local Government Act • Community Charter	• Municipalities Act • Municipal Affairs Act • Environmental Protection Act • Water Resources Act • Guidelines for Canadian Drinking Water Quality
Local Governments	• Municipal • Regional District • Improvement Districts • Water User Communities *Includes: staff (planning, engineering, public works), elected officials, water operators, volunteers*	• Municipal • Local services districts (LSD) *Includes: staff (planning, engineering, public works), elected officials, water operators, volunteers*
Estimated Existing Drinking Water Systems	• 53 public systems (regional district or municipality) • # of other systems unknown[4]	• 43 public systems[5] • # of other systems unknown
Snapshot of advisories and notices[6] (September 2013)	7 public (3 boil water notices, 4 water quality advisories) 124 total (105 boil water notices, 19 water quality advisories)	15 public water supplies on Boil Water Advisory (BWA)

Sources: (British Columbia Ministry of Community Sport and Cultural Development, n.d.; British Columbia Ministry of Environment, n.d.-a, n.d.-b; British Columbia Ministry of Health, n.d.; Christensen, 2011; Drinking Water Leadership Council, 2007; Government of British Columbia, 2001, 2003, 2012, 2013; Government of Newfoundland and Labrador, 2014a; Health Protection Branch, 2013; Interior Health Authority, 2006, 2014a, 2014b, 2014c; Ministry of Health Planning & Ministry of Health Services, 2002; Newfoundland Department of Environment and Conservation, n.d.; The Living Water Policy Project, 2011)

[4] There are 1,800 known small water systems in the IHA region, of which the Kootenays is a part. However, it is recognized there are many additional unknown systems within the region (Norlin, 2014).

[5] This number was determined by cross checking the communities in the Gander-New-Wes-Valley region found here (http://www.ope.gov.nl.ca/rural/regional_councils/community_list.html) with the information on public drinking water supplies gathered on September 23, 2013 from: http://maps.gov.nl.ca/water/.

[6] A boil water notice is issued when a health risk is determined in the drinking water source. A water quality advisory is issued when there is a level of risk associated with consuming the drinking water, but the conditions do not warrant a boil water notice or do-not-use water notice. A "Do Not Use" notice is issued when there is an imminent risk that the drinking water will cause illness even if the water is boiled.

It is important to note that Table 2 is not a comprehensive list of every institution, piece of legislation, and regulation impacting drinking water, but rather focuses on what is most directly relevant to the management of drinking water. In addition those listed above there are others that directly and indirectly impact drinking water (e.g., provincial ministries of transportation).

Related specifically to drinking water there are similarities and differences between both the provinces and the case study regions. Federal jurisdiction is the same between the two provinces, but applicable more to fish, navigable waters, and international waters (Bakker & Cook, 2011). There is a federal water policy, but much of it has not been implemented (Bakker & Cook, 2011; Bakker, 2007). The Canadian Water Act calls for joint consultation between federal and provincial governments in matters relating to water (Department of Justice, 2012). However, despite common federal policies, given that drinking water is primarily a provincial responsibility in Canada it is no surprise that there are obvious differences in institutional structure as well as legislation and regulation (Bakker, 2007). For example, NL explicitly uses the Canadian Guidelines for Drinking Water Quality, while BC does not (Christensen, 2011). BC has both required (e.g., provincial Drinking Water Protection Regulation) and discretionary (e.g., requirements set by the regional health authority and drinking water officers) standards that do not explicitly refer to the Canadian Guidelines, but can overlap and in part be consistent with them (British Columbia Ministry of Health, 2012; Urban Systems Ltd., 2009). In BC, water operators certified by the Environmental Officer Certification Program (EOCP) are required for large water systems (500+ individuals) and may also be required for small systems, while in NL certified water operators are required for all public drinking water systems under their Permit to Operate, but it has been found that this is not often enforced (Bakker, 2007; Christensen, 2011; Minnes & Vodden, 2014).

There are databases in both provinces for reports and boil water advisories. In BC each regional health authority provides listing of water advisories on their website. The Kootenays are included in the Interior Health Authority (IHA) region. Environmental reporting is done separately, through different provincial and federal ministries. In NL boil water advisories as well as other water related reporting, such as drinking water quality reports and reports related to other parameters such as disinfectant by-products can be found on the province-wide Water Resources Portal.

There are also differences between the provinces as to the regulations surrounding surface versus ground water, as well as treatment of water systems versus individual users. The level of provincial involvement on the ground differs between the two provinces. The NL provincial government can be seen as being more involved, while in BC the Province delegates authority to the regional health authorities. Additionally, the presence of the regional districts in BC makes for more clear-cut, independent regions. In BC there are no binding standards related to design, construction, materials, treatment methods, or additives, while in NL there are guidelines issued related to design, construction, materials, treatment methods and additives - which may be prescribed in individual approvals (Christensen, 2011). In terms of monitoring drinking water, NL regulations stipulate monitoring for e-coli/total coliforms, 35 inorganic parameters, and 2 disinfection by-products, however monitoring parameters may be added or changed due to site-specific circumstances (Government of Newfoundland and Labrador, 2009).

In BC drinking water regulation stipulates 3 bacterial indicators, with additions at the discretion of the drinking water officer (Bakker, 2007; Government of British Columbia, 2003). Permits are issued by drinking water officers within the regional health authorities with specific terms and conditions (Health Protection Branch, 2013; Interior Health Authority, 2006). In the case of the Kootenays, the IHA is responsible for most required operating and construction permits, as well as various programs and plans, both optional and required in varying states of optional, encouraged, and required (Health Protection Branch, 2012; The Living Water Policy Project, 2011). For example, IHA notes nine typical conditions for an operating permit: i) provide a source protection plan for each water source, ii) provide a certified operator, iii) operate according to your water quality sampling program, iv) operate according to your cross connection control program, v) provide a turbidity monitoring program, vi) provide continuous on-line monitoring of disinfection process, vii) provide long term plans for source, treatment, and distribution system that includes the '43210' objectives[7], viii) review and update emergency response plan annually, ix) provide monthly reports and annual summary (Interior Health Authority, 2006). It is important to note that each of the aforementioned conditions are not always required, as there are exceptions. The provincial government also provides various voluntary tools and programs meant to help water operators (e.g., Water System Assessment User's Guide (Health Protection Branch, 2012)).

In NL each public water system is given a Permit to Operate. The Permit to Operate Public drinking water systems in NL are regulated by the Department of the Environment and Conservation's (DOEC) Permits to Operate for Water Distribution Systems, Water Treatment Plants, Sewage Collection Systems and Sewage Treatment Plants which are required under Section 38 of the *Water Resources Act* (Government of Newfoundland and Labrador, 2014b). These permits relate to various aspects of water management: source protection; treatment system; water quality and quantity monitoring; waste and quantity monitoring; waste and process wastewater; distribution system; operation manuals; logbooks; contingency, emergency and long term planning; security and safety; consumer relations; reporting, notification and corrective actions; and operator certification and training (Government of Newfoundland and Labrador, 2014a). In NL, The Permit to Operate Drinking Water System Inspection Program was initiated in 2012 and includes up to 85 questions pertaining to the required permits (Government of Newfoundland and Labrador, 2014a). However, according to the 2014 *Drinking Water Safety in Newfoundland and Labrador: Annual Report* only six communities were inspected in the 2013-2014 fiscal year out of 320 active permits (Government of Newfoundland and Labrador, 2015), also the previous year's report had noted that only seven community's systems with permits had been inspected to date (Government of Newfoundland and Labrador, 2014a). Therefore, though some communities do have more than one active permit (if they have more than one system) it is clear the majority of systems are yet to be inspected. However, the DOEC's Water Resources Management Division aims to inspect all public drinking water systems serving a population of 500 people or more within the next five years (Government of Newfoundland and Labrador, 2014a).

[7] The '43210' objectives include: 4 - log inactivation of viruses, 3 - log removal or inactivation of Giardia Lamblia and Cryptosporidium, 2 - two treatment processes for all surface drinking water systems, 1 - less than 1 NTU of turbidity and a target of 0.1 NTU, 0 total and fecal coliforms and E. Coli.

Both NL and BC encourage source water protection, however in NL 85% of surface water sources have been protected and 30% of ground sources versus 0% in BC (although some community water sources - e.g., Vancouver - are protected by default given sole ownership of land) (Christensen, 2011). Other differences include that water rights can be transferred in NL but not in BC, and BC has first come first served access to water, versus domestic use being given priority over other uses in NL (Bakker, 2007), although it should also be noted that BC's overarching Water Act has recently undergone a revision and update and that additional changes will continue to occur some of which may impact drinking water (Government of British Columbia, 2010). Overall in BC very little is specifically mandated through regulation; however requirements are instead put in place as conditions on permits or funding.

2.3. Common Drinking Water Challenges

Successes in each of the two regions and experiences to date with regional approaches to drinking water management were also examined throughout the research and are discussed further below (see Section 4.6). In terms of similar challenges between the regions, infrastructure challenges are common and both regions house a breadth of infrastructure types, size, technology, and age. Water infrastructure challenges have been recognized in BC since the 1990s, particularly surrounding inadequate treatment (Ministry of Health Planning & Ministry of Health Services, 2002). Challenges with NL infrastructure have also been noted in recent research studies, notably ageing infrastructure in need of replacement (Cooper, 2013; Minnes & Vodden, 2014). Funding from the Gas Tax Agreement[8] is noted as being of primary importance to water infrastructure in both provinces, although there are other provincially specific examples of past and present funding programs as well (Breen, 2013; Minnes & Vodden, 2014).

Detailed asset management is not a requirement in BC, although an annual inventory of owned assets is required and asset management is often a qualifier attached to funding (Office of the Provincial Health Officer, 2011). In NL asset management is encouraged by the provincial government but not often enforced (Minnes & Vodden, 2014). In both regions water system revenue sources are generally fixed rates for residential and commercial users, which are set by the local governing bodies, although in the Kootenays there, are some examples of residential water metering. While there are no examples of residential metering in the Kittiwake region there have been water metering pilot programs in the larger centres outside the region (Murphy, Olson, & Ramirez, 2010). For both regions, as with the rest of the country, starting in 2008, municipalities across Canada were required by the Public Sector Accounting Board to account for their Tangible Capital Assets in annual financial reporting (e.g., for water infrastructure this includes: dams and diversion structures, pipelines, reservoirs, tanks, wells, pumps, mechanical and electrical equipment, buildings, electric power and emergency equipment) (Canadian Institute of Chartered Accountants, 2007; Minnes & Vodden, 2014).

Regardless of any aforementioned differences between the two regions, many similar challenges are experienced in these two rural regions. A review of documents and existing research within the two case study regions yielded a list of common challenges (see Table 3).

[8] The Gas Tax Agreement was released in conjunction with the New Building Canada Plan, to, "*provide predictable, long-term, stable funding for Canadian municipalities to help them build and revitalize their local public infrastructure while creating jobs and long term prosperity*" (Infrastructure Canada, 2014, p. 1).

Table 3: Common drinking water challenges

Challenge	Details
Infrastructure (treatment and distribution)	• Age • Condition/degradation • Variability • Materials used • Treatment technology • Cost • Public acceptability • Engineering
Capacity (all levels)	• Human (qualified staff, appropriate skills, compensation) • Financial (lack of money, funding access and continuity, investment)
Planning and management	• Lack of planning • Lack of asset management (data, adequate rates) • Complexity (multiple plans, levels of planning) • Time frame (long term vs. short term) • Implementation of plans • Big picture/systems understanding • Source water protection (lack of/not implemented, conflict with other users)
Place	• Physical setting (size, number, location of systems) • Historical resource use/practices • Change in community (existing system not meeting needs) • Lack of consideration of place in policy, regulation, standards, programs, etc. (consistency and uniformity vs. flexibility and uniqueness) • Rural access to laboratory services
Water quality	• Health • Perception and understanding of risk • Safe drinking water • Boil water advisories • Disinfectant by-products • Drinking water aesthetics • Perception and understanding of treatment methods (e.g., chlorine) • Availability of alternate sources (e.g., roadside springs)
Standards and regulations	• Complexity (perceptions and understanding) • Compliance with changing legislation and policies • Risk adverse regulation defining ‘adequate’ treatment • Liability (at all levels) • Evidence (sources of knowledge) • Lack of/issues with monitoring and reporting • Implementation and enforcement
Governance	• Downloading of responsibilities • Multiple governance systems (complexity, different types of ownership, levels of management, direct and indirect requirements) • Mismanagement (intention vs. execution, failures) • Perceptions and understanding of systems, responsibility • Management area boundaries (conflicting jurisdictions, conflict between administrative, political, functional, ecological)

Challenge	Details
	• Consultation vs. collaboration/co-construction • Accountability, support, understanding
Lack of integration	• Separation of water quality and quantity, human and environmental • Competing uses • Political separation • Conflicting mandates (within and between governments) • Lack of collaboration (internal, external, government, non-government) • Lack of knowledge sharing • Awareness of non-governmental actors
Lack of sustainability / Resilience	• Inconsistent application • Public understanding • Lack of source water protection • Lack of conservation • Lack of consideration of extreme weather events and climate change • Water as an environmental concern • Balance / holism

Sources: (Breen & Minnes, 2013; Breen, 2013; Minnes & Vodden, 2014; Return on Insight, 2012, 2013; Vodden et al., 2015)

3. Methods

3.1. Overview

We used a mixed method case study approach. Using two case study regions was intended to allow for the aggregation, synthesis, and comparison of existing data, which would then allow for the identification, development, and testing of a proposed regional approach designed to address the challenges identified (Eisenhardt, 1989; Yin, 2003). The case study approach allows for comparison of real time, on the ground situations, using multiple sources of evidence, including: documents, focus groups, interviews, and researcher observations (Yin, 2003).

The analytical stages and timeline of this project are detailed in Table 4. A discussion of data collection and analysis can be found in Section 3.2 and an explanation of limitations and methodological changes can be found in Section 3.3.

Table 4: Analytical stages and methods

Stage	Date	Task	Input	Method	Result
1	Sept. 2013 – Feb. 2014	Compile secondary case study data	• Review of published reports from existing projects related to drinking water governance, policy, programs, development, and other relevant place-based characteristics • No additional interviews required	Comparative analysis: compilation	Table 1 Table 2 Section 2.1.1 Section 2.1.2 Section 2.2
2	Draft: Sept. 2013 Final: July 2014	Comparison of known data	• Stage 1 data	Comparative analysis	Table 1 Table 2 Section 2.1.3

Stage	Date	Task	Input	Method	Result
					Section 2.2 Section 2.3
3	Oct. – Dec. 2013 Additions: July 2014	Identification of existing approaches	• Stage 1 and stage 2 data • Literature review • Participant observation and focus group additions	Compilation	Section 2.3 Section 4.6 Section 6.1 Appendix 1
4	Feb. – April 2014	Proposed regional approach development	• Literature review • Challenges currently experienced	Synthesis of literature into common indicator list. Use of indicators to generate proposed regional approach	Section 2.3 Sections 4 Section 5
5	March – May 2014	Field work March - May 2014	• BC and NL case study visits	Host trade show booth (BC/NL), BC interviews, NL focus group, written feedback from participants	Section 6 Appendix 1
6	May – July 2014	Data analysis	• Stage 5 data	Coding of 18 associated documents (e.g., notes, transcripts, supplemental interviews[9]) using NVivo	Section 6 Section 7 Section 8
7	Oct. 2013 May – April 2015	Report compilation and knowledge mobilization	• Stages 1 - 6	Presentations (2013-2015) Web page Yaffle database Peer reviewed journal article	Section 3.4

3.2. Data Collection and Analysis

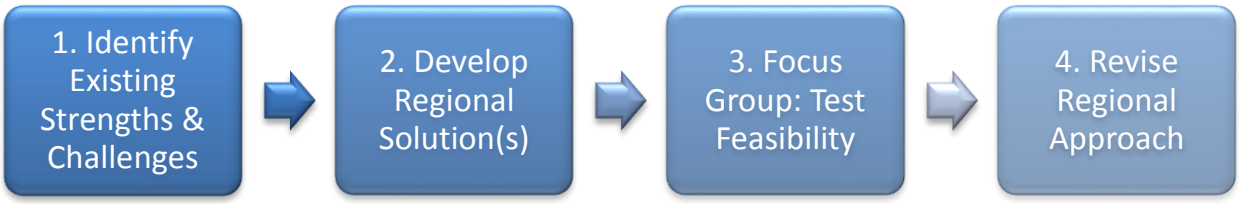
3.2.1. Original Plan

An initial overview and comparison of the two case study regions using secondary data sources allowed for the identification of strengths, successes, and challenges with the current drinking water management system, many of which are specific to rural communities and small water systems (see Figure 2, box 1), and to begin to assess evidence of new regionalism within these water systems. Secondary sources included published reports from existing projects related to drinking water within the case study regions. These secondary sources also included a variety of academic literature, as well as grey literature related to the topics, case study provinces and regions. For example, community and regional plans were reviewed, as were local and provincial government websites.

[9] Relevant Kittiwake interviews from the Exploring Solutions for Sustainable Rural Drinking Water Systems

A literature review was completed and served two purposes. First, it allowed us to identify a range of solutions from multiple sources and locations with the potential to address the challenges identified within the regions. Secondly, by linking bodies of literature together we were able to identify key indicators of a new regionalist approach to managing drinking water. This proved to be a larger task than originally envisioned, as the indicators of new regionalism that were more generally developed for the *Canadian Regional Development* project were not easily applied to drinking water management. Therefore in order to develop a new regionalist approach to drinking water management, an appropriate set of indicators had to be developed. These indicators, combined with our regional knowledge and secondary literature review, were used to create an ideal descriptor, which both addresses gaps and potentials for a new regionalist approach (see Figure 2, box 2). The literature review included: new regionalism (an emergent regional development theory); recognized themes of new regionalism (place, knowledge and innovation, integration, rural-urban relationships, and governance); watershed management and best practices in water resources management; resilience; and sustainable infrastructure.

Figure 2: Research Process



Plans for primary data collection included attending a major event per case study region, hosting a trade show information booth as well as a focus group in order to discuss the feasibility of the proposed regional approach (see Figure 2, box 3). The focus group method was initially chosen due to its ability to gather in-depth qualitative data from specific groups of individuals who have experienced a similar situation (Stewart, Shamdasani, & Rook, 2007). As the target group was local government representatives it was determined that focus groups would be held in conjunction with existing local government events in the case study regions – the Association of Kootenay Boundary Local Government (AKBLG) Annual General Meeting in Creston, BC and Municipalities Newfoundland and Labrador's (MNL) 2014 Central Regional Workshop.

Potential participants were contacted via email prior to the conferences and i) invited to participate in a focus group and ii) invited to attend our trade show booth. In preparation for the focus group an interview guide was prepared using a conventional methodological framework, examining different elements of the proposed regional approach using specific targeted questions (Krueger, 1998b; Morgan & Scannell, 1998; Stewart et al., 2007). Focus groups were to be followed by a revision of the proposed regional approach (see Figure 2, box 4). Trade show booths were intended to allow participants unable to attend the focus group sessions to review our material and provide feedback.

3.2.2. Revised Plan

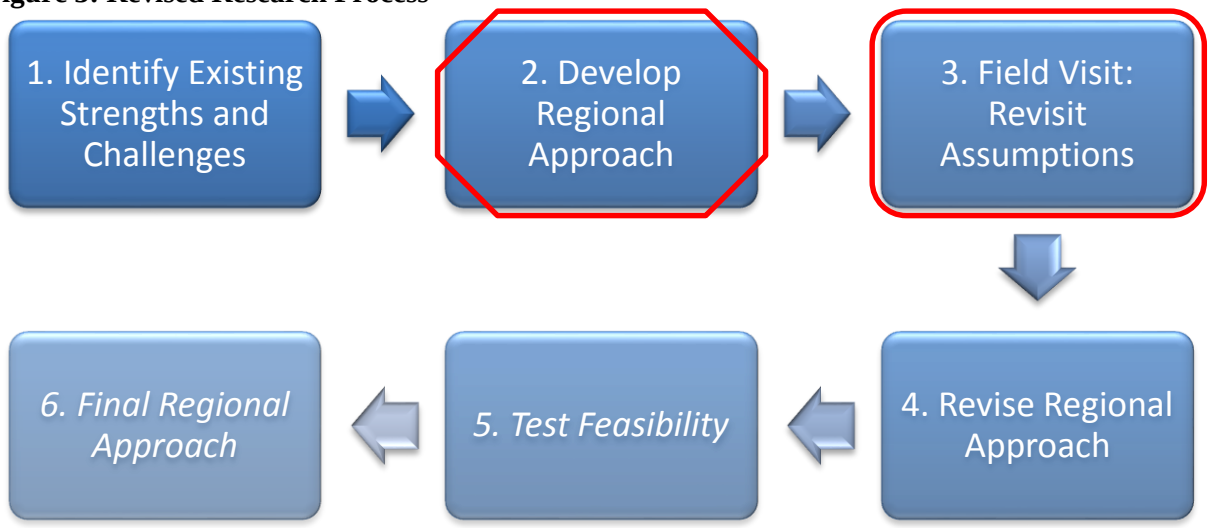
Various unforeseen circumstances forced the modification of the original research plan, particularly with respect to the presentation and discussion surrounding the approach and indicator development (as discussed above) and primary data collection. The date of MNL's Central Regional Workshop was moved from its original schedule of March 2014 to January 2014, which did not allow us enough time to prepare for the event, nor enough notice for

participants. Instead a focus group was conducted and a trade booth set up in conjunction with the 2014 province-wide MNL Symposium in Gander, NL (within the Kittiwake case study region). This change in venue meant that some participants in the focus group were from outside of the region, although notes were taken to indicate participants from the region and particular efforts made to recruit municipal representatives from the region at this event. NL interviews with town staff, residents, councillors, and mayors in the region, as well as some provincial officials, were obtained from the affiliated *Exploring Solutions for Sustainable Rural Drinking Water Systems* project and used to help provide additional context.

The Kootenay focus group was cancelled as a result of a combination of a lack of interest/lack of appeal and conference participant scheduling conflicts with conference participants. As an alternate data collection strategy, data were gathered at the trade show booth, via written feedback, and via supplemental interviews with interested local government representatives. The interview guide was based on the focus group guide, was supplemented with place specific questions, and followed best practices (Berg, 2009; Morse & Richards, 2002; Spradley, 1979).

In addition to the alteration in primary data collection methods, initial review of the data collected both through primary and secondary sources revealed a substantial gap between the reality in the case study regions and the proposed literature-based regional approach. This was despite the significant amount of time spent on not only the creation of the proposed regional approach which involved a substantial review of the literature and organization of common themes (see Figure 3, box 2), but as well on the accompanying documents to the proposed regional approach (see Appendix 2). As a result, instead of proceeding with feasibility testing we used the field visits to revisit our initial assumptions (see Figure 3, box 3). The resulting data analysis afforded suggested revisions to the proposed regional approach (see Figure 3, box 4), providing a foundation for future feasibility testing (see Figure 3, boxes 5 and 6).

Figure 3: Revised Research Process



3.2.3. Data Analysis

Interviews and focus groups were recorded and transcribed, and researcher field notes were typed and saved electronically (Stewart et al., 2007). Transcripts from BC interviews (2),

supplemental interviews conducted in NL with provincial and local actors (11), the completed focus group (1), researcher observations (2), and written feedback from trade show participants (2) were coded by researchers for common themes using NVivo qualitative research software, classifying major topics and issues, and identifying patterns (Krueger, 1998a; Stewart et al., 2007). Interviewees and focus group participants included elected local government officials, as well as provincial government representatives, and drinking water managers and operators. The following process was used for coding:

1. Both researchers review transcripts separately:
    - List general themes
    - Highlight enabling forces or barriers to regional approaches
    - Highlight specific feedback for improvement/revision of approach
2. Initial findings were written, shared and cross referenced for commonalities through a live discussion
3. A final list of themes were developed based on #2
4. Documents were re-coded using the final code list

Coding of primary sources included both direct and inferred comments. The themes resulting from the primary data analysis were used for content analysis of secondary sources found within the literature review.

3.3. Limitations and Omissions

As noted above we experienced some challenges with the initial research design. Decisions were made in the field to change from a focus group to interviews and participant observation during the BC field visit due to participants' schedules. As a result some intended participants were unable to be included.

Further, upon discovery of the gap between our proposed approach and the situation on the ground we were forced to revisit our initial assumptions, removing the potential of a detailed discussion of feasibility of the approach, in favour of a general discussion of our ideas, potential gaps, and ways forward. It could be further speculated that both NL and BC responses may have differed if additional water experts in the region were consulted, including regional officials working for provincial agencies. Had resources allowed for greater consultation of higher levels of government with greater technical knowledge and background to grasp the concepts of the approach, this could have resulted in improved feedback on the approach. The small number of interviews, combined with the differing questions means that while the data is useful to revise the proposed regional approach, the data is not robust enough as a determination of feasibility of a regional approach, although our results provide a platform for future work, including PhD research underway by Breen and Minnes.

Additionally, a formal SWOT (Strengths-Weaknesses-Opportunities-Threats) analysis was not completed, although the weaknesses and threats are included in the identification of existing challenges (see Section 2.3), and strengths (see Section 4.6 and Appendix 1). It was felt that given similar existing analysis (e.g., the NL Driver-Pressure-State-Impact-Response analysis (Ramalho, Will, Macleod, & van Zyll de Jong, 2014), as well as a recent assessment by IHA in BC (Norlin, 2014)) this would be a duplication of effort without additional gain. This previous work helped inform the analysis of current drinking water systems and development of the proposed regional approach.

3.4. Knowledge Mobilization

Various knowledge mobilization efforts were used throughout the project, including for data collection and the mobilizing research findings. These efforts include:

- Project website: http://nlwater.ruralresilience.ca/?page_id=289
- Conferences, Presentations, and Workshops:
    - Canadian Association of Geographers Annual Meeting, St. John's, NL: August 13, 2013
    - Canadian Rural Revitalization Foundation's Annual Conference, Thunder Bay, ON: October 26, 2013
    - Booth at the Association of Kootenay Boundary Local Government (AKBLG) Annual General Meeting in Creston, BC: April 9-11, 2014
    - Booth at the 2013 Municipalities Newfoundland and Labrador (MNL) Symposium, Gander, NL: May 1-2, 2014
    - Canadian Rural Revitalization Foundation's Annual Conference, Prince George, BC: September 27, 2014
    - Municipalities Newfoundland and Labrador 2015 regional workshops (Western, Northern, Avalon, and Central): February-April 2015
- Written outputs:
    - Literature review, 2015. Available on project website
    - Final report, 2015. Available on project website
    - Submitted journal article titled, "Pragmatism versus potential: new regionalism and rural drinking water management": December 2014.
    - Research contributed to a set of policy briefs for the *Exploring Solutions for Sustainable Drinking Water Systems* project

4. Literature Review

A literature review was conducted for this project, covering eight key topics, which were building blocks to the proposed regional approach (see Appendix 2). These topics are briefly reviewed below. The complete literature review will be made available on the project website (http://nlwater.ruralresilience.ca/?page_id=17). What is covered below is i) the topic defined and ii) how it relates to drinking water management.

4.1. New Regionalism

The regional scale re-emerged in terms of popularity in the 1990s. 'New regionalism' is described as a reconceptualization of regional development. It emerged in reaction to the restructuring and downloading of responsibility to local governments that began in the 1980s, as well as a result of the rise of proactive local action initiated by the changing political and economic contexts of the 1990s; the result of which is a new organizational scheme combining top down and bottom up approaches (Buzdugan, 2006; Harrison, 2006; Hettne, Inotai, & Sunkel, 2000; Hettne & Inotai, 1994; Hettne, 2005; Lovering, 1999; Markey, 2011a; Perrin, 2012; Scott, 2007; Wheeler, 2002). This broad approach to development includes various schools of thought, all focused on the regional scale (Hettne et al., 2000; Hettne, 2005; Jonas, 2011; Kraus, 2012; Ortiz-Guerrero, 2013; Rast, 2006; Savitch & Vogel, 2000). What makes new regionalism 'new' is often described in contrast to past, or 'old', approaches to regional development (Buzdugan,

2006; Markey, Halseth, & Manson, 2012), however it is important to also consider that new regionalism is taking place in a fundamentally different and changing world (Ethier, 2001; Savitch & Vogel, 2000). Characteristics of new regionalism include a focus on competitive advantage, recognition of interdependencies, co-construction, and flexibility. The *Canadian Regional Development* project identifies the following core themes in relation to new regionalism: governance; innovation and learning; integration; and place (Vodden et al., 2015).

New regionalism provides the basis for our proposed regional approach: applying a development approach to drinking water management. This is not unique, as previous projects have applied new regionalism to different elements of water (e.g., Peterson et al., 2007, 2010). An overview of how new regionalism relates to drinking water management is shown in Table 5, and further detail on each of the five core new regionalism themes and their links to drinking water is provided in the sections that follow.

Table 5: New regionalism and drinking water management

New Regionalism Theme	Link to Drinking Water
Governance	Ability to support collective action and decision-making in multi-level and multi-sector networks is applicable to complex and multi-level governance situations as in Canadian drinking water governance and management.
Integration	Affords consideration and balance between ecosystem relationships, human activities (social and economic), values and governance actors at multiple scales. Facilitates sustainability and resilience.
Place-based	Ensures consideration of place and the associated biophysical, social, cultural and economic factors (e.g., within the watershed).
Innovation and knowledge flows	Includes mobilizing knowledge through exchange, promoting water networks, and a focus on long term evaluations of new governance structures and legislation.
Rural-urban relationships	Identifies and builds on interdependencies. While the focus of regional development policy is often on urban areas, urban centres require rural resources – including water.

Source: (Ferreyra, de Loë, & Kreutzwiser, 2008; Grigg, 2012; Jonas, 2011; Pahl-Wostl, Gupta, & Petry, 2008; Peterson, Mcalpine, Ward, & Rayner, 2007; Peterson, Walker, Maher, Hoverman, & Eberhard, 2010; Reimer, 2009; Vodden et al., 2015)

4.2. New Regionalism Themes

4.2.1. Governance

Governance is defined both broadly and specifically, conceptualized in different ways. For example, governance is a process of coordination, management, and steering a society or group (Gregory, Johnston, Pratt, Watts, & Whatmore, 2009). Generally this can be any kind of coordination between organizations, groups, individuals, and otherwise (Gregory et al., 2009). More commonly governance involves self-organization and coordination between organizations and networks as opposed to government, which coordinates through hierarchy (Bogason & Zølner, 2007; Gregory et al., 2009). Government and governance are not mutually exclusive. For example, collaborative governance can include state and government actors, multilateral institutions, NGOs, business, scientists, Aboriginal groups and the public (Bakker & Cook, 2011; Bulkeley, 2005).

The literature suggests strict top down, hierarchical government structures are ill equipped for dealing with complex issues like water management (Bulkeley, 2005). It has been found that regional governance can enhance regional capacity and support more liveable and sustainable communities (Bellamy & Brown, 2009). Multi-level governance arrangements that are inclusive and less hierarchical as well as both adaptable and flexible are generally seen as best practice (Bellamy & Brown, 2009; Bulkeley, 2005; Pahl-Wostl et al., 2008; Savitch & Vogel, 2000). Often challenges arise in governance structures, especially when actors, policies and mandates are uncoordinated or conflicting (Bakker & Cook, 2011). Therefore, governance structures must be cooperative, collaborative and include equitable information sharing, problem solving, and communication through multiple, overlapping webs of agreements (Pahl-Wostl et al., 2008; Savitch & Vogel, 2000; Norman & Bakker, 2009).

Networks, a characteristic of governance, as well as collaboration, inherently involve *knowledge sharing and mobilization*, ensuring information and knowledge flow between actors. Recognizing the general public as a key actor, for true governance to be achieved this must include public education and capacity building that supports meaningful public participation (Ferreyra et al., 2008; Hirokawa, 2011; Viessman & Schilling, 1986). Governance, particularly in terms of participation, includes a joint and inclusive process for determining what ends and values should be chosen and how those ends and values should be pursued (Castro, 2007). One of the benefits of governance stems from its emphasis on participation, which can create understanding as well as help address issues of risk and uncertainty by involving more perspectives, in a more holistic decision making and planning process (Castro, 2007; Viessman & Schilling, 1986; Vikolainen, Lulofs, & Bressers, 2013; Vinke-de Kruiff & Ozerol, 2013)

The link between collaborative, multi-level governance and water is illustrated throughout the literature. Water across the world has been noted as being a crisis of governance, rather than of quantity (Castro, 2007; OECD Publishing, 2011). Currently water governance in Canada is fragmented between the levels of government (Bakker & Cook, 2011). An example of this is that there are at least 20 federal departments and agencies with water-related responsibilities, eight of which are considered to have strong water-related mandates (Bakker & Cook, 2011). A multi-level, multi-agency approach to water governance is noted as being needed given the multi-purpose nature of the resource itself (Bakker, 2007). Bakker found that a non-integrated approach to governance fails to acknowledge the interrelationships between water, people, and the environment (2007). When it comes to water governance, a mismatch between hydrological and jurisdictional boundaries can create power issues and conflict (Vinke-de Kruiff & Ozerol, 2013). Rescaling governance from an administrative or political boundary to a watershed boundary can be difficult, particularly as giving power to the local level without accompanying capacity can have opposing effects to what is intended (Norman & Bakker, 2009). Rescaling governance changes power dynamics and can create winners and losers (Vinke-de Kruiff & Ozerol, 2013). Therefore, when creating governance regimes for drinking water management capacity, context and historical backgrounds have to be considered (de Loë & Murray, 2013). Furthermore, all actors involved must believe that they have the power and capacity to design and implement solutions at the local (regional) level (de Loë & Kreutzwiser, 2007). Employing governance within a new regionalist approach when managing water does not come without complications. However, when the proper structures and supporting capital is provided, governance can provide improved water management practices (Peterson et al., 2010).

4.2.2. Innovation

Innovation is a complex and diverse concept which can be broadly defined as the introduction or adoption of a phenomenon, concept, object, practice or system, resulting in new or altered product(s) and/or process(es) (Berry & Berry, 2007; Bunnell & Coe, 2001; Gregory et al., 2009; Lavoie, 2007; Vodden, Carter, & White, 2013). Innovation is a core theme of new regionalism, with new regionalism noted as affording and encouraging local innovation (Allen & Cochrane, 2007; Amdam, 2002; Bunnell & Coe, 2001; Vodden et al., 2013). From a regional perspective, innovation systems involve a set of relationships in an area which generate collective learning processes and lead to the rapid diffusion of knowledge (Vodden et al., 2013).

Contributing to innovation are learning and knowledge mobilization, including sharing information within and across organizations about new ways of organizing, new strategies for addressing challenges, and so on (Allen & Cochrane, 2007; Vodden et al., 2013). Knowledge sources vary, as do the approaches to and patterns of dissemination (Bakker & Cook, 2011; Berry & Berry, 2007; Bunnell & Coe, 2001; Gregory et al., 2009; Maxwell, 2008). Innovation is noted as being a social process, where relationships and linkages are critical, but requires appropriate support (Ridley, Yee-Cheong, & Juma, 2006; Shearmur, 2010).

Innovation literature often focuses on potential benefits for development, particularly economic development. However, innovation is also relevant to drinking water management. For example, innovation can help alleviate potential lock in and path dependence (Vodden et al., 2013), something relevant for management of drinking water as well as overall development of the community and region. More indirectly, innovation, learning, and knowledge mobilization can contribute to creating or enhancing competitive advantage and economic development (Cooke & Leydesdorff, 2006; Council on Competitiveness, 2010; Shearmur, 2010; Vodden et al., 2013), which can in turn contribute to more sustainable drinking water systems (by generating tax revenues to support water operations and infrastructure for example). Innovation and learning are also noted as contributing to self-reliance, enabling bottom-up mobilization (Amdam, 2002; Glover, 2012), also applicable to drinking water management, as bottom level actors are able to make more informed and effective decisions with increased knowledge. Water scholars also recognize the need for education and knowledge building related to water (Bakker, 2007; Maxwell, 2008). Innovation can facilitate potential solutions to various drinking water issues, be those technological or otherwise (e.g., planning, economic instruments) (Bakker & Cook, 2011; Bruneau, Dupont, & Renzetti, 2013). It should be noted, however, that small or rural systems can face difficulties if required technological innovations are beyond their capabilities (Maxwell, 2008). Stress on water supplies has triggered a specific need for innovation, including making utilities more efficient, as well as addressing demand management (Bakker, 2007; Maxwell, 2008). In terms of water infrastructure, innovation can help improve quality and decrease cost through improvements to technology, highlighting the need to track and understand innovation (Maxwell, 2008). Successful innovation exploits change and identifies new ideas needed for adaptation, which is critical as adaptive learning is required for building resilience (Bruneau et al., 2013; Glover, 2012; Vodden et al., 2013). Finally, innovation and knowledge building are noted as being critical to the integrated approach to water governance (Bakker & Cook, 2011; Bakker, 2007; Maxwell, 2008; Muys, 2000).

4.2.3. Integration

The concept of integration in relation to regional development planning has been used and contested throughout development, planning, community development, regional analysis and other related fields (Douglas, 2011). Generally, integration refers to the linkage of social, natural/ecological, health, political and other systems in planning and decision making (Bellamy & Brown, 2009; Berkes & Ross, 2013; Hudson, 2009; Lubell, Schneider, Scholz, & Mete, 2002). Integration is a key component of new regionalism, highlighting the need for interlocking policy frameworks that include different levels of government (Wheeler, 2002). From a sustainability perspective, integration balances environmental, economic, and social arenas and reflects a holistic approach dealing with issues of fragmented and uncoordinated decision making (Gibbs & Jonas, 2001). Integration can be linked to governance through the need to involve and coordinate multiple actors engaged in complicated policy decisions (Bogason & Zølner, 2007). In addition, integration of formerly separated topics and bodies of literature (e.g., social and ecological) can be found in the resilience literature, where it is suggested that integration is needed to build resilience (Berkes & Ross, 2013; Hudson, 2009).

Water is linked with integration in various ways within the literature. In practice the need for an integrated approach to water is acknowledged, as water is a multipurpose resource, involving interdependencies across topics such as Integrated Water Resource Management (IWRM), drinking water treatment, distribution and operations, environmental sustainability, and public policy (Bakker, 2007; Boutkan & Stikker, 2004; Castro, 2007; Cohen, 2012; Ferreyra et al., 2008; Maxwell, 2008; OECD, 2011; Vinke-de Kruiff & Ozerol, 2013). Without integration, multiple uncoordinated actors can result in fragmented or conflicting water policies (Bakker & Cook, 2011). Source water protection is noted as providing an opportunity to integrate health and ecology, engaging a variety of stakeholders (Christensen, 2011; Ferreyra et al., 2008). Examples include IWRM or the multi-barrier approach (de Loë & Kreutzwiser, 2005; Vinke-de Kruiff & Ozerol, 2013). Both of these common approaches to water and specifically drinking water management, recognize that water is not a separate silo, but something to be viewed from multiple perspectives (de Boer & Bressers, 2011; Mitchell, 2005).

Though integration is seen as best practice in sustainable water management (Boutkan & Stikker, 2004) it is not without its difficulties (Cohen, 2012). One example is that integrated plans, using water as an example, don't always meet the needs of all stakeholders, as an attempt to balance differing interests often results in compromises (Boutkan & Stikker, 2004). Some literature indicates that specific to water the success of integration has been hindered due to the complexity of the system (Castro, 2007; Cohen, 2012; Fish, Ioris, & Watson, 2010). For successful integrated watershed management to occur at the local level, for example, there needs to be integration between watershed planning and land use planning, which can be challenging in practice (Hirokawa, 2011; Ivey et al., 2006; Mitchell, 2005). Further, integration cannot be achieved through a simple additive policy process. It has been suggested that in the past integration in sustainable water management has not been fully operationalized (Fish et al., 2010). Overall, it seems that integration relates directly to a holistic approach to regional planning and more specifically water planning and management, however the question of what it is to be integrated and how that can be achieved remains largely unanswered (Cohen, 2012).

4.2.4. Place

Place, and in particular place-based development, is considered to be an important component of new regionalism (Wheeler, 2002). Markey (2011b, p.2) describes place-based development, *"...in contrast to conventional sectoral, programmatic or issue-defined perspectives, is a holistic and targeted intervention that seeks to reveal, utilize and enhance the unique natural, physical, and/or human capacity endowments present within a particular location for the development of the in-situ community and/or its biophysical environment*". Following this approach, it is noted that place-based communities have a greater capacity for resilience (Berkes & Ross, 2013).

Place can be simply thought of as context, the many combined and interconnected elements of place and their associated meanings that are specific to the local area/region/context, including external connections, linkages and relations (Vodden, Baldacchino, & Gibson, In Press). Place goes beyond physical location to include other characteristics such as culture, identity, amenities, and many other elements that influence quality of life as well as the economy (Gregory et al., 2009). New regionalist authors suggest that place can and should be factored into policy, collaboration, and management (External Advisory Committee on Cities and Communities, 2006; Gibbs, Jonas, & While, 2002; Rathwell & Peterson, 2012). Also from a development perspective, strategies that are tailored to specific areas can best deal with growth management, environmental protection, and quality of life (Wheeler, 2002). Understanding how place shapes policy and action is important, particularly for local levels of government (External Advisory Committee on Cities and Communities, 2006).

In terms of the management of water resources and drinking water systems, water is recognized as being a local issue and there is no "one size fits all" solution to water-related issues (OECD, 2011). Consideration of local and regional needs as well as local knowledge and experience is reported as a best practice for water and watershed management (Boutkan & Stikker, 2004; Hirokawa, 2011). For example, source water protection is noted as best developed locally (Bakker, 2007; Christensen, 2011; Murray & de Loë, 2012). Taking place into account through the inclusion of local governments and other stakeholders in the policy design process can help with the success of implementation (de Boer & Bressers, 2011).

From a water management perspective, it is important to consider local concerns and knowledge, not only in terms of developing policies. While addressing issues of place may be ideal in water management, local level organizations (e.g., municipalities) may lack the skills, resources, capacity to fully implement place specific water plans and policies (de Loë & Kreutzwiser, 2005). The External Advisory Committee on Cities and Communities argues that downloading, or the devolution of responsibilities, needs to come with the autonomy in order to make choices surrounding local resources, as well as the appropriate capacity to enact policy decisions (2006). From a participation perspective, more powerful actors can dominate locally driven decision-making, which makes it important to consider the involvement of the disadvantaged (Ozerol, Tacer, & Islar, 2013). Place-based water management is a balancing act, having to consider a diverse set of values, multiple options and stakeholders (de Boer & Bressers, 2011).

4.2.5. Rural-Urban

Conflict between rural and urban communities is not uncommon, however these conflicts often do not acknowledge the many interdependencies between rural and urban areas (Gallent, 2006; Morris J Wosk Centre for Dialogue & Vancouver Foundation, 2004; Tacoli, 1998). Authors such

as Douglas (2013); Reimer, Vodden, Brett (2011); and the External Advisory Committee on Cities and Communities (2006) suggest there needs to be shift at all levels to recognizing and emphasizing interdependencies between rural and urban areas. These interdependencies are both positive and negative, and include flows of natural resources, environmental stewardship, population, heritage, markets, and capital, as well as environmental issues such as air pollution (External Advisory Committee on Cities and Communities, 2006; Reimer, 2005; Robinson et al., 2008). For example, rural areas provide natural resources (e.g., food, energy sources) that serve as a base for urban growth, while urban areas provide markets, technology, financial capital, and manufactured goods (Baxter, Berlin, & Ramlo, 2005; Reimer et al., 2011). Infrastructure can physically link rural and urban areas, which is both a visible and tactical link, but related issues such as cost-sharing and co-management can make shared infrastructure contentious (Douglas, 2013).

Rural-urban interdependencies are critical when it comes to policies and programs, as policy failure often stems from a lack of recognition of the complexity of these interactions (Tacoli, 1998). Regions and communities of all sizes are linked through shared use of natural resources, such as air and water. Rural places have inherent environmental value as the source of many urban water supplies, often providing a fundamental connection between rural and urban areas (Reimer, 2005; Rothwell, 2006). However, the separation between watershed and political boundaries highlights a need for better integrating institutions (Rothwell, 2007). From a governance perspective, intergovernmental cooperation is required to mediate effects of urban dependency on rural ecological services (Robinson et al., 2008). In Canada, 70% of the population is in an urban area (Rothwell, 2006). However, watersheds extend beyond the urban and a rural-urban dialogue is required to manage this resource for the benefit of both. Watersheds are regions of interconnected waterways which function as a single system where upstream activities impact downstream quality and supply connects the two, regardless of rural-urban divisions or conflicts (Rothwell, 2007). The classic water example is the case study of the Catskills region and New York City, where an ecosystem services payment program has afforded the preservation, strengthening, and increased awareness of the interdependencies between rural and urban areas on critical issues, benefiting both areas (Appleton, 2012; Catskill Watershed Corporation, 2013; United States Environmental Protection Agency, 1996).

Links with place, integration, knowledge/innovation, and governance are inherent in rural urban relationships (Reimer et al., 2011). Characteristics of place are important to rural urban interdependence, as these unique characteristics can dictate what interdependencies exist. The different experiences between rural and urban areas when it comes to water compliance illustrate differences in place (Kot, Castleden, & Gagnon, 2011). A lack of understanding of the interdependence between rural and urban areas can work against new regionalism (Wheeler, 2002). It is also important to note, specific to new regionalism, that as much of the literature is urban focused, these interdependencies are often between urban cores and suburbs or rural adjacent areas (Wheeler, 2002), as opposed to more remote rural areas with smaller "urban" centres, such as those in this research.

4.3. Resilience

Resilience is an evolving concept with connections to ecology, biology, economics, and psychology (Barr & Devine-Wright, 2012; Berkes & Ross, 2013; Brand & Jax, 2007; Christopherson, Michie, & Tyler, 2010; Davoudi et al., 2012; Folke et al., 2004; Gunderson,

2000; Hassink, 2010; Hudson, 2009; O'Hare & White, 2013; Simmie & Martin, 2010; Yamamoto, 2011). As the concept of resilience has evolved so has its potential to address complex socio-ecological issues (Davoudi et al., 2012). From a community perspective, resilience can be seen as the ability to proactively engineer positive economic success that is balanced with social inclusion and that works within environmental limits (Bristow, 2010; Centre for Community Enterprise, 2000; Glover, 2012). Community resilience requires the assumption of constant change, focused not on the ability to remain in the same state, but on the capacity of a system to absorb disturbance or to reorganize while retaining similar function and structure without collapse (Berkes & Ross, 2013; Martin & Sunley, 2014). In this way, resilience can be seen as focusing the ability of a system to sustain itself over the long term via adaptation and transformation, either in reaction to specific shocks or a general ability to continuously adapt (Magis, 2010; Martin & Sunley, 2014). For this research, the focus is on being adaptive in the face of change, where communities can absorb or reorganize without collapse, facilitating self-reliance over the long term (Berkes & Ross, 2013; Bristow, 2010; Hudson, 2009; Teigão dos Santos & Partidário, 2011). Community resilience includes the development and engagement of community resources by community members in order to thrive under change and uncertainty (Magis, 2010). Water is one such resource required for communities to survive and thrive.

The rise of regional resilience is recent, but growing interest is interpreted as a reflection of awareness of increased uncertainties combined with a theoretical focus on regional growth (Yamamoto, 2011). Like resilient communities, resilient regions adapt successfully by having the ability to anticipate, prepare for, respond to, and recover from disturbance, maintaining or improving their situation over time (Martin & Sunley, 2014; Pendall, Foster, & Cowell, 2009; Simmie & Martin, 2010; Wolfe, 2010).

Resilience thinking shares commonalities with new regionalism in terms of core themes (e.g., importance of place, innovation, etc.), but while new regionalism stems from an economic perspective, the roots of resilience stem largely from an ecological perspective. By including resilience in our proposed approach, this offers the ability to better address issues of restructuring, as well as factoring in sustainability, as resilience is considered to be a key condition for sustainable development (Barr & Devine-Wright, 2012; Teigão dos Santos & Partidário, 2011).

Resilience links to the management of drinking water in several ways, which also highlight links to new regionalism. As resilience is focused on characteristics like balance and adaptation, its inclusion in the drinking water management affords the ability to manage the resource from multiple perspectives, including the ecological perspective, something often missing when discussing management of water for human consumption. There are existing regional scale case studies of how good governance of water can enhance overall resilience, not only environmentally, but also by protecting a reliable water supply for agriculture and urban interests (Booher & Innes, 2010). Resilient watershed based approaches focus on integration, including the need to understand links between ecological and sociological systems (Hager et al., 2013). Resilience also links with infrastructure, including drinking water infrastructure. One example is the importance of considering infrastructure in disaster preparation, highlighting the need to build resilience into design (Robinson et al., 2008). Infrastructure is a factor that can aid, or hinder, a region to adjust and adapt (Berkes & Ross, 2013; Christopherson et al., 2010).

4.4. Sustainable Infrastructure

Infrastructure can broadly be defined as the built systems that connect communities to the goods and services needed to function and to maintain or improve quality of life (CBCL Limited, 2012; Edwards, Bowker, Jackson, & Williams, 2009; Federation of Canadian Municipalities, 2012; Fulmer, 2009; Government of Canada & Government of British Columbia, 2001; Pollalis, Georgoulias, Ramos, & Schodek, 2012). Some types of infrastructure are considered primary or critical, without which the built environment could not operate as intended; or as public infrastructure, where the focus is on the operation of infrastructure for the collective benefit; or municipal infrastructure, owned and managed by local government (Baldwin & Dixon, 2008; CBCL Limited, 2012; Federation of Canadian Municipalities, 2012; Fulmer, 2009; National Research Council of the National Academies, 2009). Drinking water infrastructure falls within each of these typologies.

Beyond these typologies, sustainable infrastructure is a new and evolving topic that highlights the need for reconsideration of planning, design, and management of infrastructure assets, including being fiscally responsible, environmentally sustainable, and enabling a high quality of life (CBCL Limited, 2012; Hamilton & Dale, 2007; Pollalis et al., 2012; Vanegas, 2003). Additionally, the literature explains general links between sustainability and infrastructure (Connelly, Markey, & Roseland, 2009). Infrastructure is identified as a catalyst for moving toward sustainability (Connelly et al., 2009; Hamilton & Dale, 2007; Kennedy, Roseland, Markey, & Connelly, 2008; Pendall et al., 2009; Robinson et al., 2008; Roseland, 2012).

Links between infrastructure and water are both general and specific. Generally, infrastructure design can reinforce changes in behaviour, highlighting the necessity to begin to shift to sustainable infrastructure and integration of resilience into design so that infrastructure can enhance resilience as opposed to detracting from it (Robinson et al., 2008; Vanegas, 2003). Sustainable communities, for example, are generally characterized by sustainable water systems (Robinson et al., 2008). Sustainable water resource systems are those designed and managed to contribute to the objectives of society, now and in the future, while maintaining ecological, environmental, and hydrologic integrity (Pollalis et al., 2012). Specific to water systems, conditions for sustainability are noted as including adequate funding, sustainable governance and management, owners and users having appropriate knowledge, and understanding relationships between service levels, risk, and cost (Baldwin & Dixon, 2008; British Columbia Water and Waste Association, 2013). Sustainable water infrastructure includes consideration of source water protection, as well as ecosystem protection and adaptation to environmental change (Heare, 2007; Ministry of Community and Rural Development Local Government Infrastructure and Finance Division, 2010; Pollalis et al., 2012; Santora & Wilson, 2008; Zumpano, 2008). A watershed management approach can both aid in sustainable infrastructure by reducing the burden on infrastructure due to a higher quality of water, while protecting the environment (Zumpano, 2008). Water infrastructure is a specific category of infrastructure deficit, a challenge which will be discussed later (Mirza, 2007). Specific water infrastructure concerns include prices that do not always reflect true cost, with low water prices combined with low and/or reduced levels of funding from senior levels of government meaning infrastructure has often not been maintained or repaired (Butt, 2009; Roseland, 2012). Sustainable infrastructure is, therefore, often far from a reality.

4.5. Best Practices in Water Resource Management

Recognized best practices in water resource management relate to each of the above topics, sharing common themes. For example the use of watersheds as a geographic basis for water management is widely noted as a best practice (Rothwell, 2006), as is the need for an integrated approach to water and watershed management that acknowledges the interrelationships between water, people, environment as well as the need for sharing across jurisdictions (Bakker, 2007). IWRM has been seen as a suggested paradigm based on coordination, stakeholder participation, and multiple levels of decision-making (Cohen, 2012). IWRM has been a prominent 'solution' in water management since the Dublin Conference in 1992. The Dublin IWRM principles urge integration of ecological, social and economic pillars of sustainable development into water management (Vinke-de Kruiff & Ozerol, 2013). However, in some examples IWRM can seem unachievable as it involves collaboration, confidence in the process and trust, which all require time and energy to develop between actors (Owens, Hughes, & Skoczenski, 2013). Some also believe that IWRM shadows the importance of governance and cultural adaptation (Pahl-Wostl et al., 2008).

Adaptive governance used in conjunction with IWRM could address some of the issues raised in the literature with IWRM. Adaptive governance has been discussed in the literature as recognizing the uncertainty and risk during environmental planning such as water governance (Hurlbert & Diaz, 2013). Adaptive governance requires responsiveness, learning, capacity and equity (Hurlbert & Diaz, 2013). Closely related to adaptive governance is adaptive learning, which has been found to strengthen governance capacity to find solutions to better fit local biophysical, social and economic capacity (Meinzen-Dick, 2007). Murray & Roth explain that source water protection policies benefit from an adaptive approach that provides opportunities for evaluation in order to address threats (2012). Further, collaborative and participatory governance structures are noted as best practices to improve water management and allow for more localized planning (Cohen, 2012; National Round Table on the Environment and the Economy, 2011; Owens et al., 2013; Sabatier et al., 2005; Vodden, 2009). In addition, more place specific water governance structures and legislation that devolve responsibilities to the local government are stressed in the literature (Hirokawa, 2011; Peterson et al., 2010). This has been achieved through multi barrier action plans that use a multi-level governance approach to protect drinking water from source to tap (Christensen, 2011; de Loë & Kreutzwiser, 2005; Government of Newfoundland and Labrador, 2014a). An important aspect of adaptive, collaborative, and participatory governance is capacity building. As stated previously, building on existing capacity, especially at the local level, is important for successful implementation of water policies and regulations (de Loë & Kreutzwiser, 2005; de Loë & Kreutzwiser, 2007; de Loë & Murray, 2013; Friedman & Foster, 2011).

In addition to supporting proper governance structures and providing the appropriate capacity to actors involved, putting water management into law enhances institutional capacity (de Loë & Kreutzwiser, 2005; Hirokawa, 2011; Pyle et al., 2001). Water has to be seen as a basic utility that should be managed sustainably using infrastructure and environmental best management practices (Vining & Richards, 2001; Zumpano, 2008). However, it is also recognized as a basic human right (Schindler, 2007). Canadians cannot take this right for granted and must pay reasonable prices for the service of water treatment and distribution as well as being a

responsible user of water and watersheds (Furlong & Bakker, 2011; Minnes & Vodden, 2014; Shrubsole & Draper, 2007).

4.6. Existing Regional Efforts

Existing regional efforts were identified through a secondary literature review conducted in order to assess the starting points and general appetite for regional thinking in each region. This included a review of any existing regional efforts, water related and otherwise. Table 6 provides examples from the secondary literature review of regional efforts that exemplify one or more of the five new regionalism themes as described above. A brief review of regional efforts in each of the regions is also outlined below. Some of these examples can be found alongside other examples of innovative and transferable ideas in Appendix 1.

Table 6: Examples of existing regional efforts relating to new regionalism themes

New Regionalism Theme	Kittiwake Example	Kootenay Examples
Governance	Indian Bay Ecosystem Corporation – *a non-profit community organization with the goal of protecting the Indian Bay watershed through research, community engagement, and sound stewardship. Serves the towns of Indian Bay and Centreville-Wareham-Trinity and is utilized by several other communities:* *http://indianbayecosystem.com*	Regional District Governance Structure – *this regional governance system provides governance and services to unincorporated areas, as well as serving as a platform for regional collaboration. Regional districts are able to operate multiple water systems throughout their territory, allowing for collaboration and shared resources. For example the Regional District of Central Kootenay operates 19 systems:* *http://www.rdck.ca/EN/main/services/water/rdck-water-systems.html*
Innovation	Glenwood and Appleton development of waste and sewage system using reed beds – *these two municipalities shared the cost for commissioning an innovative and award winning waste and sewage system using reed beds:* *http://cdnregdev.ruralresilience.ca/wp-content/uploads/2014/11/Vignette-WatershedGovernanceGanderNov2014.pdf*	Columbia Basin Trust Water Smart Program – *initiative led by a regional organization, but tailored specifically to individual communities. Focused on reducing consumption through innovative efforts such as leak detection and education/training. Also reflects place-based approaches, integration, and rural-urban relationships.* *http://www.cbt.org/watersmart/index.asp*
Integration	Bonavista North Joint Council – *council includes representation from Centreville-Wareham-Trinity, Greenspond, Indian Bay, Lumsden, Musgrave Harbour, and New-Wes-Valley. Which helped facilitate the regional operator program:* *http://www.env.gov.nl.ca/env/waterres/training/adww/2014/11_Churence_Rogers.pdf*	Kettle River Management Plan – *collaborative regional plan that includes participation from local and provincial governments, as well as other sectors and organizations. The plan vision brings together goals related to aquatic ecosystems, safe and secure water supplies, and reliable water systems.* *http://kettleriver.ca/*

New Regionalism Theme	Kittiwake Example	Kootenay Examples
Place	Keeping it in Kittiwake - 'Buy Local' Campaign – *initiated by the Kittiwake Economic Development Corporation in 2007 to facilitate economic development in the region. It has been beneficial for local farmers and received a Community Economic Development Award for Excellence in Best Practices at the NLREDA's Community Economic Development Awards Banquet.* *http://cdnregdev.ruralresilience.ca/wp-content/uploads/2014/11/Vignette-BuyLocalKittiwakeNov2014.pdf*	Invest Kootenays – *joint initiative between local government, economic development organizations, and chambers of commerce that is designed to attract and retain investment within the region focusing on unique elements and opportunities.*
Rural-Urban	Gander River Ecosystem Corporation- *Originally called the Gander River Management Association, this community organization formed to protect and manage the Gander River and includes stakeholders from the smaller towns of Appleton, Gander Bay and Glenwood as well as the more urban municipality and regional centre of Gander. In 2008 the Gander River Management Association disbanded, however has recently reformed as the Gander River Ecosystem Corporation.* *http://cdnregdev.ruralresilience.ca/wp-content/uploads/2014/11/Vignette-WatershedGovernanceGanderNov2014.pdf* *https://www.facebook.com/pages/Gander-River-Ecosystem-Corporation/315257245323037?sk=info&tab=overview*	Kootenay Lakes Partnership – *formed to address development pressure on Kootenay Lake, impacting a number of stakeholders, both rural and urban. The diverse partnership includes the City of Nelson, the surrounding Regional District of Central Kootenay, First Nations, the Province of British Columbia, CBT, and so on. The mandate it to develop integrated and collaborative approaches to lake management planning, with consideration to the multiple uses and values associated with the lake.* *http://www.kootenaylakepartnership.com/*

4.6.1. Summary: Regional Efforts in the Kittiwake Region

As mentioned in Section 2 there are several functional regions within the Kittiwake region, including the functional regions of Fogo Island, Gander and area, Twillingate-New World Island, as well as a portion of the Grand Falls-Windsor region (Skeard et al., 2013). Within these regions there are examples of regional efforts, related to drinking water and other aspects of regional development. For example, there is the Bonavista North Joint Council (see Table 6) as well as the region wide Gander-New-Wes-Valley Regional Council. The Gander-New-Wes-Valley Regional Council is one of the Rural Secretariat regional councils, and is present in the region, however does not have a regional plan (Daniels et al., 2013). Reflecting some degree of regional thinking there has been restructuring in the last couple of decades in the region. This can be seen

in the amalgamations of the towns of Centreville, Wareham, and Trinity into the town of Centreville-Wareham-Trinity (CWT), and the creation of the Town of Fogo Island municipality in 2010, consisting of all island communities (Skeard et al., 2013).

In the Twillingate-New World Island functional region, communities on New World Island[10] have been service sharing with the town of Twillingate (over 2,000 people) to deliver services such as waste disposal and recreation since the 1970s (Vodden, 2005a). In regards to water supply, the towns of Summerford and Cottlesville have shared water and sewer systems since the 1980s, and this collaboration has been noted as being successful (Vodden, 2005a). Success factors for regional collaborations in the Twillingate-New World Island area have been attributed to: the ability to evolve; the isolated geography of the island; having formal agreements in place; seeing benefit or profits from their collaborations; ability to communicate and delegate; presence of leadership and volunteerism; and support from internal and external policies and actors (Vodden, 2005a).

Particularly related to watershed-based organizations one of the more prominent of these organizations in the region is the Indian Bay Ecosystem Corporation (IBEC) (See Table 6). The Gambo-Indian Bay and Cape Freels Development Associations, another form of a regional level group operating in the province at the time, as well as various ministries and developers, established IBEC in 1988. At that time a community-based resource management initiative was uncommon (Vodden, 2009). IBEC is currently working with the Atlantic Canada Opportunities Agency to create a business plan in order to enable IBEC to be self-financing (Indian Bay Ecosystem Corporation, n.d.).

There are also watershed management committees in NL recognized by the DOEC, which were, "formed to oversee land use management, and development and conflict resolution activities inside a PPWSA"[11] (Government of Newfoundland and Labrador, 2015, p. 3). These committees include town council members, town residents, and representatives from industry involved in development activities in the area, DOEC staff, other departmental government staff, members of environmental groups, and other concerned stakeholders (Government of NL, 2013). The only example of this type of committee in the Kittiwake region is one located in Gander, which does have a watershed management plan for Gander Lake and its catchment (Environmental Design and Management Ltd., 1996; Government of Newfoundland and Labrador, 2015). The Gander River Management Association is also noted as an influential regional actor in the region. This association disbanded in 2008, but has now reformed to create the Gander River Ecosystem Corporation (see Table 6).

Though there are examples of regional thinking and actors in the Kittiwake region, it has been speculated that that there could be need for more regional collaboration, which will require a great deal of support (Greenwood et al., 2011; Vodden, 2005a). The *Canadian Regional Development* project highlights that new regional themes are emergent within the region, however in varying degrees (Daniels et al., 2013). As outlined in Table 6, some regional efforts display evidence of a new regionalist approach. However, given various of examples of cut

[10] New World Island has a population of less than 4,000 people and contains two municipalities and 13 local service districts.
[11] PPWSA- Protected Public Water Supply Area

backs in funding for organizations such as the Kittiwake Economic Development Corporation and the Rural Development Associations, it seems that there are gaps in providing the necessary support for longevity and stability of regional efforts (Skeard et al., 2013; Vodden et al., 2013).

4.6.2. Summary: Regional Efforts in the Kootenay Region

There are many examples of existing water-related regional efforts within the Kootenays. These efforts range in scale from small or sub-regional (e.g., municipality and surrounding area) to large (e.g., extending across the entire region) and everything in between. For example, at the more localized scale the City of Castlegar provides treated water to the neighboring Lucas Road Water System, an unincorporated community system operated by the regional district (Regional District of Central Kootenay, 2014). At a larger scale, as noted above the CBT's Water Smart Program includes multiple efforts across the region (Hamstead, 2014). There are efforts that are targeted (e.g., specific to a single water course or community) and broad (e.g., general water conservation efforts). In addition to the formalized organizations and programs, both our project and other projects noted the importance of informal relationships between water system managers and operators (Breen, 2013). Additionally, the Province of BC and IHA provide a number of water-related resources for communities and water systems that include regional scale efforts (e.g., watershed planning). Overall there are different degrees of evidence of top-down, bottom-up, and co-constructed efforts related to water. Beyond water, the *Canadian Regional Development* project indicates similar findings relative to regional development across the region, demonstrating the variety of regional actors in the Kootenays and well as regional interdependencies (Breen, 2012).

What is clear is that capacity differs across the region. This is evident both in what exists for sub-regional efforts and participation in whole-regional efforts. This is no surprise given the range of communities across the region, however it is important to highlight as there is no unified starting point within the region. Additionally, because of the multiple political and administrative jurisdictions within the region there is no single overarching or coordinating regional body. The closest organization would be the CBT, which offers multiple region-wide programs, however not only does the CBT region exclude the Boundary portion of the Kootenay Boundary Regional District, but the CBT is a supporting organization whose mandate does not allow for it to take on a governance role where the province or local government have jurisdiction.

Table 6 illustrates a number of existing regional examples from the Kootenay region, demonstrating evidence of each of the five themes of the new regional approach. However, the *Canadian Regional Development* project highlights that, as in the Kittiwake region, these themes are emergent within the Kootenays. For example, while there are many examples of multi-level collaborative planning efforts it appears as though day to day operations remains very much both top-down and siloed. While evidence from these secondary sources suggest there is potential for further development of new regionalism, these themes are not dominant within the region, particularly in practice, and as a result are difficult to identify and build on.

5. Proposed Regional Approach

Existing literature indicates that the current approaches to drinking water management contribute to existing challenges, as well as presenting a challenge for overall regional resilience. We

considered these challenges to be indicative of a need for a different approach. In response to this we proposed to explore the feasibility of a new regional approach to drinking water management. As the general indicators of new regionalism developed for the *Canadian Regional Development* project were not easily applied to drinking water management we developed an appropriate set of indicators based on the literature. Additionally, we re-framed the presentation, focusing on key concepts as opposed to the themes of new regionalism. Key concepts include:

- **Self-identifying the working region**
    - Identify a manageable region that considers the watershed, cultural values, and economic ties
- **Coordinated efforts using existing resources**
    - Begin with all local governments within the working region and establish a core working group
- **Flexibility to collaborate while remaining independent**
    - Flexible structure allows authority of the core group to be recognized in the working region and allows for resource sharing
- **Making connections and reducing duplication**
    - Inclusive regional participation through the creation of a regional water network
- **Incorporating local context**
    - Use place-based management to identify and understand different uses of water
- **Combining best practices from different fields of study**
    - Multiple knowledge sources to better inform decision making, technology choice is driven by knowledge, innovation, and creativity
- **Integrating the human and environmental aspects of water**
    - Flexible structure allows for consideration of the big picture and supports the ability to learn and adapt with change

Further details of the proposed approach can be found in Appendix 2.

Why a regional approach?

Two considerations drove the decision to specifically explore a regional approach. Firstly, water is inherently regional, and although watersheds do not necessarily align with existing political or administrative regions, watershed based approaches have been increasingly adopted. Furthermore, jurisdictional lines do not bind water. A regional approach allows for effective, collaborative action that includes the watershed level. Secondly, many of the current challenges related to drinking water experienced in rural communities indicate that continuing the single community/single system approach would be ill advised. A flexible regional approach offers an opportunity to combine strengths to overcome challenges, while maintaining community independence.

Why use a development theory to address drinking water?

While the *Canadian Regional Development* project found some evidence of new regionalism in the two case study regions (Vodden et al., 2015), based on its potential we decided to see if we could apply it to drinking water. As noted in Section 4.1, new regionalism is often applied from an economic perspective. However, as discussed throughout the literature review provided above, existing watershed approaches reflect principles and practices of new regionalism and recent new regionalist literature has extended to resource management, watersheds, infrastructure

and water quality (e.g. Peterson et al., 2010; Scott, 2007). Additionally, as illustrated throughout Section 4, there are many elements of new regionalism that are relevant to drinking water management, as well as incorporated in existing literature on best practices in water and watershed management. Water links multiple topics together, including economic, environmental, and socio-cultural elements. These overlaps provide both an opportunity and reason to shift to a new approach, a regional scale approach to managing drinking water that is grounded in new regionalism. A new regionalist approach suggests that drinking water can be approached at the regional scale, through an integrated management strategy that includes public buy in, place-based knowledge, interaction of rural and urban, the sharing of knowledge and innovation, and the inclusion of multiple levels of government along with a suite of other actors. A new regional approach follows the general trend in water management that is seeing traditional hierarchal, central government approaches being replaced by more flexible, horizontal, multi-level ones (Ferreyra et al., 2008). These new approaches are attempting to break down traditional boundaries and helping to create a multi-disciplinary approach to water management and governance.

Using the challenges noted in Section 2.3 as a guide, combined with the completed literature review, we developed a proposed regional approach to drinking water management (see Appendix 2). This approach was intended to reflect an ideal based on a series of indicators for each of the topics covered. We refer to this as a management approach because while it includes reference to governance, the bulk of the proposed approach is focused on operational processes. Our proposed approach was deliberately open, inclusive of multiple aspects of drinking water management, as well as recognizing links beyond drinking water. Table 7 below provides a high level overview as to how the proposed regional approach was intended to address existing challenges identified within both regions through actions taken at the local level by local actors.

Table 7: How a new regionalist approach addresses identified challenges

Existing Challenges	Regional Solution
Capacity ***Includes: financial, human, social, political, institutional, technical, etc.***	• Gain economies of scale via sharing of resources • Increase knowledge flow • Seek out and learn from innovations in practice and policy • Enhance technical capacity for those making decisions through: knowledge exchanges, promoting water networks and formal/informal sharing and learning opportunities • Cooperative, regional-scale education for the general public to increase the understanding of potential benefits of good water governance
Governance, planning and management	• Recognize importance of regional approaches to drinking water management • Regional data sharing programs and strategic regional approach to help create better drinking plans • Regional protection of source water to enhance drinking water quality • New institutional structures that support regional planning as existing structures are inappropriate • New governance structures formed in water and watershed management that are multi-level and multi-sector, top-down and bottom-up and that deal the with disconnect between power and

Existing Challenges	Regional Solution
	responsibility, as well as overlapping and multiple jurisdictions • Acknowledge that structures such as source water protection committees take time to develop and have transaction costs, but can result in increased resilience, capacity and trust
Place	• Recognize that no two watersheds are the same - consideration of place and the biophysical, social, cultural and economic factors is critical for sustainable planning • Collaborative regional governance structure to facilitate recognition of place and help address local situations
Standards and regulations	• Regional innovation and learning - need for innovation to address issues of compliance, demands, conservation, etc. • Present a united front to the province (e.g., requests for changes to regulations, for local involvement in provincial decision making)
Lack of integration	• Consideration of ecosystem relationships and the full range of human activities (deals with current disconnect within water related issues) • Facilitating collaborative governance arrangements involving rural and urban communities in order to counter perceptions of command and control from urban centres and recognize that i) urban centres require rural resources – including water supplies and ii) rural areas need appropriate policy.
Lack of asset management	• Regional maintenance programs (sharing of human resources that have the certification to undergo sophisticated asset management activities) • Regional sharing of asset management technology (e.g., leak detection equipment) to encourage efforts and make such activities more accessible
Lack of sustainability / resilience	• The infrastructure deficit, including aging and degrading water systems is noted as an impediment to sustainability, but also as an opportunity to tackle problems regionally (e.g. conservation/demand side management, appropriate level of service, climate adaptation and mitigation strategies) • Community cooperation is seen a component of local government sustainability • Regional innovation and learning - need for innovation to address issues of compliance, demands, conservation, etc.

Sources: (Breen & Minnes, 2013; Connelly et al., 2009; External Advisory Committee on Cities and Communities, 2006; Government of Newfoundland and Labrador, 2014a, 2015; Hamilton & Dale, 2007; Heare, 2007; Maxwell, 2008; Ministry of Community and Rural Development Local Government Infrastructure and Finance Division, 2010; Minnes & Vodden, 2014; Pendall et al., 2009; Pollalis et al., 2012; Robinson et al., 2008; Roseland, 2012; Sancton, 2001; Zimmerbauer & Paasi, 2013)

6. Findings

The following section presents our research findings, starting with feedback on the proposed approach, followed by the identification of both enabling forces and barriers that could help or hinder the feasibility of using a new regional approach to drinking water.

6.1. Feedback on Proposed Regional Approach

While our review of the secondary data indicated potential for the proposed approach, as well as evidence that some aspects of the approach were already present within the case study regions, the primary data we collected indicated that the local actors we spoke with were not ready to evaluate the proposed regional approach, primarily because these actors considered the approach to be too far beyond the present reality of rural drinking water management. Key informant interviews and the focus group often deviated from the proposed regional approach toward a more general conversation about issues in the community and potentials for regional collaboration. Although the supplemental interviews did not speak directly to the proposed approach, the interviews were topical and offered various indirect comments on current and potential management approaches as well as regional approaches. Therefore, there was limited direct feedback concerning the proposed regional approach. Instead we drew implications related to indicators of the approach and its potential from these more general discussions.

One BC actor had recently submitted a letter to IHA that urged for points similar to what this project's proposed regional approach would support. Suggestions included multiple towns sharing water systems and infrastructure, as well as promotion of associations and collaborations related to water. NL focus group participants added that there is a lack of expertise in rural NL, particularly in the Kittiwake region, and that a regional approach could help in the cost effectiveness of sharing experts within a region such as water operators, planners, and engineers.

Indirect comments concerning the proposed regional approach included affirmation of the need to address identified challenges (e.g., better asset and data management was noted in both regions). Also discussed were examples of existing successes with regional efforts (e.g., regional water operators in NL), as well as the support for regional approaches by provincial actors in NL.

In terms of existing examples, those in the Kittiwake region involved in the regional operator program were generally happy with the program while it lasted. One key informant from the Kittiwake region explained,

> *"What is nice about the regional operator is that it allows a way of sharing experiences and things like that across the board. It doesn't isolate as much. Some things can be accomplished on a regional scale instead of at [the]community level, so it cuts down on the time with that. Particularly the data, a lot of the data review that I did, there is no way that the regular maintenance staff [would] have the time to do that- to look for those systemic problems and trends. For someone to do that on a broader level, and then present the smaller picture to maintenance staff, then there can be solutions for ongoing problems that way. They don't have time to do the things that need to be done let alone the long-term work"*
>
> - NL Respondent

The success with the regional operator program in terms of knowledge mobilization and asset management suggests a regional approach can work under certain circumstances, including both good relationships and sustained funding. Given that an otherwise successful initiative is no longer active on account of a lack of sustained funding, the importance of sustained funding is evident along with the need to explore in future research what mechanisms are available to

generate sustained funding for such programs in rural areas. In NL a great deal of funding is provided for water infrastructure projects. In fact, from 2008-2014 the Department of Municipal and Intergovernmental Affairs invested $234,983,015 (an average of just over $39M per year) through their capital infrastructure program specifically to drinking water infrastructure projects and $132,037,213 (an average of just over $22M per year) to water and sewer joint projects (a total of $367,020,228) (Minnes & Vodden, 2014). However, greater investment in regional asset management plans is required to maximize the benefits of these investments, which could be achieved through regional operator programs (Minnes & Vodden, 2014). As will be described below there has been an example in another part of NL (outside of the Kittiwake region) where a regional operator program has maintained sustained funding, which was due to the municipalities involved taking full responsibility of the funding of the position, rather than relying on provincial funding.

Generally those who reviewed the proposed regional approach thought the ideas had merit. There were also various direct and indirect critiques and amendments. Directly there was the need to include both public and private water systems. Private systems such as neighbourhood systems or individual wells were noted as an important demographic when dealing with rural drinking water systems. Another critique raised by town representatives at the NL Focus group was an overall scepticism as to how regional efforts can help NL communities. These informants believed the 'real problem' is not the management of drinking water, but rather bigger picture issues such as urbanization and as aging demographics, which in turn put pressure on services in rural areas. While the proposed regional approach was designed to help address these types of challenges, that this was not evident to participants is a problem. There were also questions as to applicability of the proposed regional approach for remote areas. For example, provincial government representatives noted in some interviews that aspects of the proposed regional approach, such as water metering, are sometimes not feasible in rural areas at the residential level due to the financial, technical and human capacity it takes to install and operate the meters. Lastly, in relation to the regional operator program one Kittiwake participant stated that there will always need to be a water operator who is 'hands on' in the community. It was mentioned that seeing the cost savings of regional approaches is often difficult, especially for local decision makers, something not addressed in our proposed regional approach.

6.2. Enabling Forces

One element of our data analysis was to identify those forces that could potentially enable a regional approach. This included both existing enablers, as well as hypothetical ones. Enabling forces were identified using a grounded theory approach, identifying themes within the data gathered. The section below provides an overview of the identified enabling forces in order of prevalence, with preference identified by the number of documents where each code occurred.

Evidence of Potential Benefits

The most prominent enabler of regional approaches appeared to be the recognition of potential benefits, which appeared in fourteen of eighteen documents reviewed, which included both the interviews and notes from feedback collected for this project as well as supplemental interviews associated with the *Exploring Solutions for Sustainable Rural Drinking Water Systems* project with local and provincial actors. This included both the identification of benefits from existing regional approaches and recognition of the potential of a hypothetical regional approach such as that proposed. The majority of documents recognized a need for regional approaches as a result

of the inability to continue on with business as usual. Long standing issues, such as a lack of financial and human capacity or long term BWAs were noted as challenges potentially solved through a regional approach. For example, a regional approach outside the Kittiwake region was credited with the removal of BWAs, and linked to one community's return to a BWA upon leaving the regional water operator program,

"[they were] on a long term boil water advisory. They've got into the [regional] committee. They got off the boil water advisory. They got involved with the regional operator, they opted out of the plan a couple of years later and they've been back on the boil water advisory".

- NL Respondent

The benefits of both informal and formal regional arrangements were noted. For example, informal knowledge exchange within a region was noted as a benefit. More formally, the sharing of operators, other staff, and equipment (e.g., leak detection equipment) were also noted as potential benefits that are often accompanied by a formal sharing agreement. It was suggested that sharing staff could go beyond an operator to include an engineer or planner.

"I don't know of any myself, as a councillor. We fix emergencies (leaks) as we go. We have had someone come and show us their specialized leak detection equipment, I believe Wiseman from Gander. I think they worked a couple of times for us too. We have been thinking in investing in something like that. Now New-Wes-Valley bought a system for like a pressure for blocked sewers. We need to work together like that, where we buy something and they buy something and we share services. Because you can't, as a small town, buy everything that you need. If you've got 5 or 6 towns that can share, that's a lot easier than renting something from St. John's."

- NL Respondent

It is important to note that the regions discussed by respondents did not match the case study regions, but were smaller regions or clusters of a number of communities or groups of a particular system type or size. Benefits noted also included an identified decline in emergencies, as well as cost sharing affording skilled human resources. A more knowledgeable staff can provide not only planning, but also resources such as asset management and maintenance schedules – something that may not occur otherwise, as well as someone to track and watch the bigger picture. Existing examples also demonstrate the benefits of attention to place. Regional programs like the CBT's Water Smart in BC affords each community its independence while providing education, collecting data, sharing knowledge, and making gains. Additionally, in some cases regional efforts have made it easier to get funding.

Innovation

Fourteen of eighteen documents discussed innovation as an enabling force, but with fewer references than the potential benefits discussed above. This theme can be split into three categories. Firstly, and reflected in the majority of the comments is innovation related to data management. The creation and use of data management systems was noted as having various benefits such as efficiencies in dealing with information requests and general asset management (specific with drinking water systems). Existing databases were either macro regional/provincial or community based. The potential for community data systems to be expanded to the regional scale was noted,

"But I think it could be useful to have this kind of information there, then you wouldn't have to dig through reports. And for [the] position as regional water operator, I think that would be a wonderful asset … because [the operator] would have it all there, especially if all the towns had similar systems".

- NL Respondent

The overall consolidation of and access to data was noted as beneficial, particularly for gathering long term and baseline data. While the focus of discussions on innovation in data management systems centred on benefits for infrastructure management, one respondent noted the application to other subjects like relationship building, networking and governance. Shared data and information can facilitate these processes. It is important to note that barriers were also noted in terms of cost, skill, and gaps in data/data quality. Databases were noted as having huge potential benefits for single communities as well as potentially for regions or even the province as a whole. The NL example of the use of Town Suite software illustrated benefits for infrastructure management, mapping, and data storage. A NL infrastructure database was noted as being in progress at the Provincial level, illustrating inefficiencies as multiple agencies create databases with overlapping functions. There are also databases in progress in the Kootenays, such as one being developed by the Columbia Basin Watershed Network (see Appendix 1).

Second is innovation related to drinking water treatment and other infrastructure, as mentioned by half of the documents. These involved technological alternatives such as PWDUs, point of entry (POE)/point of use (POU) systems. While not regional in nature, such technologies help to create access to safe drinking water at a reasonable cost – building a strong local foundation. Additionally, particularly with the POE and POU systems, it highlights the potential for decentralized treatment, something applicable to low-density rural areas, which presents an opportunity for a new regional governance and management structure. While there remains discussion over the appropriateness and feasibility of the existing standards and regulations surrounding these technologies, examples were provided in BC that suggest a willingness both locally and at the provincial level to explore the potential of alternative system designs. In NL there was discussion of varying degrees of success with PWDUs, an alternate, centralized form of treatment of drinking water. Additional mentions of technology included the implementation of residential water metering by several communities in the Kootenays and other technological innovation included linking drinking water with other infrastructure systems (e.g., micro hydro and Independent Power Producers), separating treatment (e.g., drinking vs. irrigation). The need to develop affordable technology was also noted.

Lastly, a third of the documents noted innovative programs applicable to regional approaches. In terms of training and education there were various resource examples mentioned such as the Maintenance Assurance Manuals (MAMs) designed for local governments in coordination with MIGA and the DOEC. Additionally, NL offers a mobile training unit (as part of the Operator Education, Training and Certification program), which travels to small communities across the province helping to train and educate operators. A similar program in Alberta was referenced. In BC the CBT Water Smart Program was mentioned several times, a regional program focused on addressing the "peaks and leaks" – i.e., dealing with water conservation as well as system improvement. As the CBT program illustrates, the regional scale offers potential as an appropriate scale for water program delivery and coordination.

Principles of good governance

A range of accepted principles of good governance are, or could be, supportive of a regional approach. Certainly, without good governance regional approaches are jeopardized. Twelve of the eighteen documents discussed different principles. By far the category that discussed communication and relationships was the largest element, occurring in each of the twelve associated documents. For example, in NL at the provincial level the need for integration and collaboration between ministries and departments was noted frequently. One respondent noted,

> *"There needs to be a [good] communication between us so when they're bringing in initiatives in the place or regulatory requirements we can understand the impact will be prior to them occurring because you need to be geared up and not just have a knee jerk reaction".*
>
> - NL Respondent

However, between levels (e.g., between the provincial and local level) communication and relationships were less collaborative and more instructional/informational/reporting-based. The need for translation of reports from technical jargon to more informal language was noted as an important step for aiding communication between these two levels. Communication and relationship building provides a critical foundation for regional initiatives, setting up (or not) critical pathways for information sharing and partnerships.

One key finding evident in a minority of documents, including both BC and NL, was that there were individuals who did not feel limited by the current requirements/institutional structure and who had worked toward accommodating requests (e.g. coming out to communities to fix infrastructure) even if they were not obligated to do so. The unique perspectives of this particular set of local actors also illustrates that the perception of particular respondents can differ considerably. Additionally within the category of communication and relationships the importance of developing a shared sense of responsibility was noted. Communications were helpful particularly when they enhance understanding and provide justification for policies and regulations, as opposed to relying on a command and control approach. As well, the need for effective conflict management and resolution was discussed. Relationships were noted as developing in and outside of work.

Capacity building, another principle of good governance was found. For example, the need for support, including support in the form of funding or resource sharing was noted, including support to allow for fair compensation of human resources. Capacity provides a foundational element, as well as being something that can be further developed from a regional approach. Integration was also noted as important, not only for communication, but for planning, including joint planning and partnerships, involvement in planning, representation, and the integration of elements like regulation and financial support. Understanding the big picture was noted as critical, and something that could be achieved through recognition of regional potential to achieve mandated outcomes. Finally in terms of key themes associated with enabling good governance, the ability to be flexible and adaptive was noted within one quarter of the documents. This included flexibility to consider and accommodate place.

Existing regional approaches

In addition to the findings on existing regional approaches from the secondary literature review outlined in Section 4.6 and Appendix 1, primary data collection found that twelve of the eighteen documents also discussed existing regional approaches. References in this theme provide concrete existing examples that can be used as case studies or models in creating future regional initiatives. By in large, the majority of these discussions were positive, using the benefits and success of existing regional approaches as a rational for continued and expanded regional efforts, as well as providing lessons learned.

"[We] are on the [regional] council, and everyone who was involved in that program said it was excellent. It was well worth the money."

- NL Respondent

Two existing NL regional drinking water operator programs, one short term and one long term, were discussed primarily within the supplemental interviews. Regional water operator programs in NL have seen a certified water operator overseeing a collaboration of several smaller systems, assisting local operators, addressing issues surrounding asset management and reporting, as well as facilitating relationships and knowledge sharing. These programs illustrated two different cost sharing structures, and both resulted in various successes despite initial and ongoing challenges. However, long-term success of the regional operator program in the Northern Peninsula (outside of the case study region) was attributed to the municipalities taking over the full cost of the program, rather than relying upon the Province for funding.

It was found that success bread success. If existing regional programs were seen as beneficial, this enabled other regional initiatives by providing models, lessons learned, and so on. However, it should be noted that these examples are not perfect. The regional water operator programs also saw challenges and 'growing pains'. Additionally, one document referenced an existing shared infrastructure system in NL, which was noted by those involved as having experienced a number of challenges, particularly financially and with issues concerning cost sharing, indicating that not all existing regional examples act as an enabling force, but can instead act as a barrier.

Beyond regional examples specific to drinking water, three documents referenced general regional councils or advisory boards, providing a foundation for more targeted regional initiatives. The mentions of existing Joint Councils and Regional Advisory Boards illustrated small regional collaborations, which extend beyond drinking water. Kootenay electoral areas may find these aforementioned councils and boards provide transferable examples. Within these existing regional boards, programs, and governance structures, examples were provided of water, fire, and recreation being shared (see Section 4.6 and Appendix 1), with both positive and negative results. In NL the regional operators acted as an overarching coordinator among single systems (specific program). In comparison, the BC water governance is more complex. Individual municipalities generally operate large systems. Small systems however can be independently operated (e.g., Water Users Communities), or can be voluntarily taken over and managed by the Regional Districts. Regional scale plans were also noted from Kootenay participants, such as the Kettle River Management Plan, which, while environmentally focused provides a regional level foundation for collaboration (see Table 6). Additionally, the regional scale CBT Water Smart program was noted multiple times by BC participants (see Table 6).

Lastly, a provincial led macro scale initiative in NL is the Operator Education, Training and Certification training initiative, where a provincial actor is designated for each region. However, provincial regions are very large and the provincial employees have other duties other than just training.

A number of different cost sharing approaches were also noted. However, as noted in Section 2, while there are various funding models, there is a particular reliance on the gas tax funding in BC and NL. The Columbia Valley Local Conservation Fund, while not water specific, is an example of a bottom up funding initiative[12] for local conservation and stewardship, as well as data collection and management. Additionally, while not specifically regionally, the NL special assistance program for small capital works projects could provide a potential transferable model (http://www.miga.gov.nl.ca/for/saf.html). Adjacent to this discussion were informal regional relationships,

"A lot of towns I'll say will piggy back with their neighbours"

- NL Respondent

Policy window

Finally, nine of the eighteen documents referenced policy windows. A policy window is a situation, action, or incident that affords the opportunity to act, in this case affording an opportunity for a regional scale action. Unsurprisingly the most common policy window discussed was the Walkerton, Ontario tragedy in 2000, in which seven people died and thousands became seriously ill due to e-coli in the public water supply (O'Connor, 2002). For example it was explained,

"*You have to remember, back when Walkerton happened, there was heightened community awareness- it was almost like a wakeup call and people became more knowledgeable about it"*

- NL Respondent

While not directly related to regional management of drinking water, the Walkerton incident did, and to some extent continues to provide a policy window for changes to the management of drinking water, particularly when it comes to treatment. Other inciting incidents, such as a large infrastructure failure or illness within communities other than Walkerton were also noted as policy windows. While policy windows are not directly regional, these windows afford the potential for changes to be made generally to drinking water management, potentially allowing an opening for a regional approach to be brought in. Relatively widespread recognition of the potential benefits of regional approaches provides a supportive environment for promoting such approaches when such policy windows occur.

6.3. Barriers to a Regional Approach

Throughout this report we have discussed drinking water challenges such as the current infrastructure deficit. Some challenges would occur regardless of the scale of the management approach, however this section will specifically discuss barriers to a regional scale approach. As with Section 6.2 the barriers are listed in order of importance according to our research findings.

[12] A $20 tax per land parcel, voted in by residents of the region, to support conservation.

Knowledge, Understanding, and Awareness

This is a foundational theme in terms of factors that can both enable and block or hinder regional approaches. Related comments were found in seventeen of the eighteen documents. For example, in order to determine if a regional water operator would be worth pursuing, an initial recognition of basic issues with the existing drinking water system is needed (e.g., recognition of a need for treatment or improved asset management). So even when knowledge gaps are not regional in nature, they can reduce the feasibility of regional approaches even in areas where they might be most needed. If there is no recognized problem, actors involved will not see the need to change the management approach.

There are different perspectives on this barrier. For example, some respondents noted a lack of understanding of the importance of looking at and using data, while others were unaware of the existence or where to access the same data. One of the key topics within this theme was water borne illness, including what does/does not cause illnesses, correlation versus causation, and personal experience. Overall, our findings suggest a lack of useful and understandable information, as well as a tendency to rely on personal experience over other forms of evidence. Participants noted a gap in the understanding of themselves or their constituents, particularly related to the need for water treatment, but also related to asset management (e.g., infrastructure cost) and other related topics. This is tied to a recognized need for information to be made available in a more understandable and relevant way. This is particularly important for things like test results or information on system risks, levels of treatment, and DBPs in an effort to more fully inform the public and decrease misunderstandings and assumptions.

There were misunderstandings and misperceptions in both regions related to changes in regulations, BWAs, and lack of awareness of how monitoring works (e.g., what data is used for, sources of contaminants, attitudes and perceptions not keeping pace with changes in water quality conditions). For example one respondent explains the misunderstanding that roadside springs are monitored in NL:

"The Indian Bay Ecosystem Corporation put out an advisory about E. coli being detected [in the spring]. You wouldn't believe the number of calls we received here at the town hall about whether that had been cleared up. We said that we don't monitor it".

- NL Respondent

There was also an apparent disconnect between what residents believe was evidence and where information was derived from. This included issues of where information came from, monitoring, causation, and correlation, particularly related to health. A question posed was,

"*Where is the logical lever I could [provide] my constituents with, because they don't see an evidence based need for [water treatment]".*

- BC Respondent

A lack of systems thinking in terms of connecting drinking water with environmental stewardship was also apparent in both regions. Issues of knowledge and understanding around subjects like illness, aesthetics, and so on were also a clear indication of a need for further understanding of place. There was also a perceived lack of understanding from upper levels in some cases, for instance a Kootenay participant expressed a perception of that source water

protection did not matter to higher ups so long as water is being treated. This kind of lack of awareness of good drinking water management practices and a whole systems approach was often missing at the local level as well in both regions.

Other evident knowledge gaps included the level of complexity in the system as well as the need for training, for proactive asset management, short verses long term thinking, full cost accounting, and the difference between paying for water versus paying for a service. This is particularly important when it comes to willingness to pay, and people understanding what exactly they are paying for. It was explained in NL that,

"In order for me to show them how important a computer was I needed to use my own lap top for the first 6-7 years"

- NL Respondent

Institutional and Regulatory Structure

The second barrier to regional approaches identified were those resulting from the existing institutional and regulatory structures, noted in sixteen out of eighteen documents. The current structure is not perceived as conducive or supportive of regional structures or approaches. Some concerns related to institutions and regulations provided were potentially contradictory. For example, there were calls for further legislation and regulation but also for flexibility. Also noted is a need for place appropriate changes and further clarification over local regulatory requirements, as well as issues with compliance. Local governments felt there were unfair expectations for rural communities, as the governance structures were clearly based on an urban model. Often, rural communities did not have the same tax base to support the changes that need to occur to meet provincial standards.

"I mean the province has not done anything. DOEC has come out with the cry that levels are high, but nothing else has been done. So nobody has walked into this office had said 'here…here is a relatively cheap solution to your problem'".

- NL Respondent

However also noted was that communities in some cases need to play a larger role, taking on more responsibility and initiative, as opposed to relying on the Province. However, this requires local capacity building

There was some discussion of who should be responsible for enforcement of policies, the local level or the provincial level. Given their proximity it would make sense for the local level to enforce policies in many cases, however, they often do not have the human, financial or technical capacity to do so. Yet another related concern is an observed lack of integration. Examples of this included the NL example of having bacterial and chemical monitoring done by separate agencies and the communities themselves not always understanding what agencies test for what parameters and for what purpose.

Also noted were missing links surrounding best management practices such as asset management, better mechanisms for charging for water services (e.g., full cost accounting, metering), and the sustainability of current infrastructure. Evidence reviewed suggested a lack of explicit policies and support from the provincial level. For example, it was noted in a NL

example that government should approve more funding to support more regional efforts. One provincial government representative explained regarding community's operational problems and not charging enough for water:

"….so we need to have good answers for them and have the programs in place so I think it's more on our responsibility than theirs. And I can understand communities especially small communities looking at this stuff and wondering if it's fit to eat, and some of it has to be scary and not surely understanding it all, it's not being fully explained and again and that's not saying that there isn't information online because I know there is but there is a lot to comprehend"

- NL Respondent

Our findings suggest a need for more support and capacity building for rural communities, however as seen in both NL and BC, administrative regions are very large and human capacity is limited at not only the local, but also the provincial level. For example, there appears to be a lack of options or support for very small systems in BC, especially for communities outside the municipal or regional district jurisdiction.

Furthermore, in NL it was mentioned that there is little support or venues where learning experiences can be shared. Support from higher levels of government (e.g., provincial policies, legislation and programs) is needed to foster and sustain regional initiatives and provide proper mechanisms for enforcement of policies (e.g., with source water protection or mandatory training of water operators). The need for institutional support for succession planning of water operators was also identified, potentially with opportunities for the use of regional operators.

Equity

Lastly, in terms of barriers to a regional approach is the idea of equity or fairness, which has a number of different elements, illustrated in thirteen of the eighteen documents. One element of this has to do with poor relationships between communities, and in some cases rivalries (which can exacerbate accusations of favouritism and unequal benefits within existing regional set ups and differences of perspective on what makes for a fair regional arrangement). One provincial official explained that, *"unfortunately it's too much like the Hatfields and the McCoy's"* (NL Respondent). In some cases conflicts and/or reluctance to work together stem from historical issues that have resulted in communities now finding it difficult to work together. Concerns also exist surrounding free ridership, particularly where there are different levels of service fees and taxation. A very small system example from BC indicated free ridership in volunteer run systems, for example, where some community members neither paid nor volunteered time on account of not being mandated to do so. These issues point directly to the role of leadership and relationships, something acknowledged by some.

Different challenges across communities can make it hard to gain mutual understanding. Some communities, or parts of communities, also simply favour independence. This can be both the "have" communities where no obvious gain is perceived by partnering with others, as well as the "have not" communities who may fear a loss of independence and control. In other cases, such as in BC, while there was recognition of potential benefits of having the regional district take over/manage small systems, it was also noted that there was a fear of loss of control and outside interference. There was a recognized spectrum of communities within the case study regions,

wherein some communities have advantages in terms of available resources and others may be struggling to provide basic services given limited human and financial assets. This range of communities provides different starting points and different needs, meaning not all communities may be compatible working together (or not without considerable energy devoted to facilitating dialogue and examining varying possible regional arrangements).

Equity in funding was a major theme, in terms of who gets or has money and who does not, including that some forms of drinking water government/management are not eligible for certain funding programs, an issue in both NL and BC that can impact regional initiatives. Additionally, a small, but overarching theme is that of rural / urban equity, which is worth noting as it can add to the conflict within and between regions.

In some instances communities found regional initiatives too expensive or there had been disagreements over management and the communities subsequently dropped out. It was noted, however, that disagreement, conflict, and other "growing pains" could be addressed through practicing good governance.

"But then of course you've got the idea of, well whose going to hold onto it, and what if the last time [one community] used it and [another community] needs to use it and all of a sudden its broken, whose going to pay for it to be fixed? So unfortunately those are little minute details that are going to need to be worked out, but unfortunately those are road blocks that are needed to make the relationships work."

- NL Respondent

7. Discussion

The following discussion is divided into two sections. First is a general discussion of the findings, and second, a more detailed discussion on how to move forward with our proposed regional approach.

7.1. General Discussion

While at opposing ends of the country and despite some differences, the Kootenay and the Kittiwake regions share common experiences surrounding management of rural drinking water systems. While data limitations prevented an even comparison between the two regions, similarities were discovered. Firstly, both regions indicated the Walkerton tragedy initiated a review of and changes to drinking water legislation, where the resulting changes have proven to be challenging for rural communities. Additionally, common drinking water management challenges were found at the local levels in the two regions (e.g., engineering issues; data management; infrastructure issues, and capacity). In both regions there were also issues related to perception surrounding drinking water and health, chlorinated water, the use of untreated water sources (e.g., roadside springs), as well as occasional friction or lack of strategic coordination between the local and provincial level actors.

In terms of differences, NL has a zero risk BWA system that does not differentiate between levels of risk, which has caused issues of non-compliance. In BC, the BWA system has three levels differentiated by severity and duration. Another difference between the regions are the

local conservation efforts related to water. Conservation seems more prominent in the Kootenays than the Kittiwake region, especially regarding public education programs. The CBT's Water Smart program is an example of a regional scale, conservation focused program that the Kittiwake region could benefit from (see Appendix 1).

As discussed in Section 3, unforeseen circumstances regarding methods and the practicality of the proposed regional approach required the research team to modify our methodology, resulting in a low amount of participation and written feedback and greater reliance on secondary and supplementary sources. This was particularly difficult in the BC case, whereas supplemental interviews were available for analysis in NL through the *Exploring Solutions for Sustainable Drinking Water Systems* project. In addition to making a true comparison between the provincial results difficult, this also resulted in issues with determining the feasibility of the proposed regional approach. However, the information that was gathered from key informants in both regions was important as it will help in the future to refine the proposed regional approach, including the conceptual design as well as feasibility testing methods, and target audiences.

Generally, it was found that various elements of the proposed approach apply at different scales. As noted above, the proposed regional approach was derived from an amalgamation of ideas taken from existing new regionalism and water management and governance literature. Many facets of the proposed approach were acknowledged by participants in both regions as important in the management of drinking water systems. These facets include collaborative and inclusive governance; the need for databases, straightforward and open access to consolidated data and information; the need for knowledge sharing venues; as well as the need for sustained funding and more accurately priced water fees.

However, the proposed regional approach was often hard to conceptualize for key informants, for a variety of reasons. The proposed approach includes a variety of possibilities, seen as being open as opposed to concrete, which, while making it easier to tailor to a specific place, is also vague and difficult to conceptualize and assess. Additionally, not all of the potential examples are transferable to each community within a region. For example, certain collaborative efforts did not make sense for more remote communities (e.g., sharing regional operators). Furthermore, while a regional approach offered potential solutions to existing challenges the institutional structures are not always in place to support these types of collaborations. There were also issues with multiple overlapping regions. The regional initiatives discussed by key informants by in large did not match the case study regions (Kittiwake and Kootenays). Feasible regional activities also require a perceived need and "buy in" from local actors and currently many local actors were not convinced due to concerns related to equity, capacity challenges and bad experiences in the past with regional efforts. Considering all of these factors, it was noted that there are a number of steps missing between the current state of drinking water management and the proposed regional approach.

One critical element highlighted by participants is that consideration of place is important in drinking water management (e.g., implementing context appropriate engineering and governance solutions). There is a need for flexibility in regional approaches and solutions, and mechanisms for adaptive governance and continual monitoring and evaluation of regional efforts. Furthermore, downloading of responsibility to the local level when it comes to water

management seemingly has not been matched with the necessary capacity to enact proper management actions for implementation of provincially directed policies and programs (e.g., source water protection, asset management, operator certification). Overall, regional approaches cannot happen without foundation building. Building upon capacity (human, technical, institutional, social, financial, etc.), especially at the local level, is needed in both regions.

The Kootenays have the benefit of having regional actors such as the CBT, however no comparable organization was found in NL. In NL the provincial government takes a great deal of criticism for not providing the needed capacity that could promote better governance and operational processes in the Kittiwake region(s). Similar criticisms are directed at the provincially mandated IHA in BC, although in both provinces there are also capacity issues at the provincial level. Interestingly however, we found that when regional solutions are employed, such as regional water operators, other best practices such as asset management are prevalent. It is our opinion based on this research, that there needs to be more support for regional approaches, including mechanisms for sustained funding for regional operator programs and greater institutional supports of alternative approaches. The data shows that local decision makers, especially in the NL region, are not always ready to accept the proposed regional approach. However, this was often a result of negative past experiences, as well as a lack of a holistic or integrated understanding of what was meant by the regional approach. Also, when past regional efforts were not met with immediate cost savings, the long-term benefits of regional approaches were difficult for local actors to realize.

As researchers we need to develop more practical and tangible ways of outlining the proposed regional approach. It was suggested that it would be helpful for respondents if regional approaches were outlined in a scenario-based manual, which had different regional options depending on local needs. Furthermore, the approach must have mechanisms to deal with communities at different stages and coming from different perspectives, while also maintaining an overall umbrella approach. Also, further additions should seek to include both remote communities and private systems. For example, the potential of mentoring was brought up in the Kootenays as a way of sharing success in a region, as communities who are not having issues with their water systems often did not express as much of a need for regional approaches but could serve as regional leaders.

7.2. Moving toward a new regionalist approach

The following section explains what would be needed in each region to move from the current approach to a new regionalist alternative. The proposed approach considers policy, planning, operations, and evaluation and monitoring. The summary below examines what shift would be needed in order to make this regional approach feasible.

Within the Kootenays the current approach to the management of drinking water is dominated by a traditional approach, meaning it is top-down and focused on single organizations, as well as being siloed. Under this approach to management, authority and jurisdiction come from the top (i.e., the province and the regional health authority) down, as the standards and regulations are passed to the local level. Organizations are largely insular, focused on what is within their jurisdiction, and water is considered in silos, largely environmental and health/human consumption. This traditional approach is reflected in policy, planning, operations, and evaluation/monitoring. However, that is not to say traditional is the only approach, as previously

examined examples indicate the emergence of alternatives. That being said these examples are currently the exception as opposed to the rule. In order to facilitate a shift to a broader take-up of regional approaches, such as our proposed approach, it would be prudent to further examine these existing regional approaches, identifying what both their influencing factors and what works about them in order to transfer these concepts. This project represents a starting point for this examination. In order to shift to a new regional approach the emergent evidence of new regionalism will have to be carefully identified and deliberately cultivated in order to change the dominant approach.

In the Kittiwake region there is diversity in existing regional approaches. Some towns have experienced successes however have had funding cuts from the provincial level that has been a barrier to the sustainability of initiatives such as regional operator programs. On the other hand, as evident by our focus group there is still scepticism in the region of the benefits of regional approaches. In this region a significant amount of social learning and capacity building is needed to not only realize the benefits of regional approaches but to also have the resources required to achieve these benefits. This could be facilitated through greater collaboration in funding packages and planning opportunities, facilitated by the provincial government level and also by organizations such as Municipalities Newfoundland and Labrador. Pre-existing regional councils such as the Bonavista North Joint Council may be a first step. Such councils could create regional water committees, and provide further opportunities for training for town staff, councillors and operators in the region. There is also a need for multi-level governance opportunities, so all actors with water and watershed management responsibilities in the province are able to strategically work together towards solutions. Similar to the Kootenay region and smaller sub-regions, the new regionalist elements identified in the region (e.g., watershed organizations and management committees; regional operator programs; innovations in waste water treatment; regional councils, etc.) require support and encouragement and offer learning opportunities that can enhance the success of future regional efforts.

8. Conclusions and next steps

This research builds on the existing *Canadian Regional Development* (Vodden et al., 2015) and *Exploring Solutions for Sustainable Rural Drinking Water Systems* projects (Minnes & Vodden, 2014). While our project focused on using new regionalism as a platform for a regional approach to drinking water management questions remain as to the extent to which regional approaches can assist in addressing existing rural drinking water challenges, as well as the feasibility of new regionalist approach in rural Canadian regions. Overall, we found a disconnect between where the current literature on drinking water management is and the reality of the capacity of rural drinking water actors. Our research found that achieving best practices for drinking water management and action at the regional scale often was particularly challenging in the rural case study regions due to a lack of human, technical, institutional and financial capacity.

The literature does suggest that shifts toward new regional governance structures in water management does not come without its problems (Pahl-Wostl et al., 2008). Collaborations in water management have been criticized for having: high transaction costs; potential implementation gaps and problems with translating plans into policies; issues ensuring commitments to long term goals; and challenges in making sure benefits and costs of

collaborations are fairly distributed (Fish et al., 2010). All of these threats were found in this research project as barriers to regional drinking water governance and management.

It has been realized that in Canada, regional water initiatives must address place-specific issues within the regional/sub-regional context. What may work for the Kootenays region in BC may not work for the Kittiwake region in NL. The creation of new and improved policies without matching capacity will be moot if no one can comply with them. Our project has offered a regional option to drinking water management that provides links beyond drinking water and aims to be more integrated in nature than perhaps current capacity and institutional arrangements will allow.

Ultimately, this report has a strong NL focus, and was meant to derive solutions or lessons learned from the Kootenays region in BC. For example, to support a regional approach to drinking water management, NL could benefit from more and stronger regional actors, such as the CBT in BC. The CBT and other non-traditional agencies have been key players in creating networks, integrating regional data, and in capacity development in relation to drinking water management in the Kootenays. A similar actor currently does not exist in the Kittiwake region. Furthermore, institutional structures that support regional governance toward drinking water systems are needed, both in NL and BC. Above all, educational activities concerning water management for elected officials, decision makers, and for the public are needed to enhance local knowledge and capacity.

We suggest that the pillars of new regionalism and connections between them are beginning to guide water and watershed management, as well as the new emerging governance structures surrounding this field. We further argue that the understanding of new regionalist principles, and the opportunities and challenges of this approach, can in fact improve future policy design for regional water and watershed management efforts. That said, there is much to be done to move further in this direction. There is a need for future research into making more succinct and all-encompassing guidebooks or manuals on how regional approaches can aid in place specific drinking water management. It was clear that NL provincial officials would like to see a push for regionalization. Priority must be placed on bottom-up regional development, where capacity building and local buy in are emphasized. In terms of next steps and future research the authors have identified source water protection and infrastructure as two specific target areas on which to focus for further research, due to the concerns in the data related to issues with infrastructure and inter-jurisdictional or regional approaches to watershed management.

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Appendix 1: Transferable Actions and Ideas for Water and Watershed Management

The examples included in the following table are either i) regional in nature, or ii) reflect characteristics of a new regionalist approach. This is not an exhaustive list, but rather a sample of existing initiatives. Equally as important as the examples themselves are the driving and influencing factors behind them.

	Actor Details	Key Words	Details	Link
PROGRAMS				
Columbia Basin Water Smart	Columbia Basin Trust *Regional organization* *British Columbia*	Conservation Leak detection Education Training	• Delivered across the CBT region • Community specific programming • Programs include: water loss management training, water smart ambassador program, water metering assessment and support, and learning opportunities • Multiple resources available on the website	https://www.cbt.org/watersmart/

Operator On-site Training	Department of Environment and Conservation
	Provincial organization
	Newfoundland and Labrador
		Operator training
		Curriculum development
			• Program includes:
			  • Mobile training units designed to increase access to training
			  • On-site training curriculum developed in response to the needs of local operators
			  • Standard Operating Procedures to be used by local drinking water system operators to augment training
				http://www.env.gov.nl.ca/env/waterres/training/operator_onsite_training/index.html

Small Water System Guidebook	Ministry of Health *Provincial organization* *British Columbia*	Education Resource	• Resource directed at small water system operators • Includes: regulator and permitting information, monitoring, reporting, understanding and mapping water sources, water treatment, identifying and assessing vulnerabilities and risk, financial management, revenue and rates, etc.	http://www.health.gov.bc.ca/protect/pdf/small-water-system-guidebook.pdf
Drinking Water Quality Improvement Program	Interior Health Authority *Provincially designated regional organization* *British Columbia*	Education Resource	• Resource directed at water system operators • Includes: resources on source protection, certified operator to operate water system, water quality monitoring program, turbidity monitoring, on-line monitoring, long term plans for source, treatment, and distribution, and reporting.	https://www.interiorhealth.ca/YourEnvironment/DrinkingWater/Documents/Conditions-on-Permit.pdf

	Actor Details	Key Words	Details	Link
Maintenance Assurance Manual Program	Municipal and Intergovernmental Affairs, Department of Environment and Conservation *Provincial organization Newfoundland and Labrador*	Monitoring Reporting Asset management	• Generic document to be used as a template for each town to develop their own manual • Requires towns to: know what water infrastructure they have and where it is located; have accurate mapping/as-built drawings of infrastructure • Encourages asset management, succession planning, and opportunities for regional approaches	http://www.env.gov.nl.ca/env/waterres/training/adww/2012/13_Alan_Kirby_MAM.pdf
NETWORKS				
Columbia Basin Watershed Network	Columbia Basin Watershed Network *Regional organization British Columbia*	Source water protection Water stewardship Data collection Communication Education Resource	• Goals: promote networking among community based water groups, building capacity, access to scientific and technical expertise, facilitate opportunities for funding and collaboration, and support solutions-based approaches • Includes: stewardship group inventory, database of water quality indicators/statistics, and mapping resources	http://cbwn.ca/dev/
Indian Bay Ecosystem Corporation	Indian Bay Ecosystem Corporation *Regional / watershed organization Newfoundland and Labrador*	Education Resource stewardship Data collection Ecosystem restoration	• Non-profit community organization • Goal of protecting the Indian Bay watershed through research, community engagement, and stewardship • Serves the towns of Indian Bay and Centreville-Wareham-Trinity and is utilized by several other communities	http://indianbayecosystem.com
PLANS				
Kettle River Management Plan	Multi-organization Collaboration *Regional / watershed organization British Columbia*	Plan Source water protection Data collection	• Collaborative planning effort • Stakeholder advisory group includes: regional district, local government, provincial government, representatives from multiple sectors and organizations • Nine goals: affirming healthy aquatic ecosystems, safe and secure water supplies, and a reliable water system supporting a sustainable economy and local	http://kettleriver.ca/

	Actor Details	Key Words	Details	Link
			food system.	
Watershed Management Plan for Gander Lake and its Catchment	Multi-organization Collaboration *Regional / watershed* *Newfoundland and Labrador*	Watershed management plan Source water protection Data collection	• One of three watershed management plans in the province • Provides information on Lake water quality, lake use and catchment land use • Supports water modeling and created an integrated watershed management plan outlining planning controls for the watershed	http://www.env.gov.nl.ca/env/waterres/quality/drinkingwater/pdf/Gander_Lake_WMP.pdf
DATABASES				
Water Notifications	Interior Health Authority *Provincially designated regional organization* *British Columbia*	Monitoring Reporting Database	• Open access public health reporting • Advisory type by facility	https://www.interiorhealth.ca/YourEnvironment/InspectionReports/Pages/WaterNotifications.aspx

Environmental Databases	Ministry of Environment
	Provincial organization
	British Columbia
		Monitoring
		Reporting
		Database
			• Open access database
			• Includes:
			  • Environmental monitoring systems
			  • EMS Monitoring System: Web Reporting
			  • Electronic data transfer
			  • Authorization management systems
				http://www.env.gov.bc.ca/epd/wamr/ems_internet/

Water Resources Portal	Department of Environment and Conservation
	Provincial organization
	Newfoundland and Labrador
		Monitoring
		Reporting
		Database
			• Open access database
			• Includes:
			  • Mapping application
			  • Community water resources reports
			  • Current boil advisories
			  • Public water supplies
				http://maps.gov.nl.ca/water/

Digital Basin	Columbia Basin Rural Development Institute *Regional organization* *British Columbia*	Monitoring Reporting Database	• Open access database • Water data displays: consumptive water use charge, stream health, change in stream flow timing, and watersheds. • Also includes: economic, environmental, social,	http://www.cbrdi.ca/state-of-the-basin/digital-basin-portal/

	Actor Details	Key Words	Details	Link
			cultural pillar.	
NL Nature Atlas	Nature Conservancy of Canada, Grenfell Campus- Memorial University *Regional branch of national organization Newfoundland and Labrador*	Monitoring Reporting Database	• Open access database • Includes maps and data related to the NCC's Labrador Conservation Blueprint project • Information specific to the island of Newfoundland related to drinking water, watersheds and Newfoundland and Labrador habitats and species.	http://209.205.241.58:8080/Home/Index

Appendix 2: Proposed Regional Approach to Rural Drinking Water Management

Authors: Sarah Breen, Simon Fraser University & Sarah Minnes, Memorial University

Drinking water management is a critical issue with unique challenges for rural communities. How drinking water is managed has important links to the economy, the environment, and society. However these links, as well as unique challenges faced in rural areas, are often poorly addressed by traditional management approaches.

We are proposing a regional approach to drinking water management designed to address identified issues and overcome challenges in rural areas. Before developing a detailed guide **we would like your feedback on the proposed key concepts and regional characteristics described below**.

Key concepts:

- **Self-identifying the working region**
- **Coordinated efforts using existing resources**
- **Flexibility to collaborate while remaining independent**
- **Making connections and reducing duplication**
- **Incorporating local context**
- **Combining best practices from different fields of study**
- **Integrating the human and environmental aspects of water**

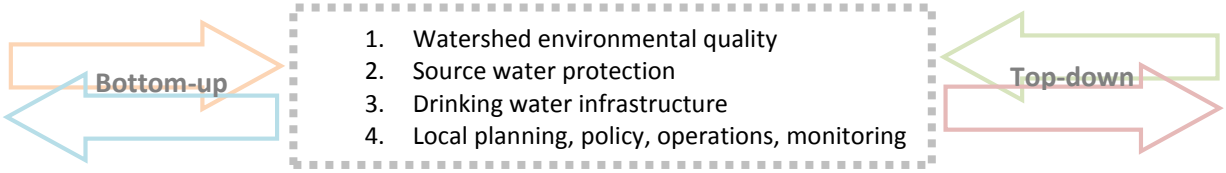
Why a regional approach?

- A flexible regional approach offers an opportunity to combine strengths to overcome challenges, while maintaining community independence.
- Water is not bound by jurisdictional lines. A regional approach allows for effective, collaborative action at the watershed level.

How is this approach different?

Water is often considered from an engineering, environmental, or health perspective, but the link between development and water is often unrecognized. Existing and past approaches to drinking water have achieved different degrees of success and each provides valuable lessons. What makes the proposed approach different is the inclusion of regional development, deliberately adding the consideration of development (particularly economic development) to the more typical best practices for drinking water management.

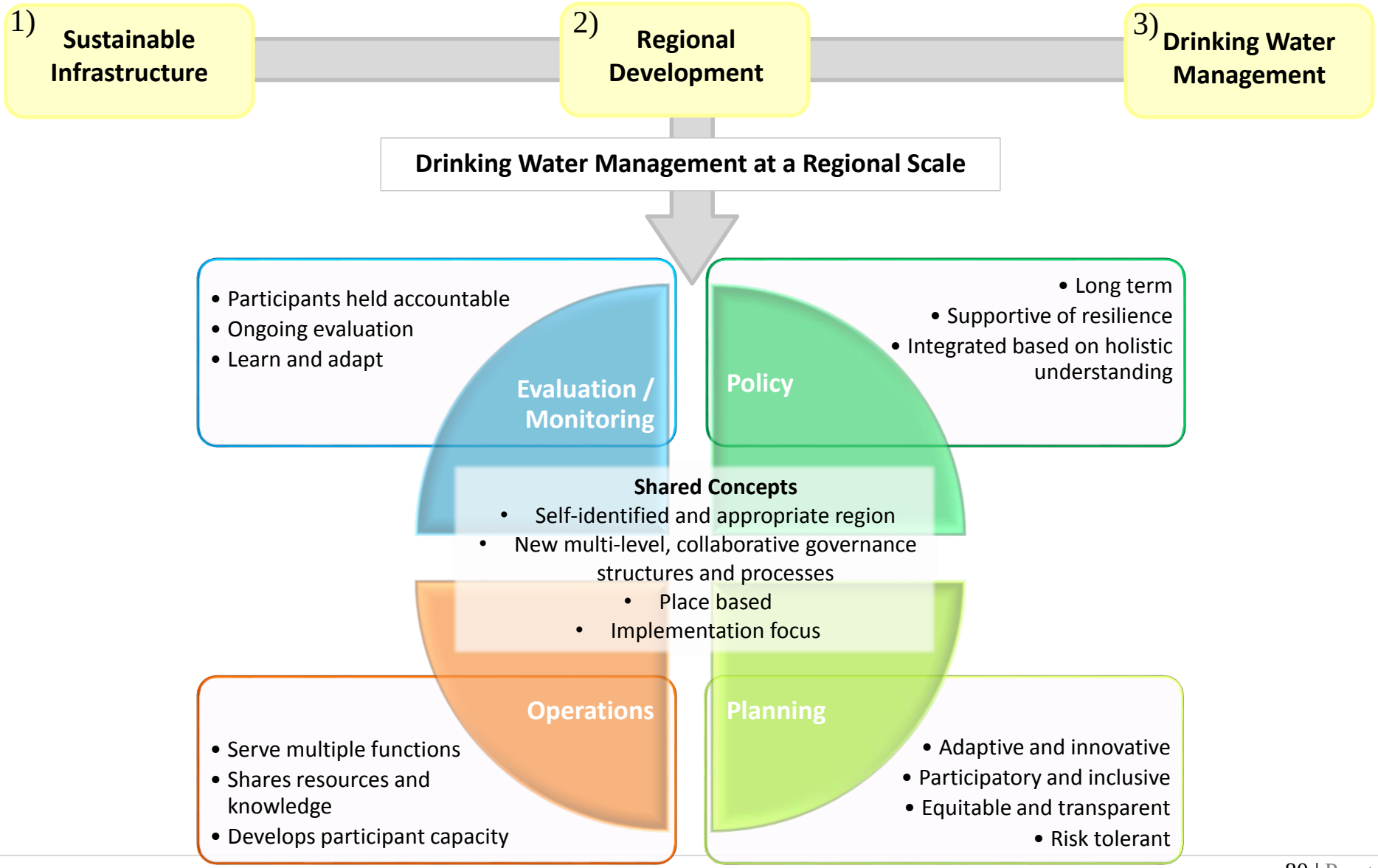
What is included?



While this approach is not intended to change outside factors like existing provincial legislation, it does have the potential to link to other subjects or important factors and provide steps the local level can take to improve and maintain their current systems.

Overview: Regional Drinking Water Approach

Strengths from 1, 2, and 3 combine to inform action surrounding policy, planning, operations, and evaluation and monitoring within a self-identified region.



Proposed Regional Characteristics

Working region - ***Shift*** *to a self-identified regional scale*

- Considers the watershed, but allows for consideration of manageable physical size, cultural values, and economic ties.
- The working region can apply to policy, planning, operations, and evaluation/monitoring but regional action is not required.

  WHY?
- Nothing exists or functions in isolation.

Core regional group - ***Shift*** *to collaborative efforts*

- Start with all local governments (single service, municipal, regional) in the working region and include all applicable departments/people.
- The group identifies appropriate regional priorities, actions, scope, and timeline.

  WHY?
- Potential to combine strengths and reduce duplication of efforts.

Institutional and governance structure - ***Shift*** *to enhanced flexibility*

- Core group authority and decision making power is recognized in the working region.
- Resource sharing and collaborative access to financial capital.
- Best governance practices:
  - Risk tolerant and adaptive
  - Clearly identified benefits, costs, roles, and responsibilities
  - Sustainable financing
- Implementation
  - All actions support implementation, evaluation, and monitoring
  - Success includes environmental and social factors

  WHY?
- Ensures decisions and actions are made at the right scale and are supported.

Regional participation - ***Shift*** *toward inclusivity*

- Creation of a regional water network including the private and non-government sectors
  - Potential to include or partner with network members in policy, planning, operations, and evaluation/monitoring
- Include neighbouring regions as necessary

  WHY?
- A broad network has benefits like reducing duplication, sharing knowledge or resources, enhancing strengths, building capacity, and creating understanding and support.

Place-based management - *Shift* to tailor made approaches

- Identify water related values, perceptions, history, geographies, etc.
    - Understand different uses of and reliance on water
    - Identify common ground
    - Develop mechanisms to balance considerations

  WHY?
- Understanding place (unique physical, social, and economic context) is a critical consideration in policy, planning, operations, and evaluation/monitoring.

Decision making and knowledge - *Shift* to integrated decision making

- Informed decisions based on a transparent review of all available evidence/data.
- Decisions reflect integration of social, economic, and environmental considerations.
- Knowledge sharing within and outside working region.
- Public education to enhance understanding and gain buy-in.
- Support for capacity building, including opportunities:
    - To maintain/enhance professional qualifications
    - For cross-discipline learning and monitoring/evaluation of water governance

  WHY?
- Create a culture of understanding and learning.

Technology and infrastructure – *Shift* to innovation and creativity

- Fostering sustainability initiatives related to water
- Moving toward sustainable infrastructure:
    - Integrate drinking water infrastructure with other infrastructure systems
    - New infrastructure and retro-fits reflect sustainable characteristics
    - Infrastructure planning is based on future needs
- Technology choice is driven by knowledge, innovation, and creativity

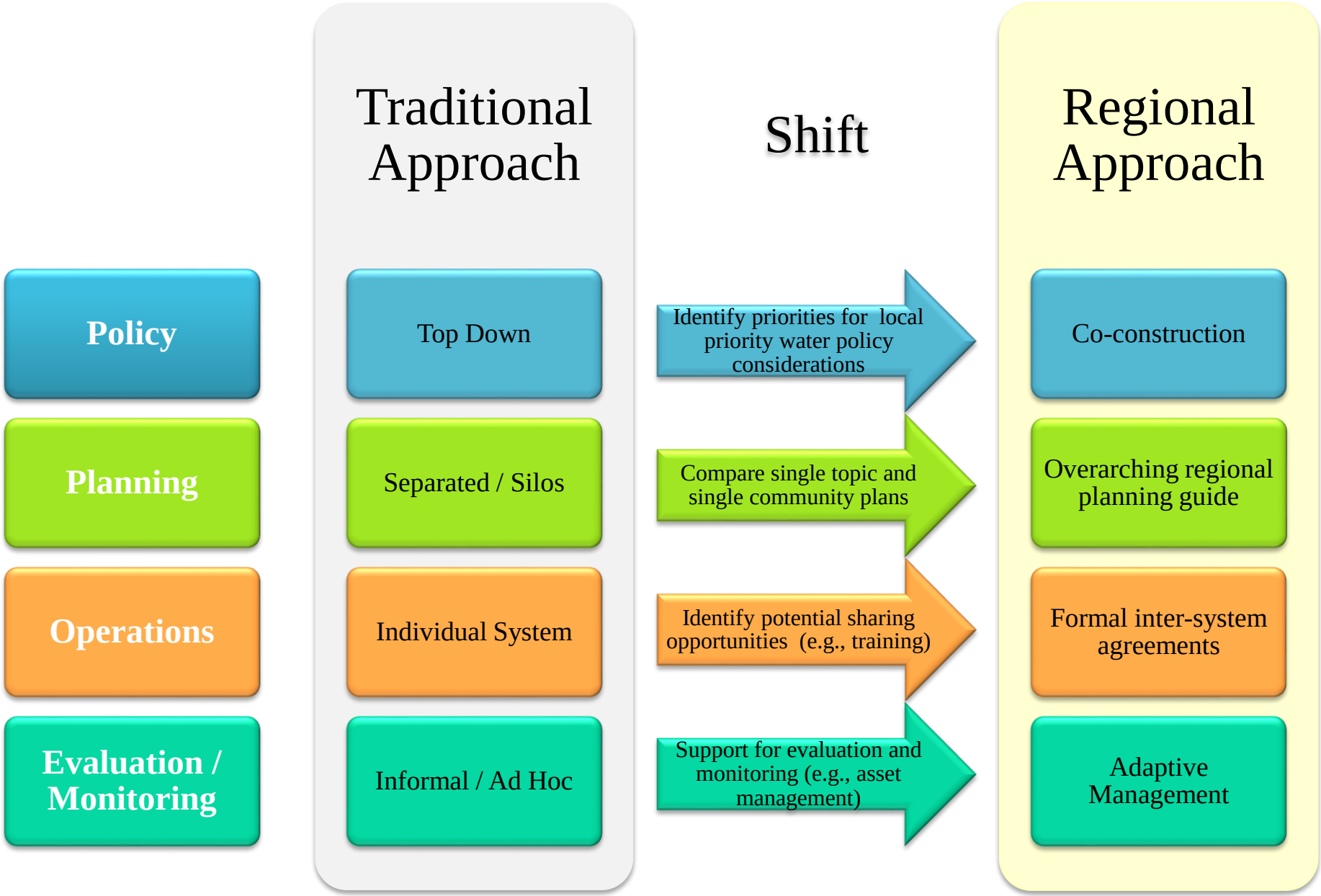
  WHY?
- Support for forward thinking.

Resilience and adaptation - *Shift* to adaptive management

- Flexible structure supports the ability to learn and adapt with changing circumstances
    - Monitoring and evaluation inform changes
- Full cost accounting
- Asset management

  WHY?
- Focus on long term success.

Example: moving toward a regional approach



Feedback

We welcome any feedback on what is included, things that are missing, areas for clarification. Feedback can be provided in the following ways:

1. Project website: http://nlwater.ruralresilience.ca/?page_id=289
2. Email: Sarah Breen swbreen@sfu.ca
   Sarah Minnes sminnes@grenfell.mun.ca
3. Mail: Unit 110, 175 1st Street West
   North Vancouver, BC
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Glossary

- **Co-construction:** combining top-down and bottom-up efforts.
- **Drinking water management:** anything related to the management of drinking water.
- **Integration:** cross over between traditionally separated areas (e.g., environment, economic development, social, planning, engineering).
- **Multi-level governance:** different levels of government (municipal, regional, provincial, federal) working together. Non-governmental stakeholders are also included.
- **Place-based:** understanding, considering, and accommodating the uniqueness of the local (community and regional) context.
- **Planning**: action required to fulfil direction from policy.
- **Policy**: provide direction for planning (e.g., vision, goals, priorities).
- **Regional approach:** regional scale management approach that reflects pre-determined characteristics based on place, governance, integration, innovation and knowledge sharing, sustainable infrastructure, and the best practices of water management.
- **Regional development:** traditionally focused on economic development, but also includes consideration of social well-being and environmental quality, at a regional scale.
- **Resilience**: ability to cope with or adapt to change.
- **Shift:** transition, the process of change occurring.
- **Traditional approach:** reflects characteristics such as single-focused planning and development, top-down policy, and a lack of inclusion.
- **Sustainable infrastructure:** design, construction, and operation of infrastructure reflect particular characteristics related to sustainability.
- **Working region:** geographic area larger than a single community. Considerations of watershed, source water, economic ties, and other relations factor into regional determination. Voluntary as opposed to predetermined political area.