

## Article

# Understanding Water Use Conflicts to Advance Collaborative Planning: Lessons Learned from Lake Diefenbaker, Canada

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**Abstract:** Conflicts around the multi-purpose water uses of Lake Diefenbaker (LD) in Saskatchewan, Canada need to be addressed to meet rapidly expanding water demands in the arid Canadian prairie region. This study explores these conflicts to advance collaborative planning as a means for improving the current water governance and management of this lake. Qualitative methodology that employed a wide participatory approach was used to collect focus group data from 92 individuals, who formed a community of water users. Results indicate that the community of water users is unified in wanting to maintain water quality and quantity, preserving the lake's aesthetics, and reducing water source vulnerability. Results also show these users are faced with water resource conflicts resulting from lack of coherence of regulatory instruments in the current governance regime, and acceptable management procedures of both consumptive and contemporary water uses that are interlinked in seven areas of: irrigation, industrial, and recreational water uses; reservoir water level for flood control and hydroelectricity production; wastewater and lagoon management; fish farm operations; and regional water development projects. As a means of advancing collaborative planning, improvements in water allocation and regulatory instruments could be made to dissipate consumptive use conflicts and fill the under-regulation void that exists for contemporary water uses. Additionally, a comprehensive LD water use master plan, as a shared vision to improve participation in governance, could be developed to direct the water uses that have emerged over time. This study suggests that these three areas are practical starting conditions that would enable successful collaborative planning for the seven areas of water uses. Focusing on these three areas would ensure the current and future needs of the community of water users are met, while avoiding reactive ways of solving water problems in the LD region, especially as the water crisis in the Canadian Prairie region where LD is located is expected to intensify.

**Keywords:** water use conflicts; collaborative governance; collaborative planning; coherence; regulatory instruments



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## 1. Introduction

Broadly understood, collaborative environmental governance comprises approaches that are characterized by deliberation among various actors, and a desire to achieve consensus in environmental decision making [1–4]. There are diverse forms of collaborative approaches for environmental decision making, each with different purposes, functions, and mechanisms, to enable the integration of various forms of knowledge, values, interests, sources of information, and perspectives of diverse actors to improve governance and management decisions for natural resources of concern [1,3,5–7]. The central tenet is that deliberation allows participatory processes in collaborative governance and management regimes, and the expectation is that this participation, especially if it is broadly

performed with the relevant stakeholders, improves the ‘quality’ of decisions made and leads to implementation of those decisions [1,6,8,9]. Moreover, it is expected that the involvement of non-government actors in these participatory processes will lead to a higher acceptance of decisions made and that ultimately such decisions lead to better environmental outcomes [1,6,9–12].

Such collaborations, particularly in water resources, have gained ground since the 1990s [1,2,4,12–14]. In this paper, collaborative water governance is defined as per Ogada et al. [15] as being a collaborative process (i.e., cooperation to achieve common goals) and governance approach (i.e., systems, instruments, and mechanisms to achieve specific water resources management outcomes). This definition is underpinned by formal approaches of collaborative governance as proposed by Ansell and Gash [4], whereby government actors, together with diverse water resources stakeholders, engage in a deliberative and consensus-oriented decision-making process, with the aims of making or implementing public policy, managing public programs, or managing public assets. In this context, collaboration suggests a way of forming a partnership, a coalition, or establishing cooperation as part of a governance regime to achieve water management goals [1,3,5,16–18]. As such, collaborative water governance has been advocated as one of the most promising frameworks to address water management challenges for various water resources systems at local, regional, watershed, and global levels [1,5,10,15,19]. Such frameworks have been established under polycentric governance systems that have water responsibilities over many devolved points of authorities, including such countries as Canada, USA and Australia [2,17,18,20,21]. They have also been established in centralized non-devolved governance systems with a national-wide single point of water authority, such as in Sri Lanka [22]. In particular, collaborations between communities of water resource users (individuals who share and use a common water resource) or other water users’ groups (individuals organized into stakeholders groups such as irrigation associations, landowner lobbyists, and others) with government actors are viewed as important, since they are believed to enhance the quality of decisions by considering more comprehensive information in solving concerns from the use, conservation, and development of the water resources of interest [1,12,13,23–26]. This is because such groups are perceived as being more informed on the local challenges that impact them directly, since they form important social-environmental interactions with water systems, as they depend on these for their own livelihoods and social well-being [10,23,27–29]. Furthermore, due to close social-environmental interaction, such groups also affect ecological health from the use of the water system itself [1,28,30].

Lake Diefenbaker (LD), located in the province of Saskatchewan (SK), Canada, is a water system that supports 70% of the population of SK with water for multiple uses [31]. The lake was formed between 1958–1967, as a bifurcation reservoir, under a hydrological development project known as the South Saskatchewan River Project (SSRP) [32,33]. The SSRP was initiated to meet the challenges of frequent droughts of the 1930s, which followed other man-made water development projects in the arid Canadian Prairie region in the form of dugouts, wells, pipelines, irrigation canals, water supply (conveyance) channels and other smaller reservoirs [34,35]. However, despite the lake’s significant importance, and its existence for more than 50 years, there has been a limited analysis of the existing legacy of ongoing contentions and prehistory of conflicts from what has been perceived as rivalries water uses, driven by the lack of participatory approaches for the lake’s governance and management to date. With the formation of a new water governance and management coordinating authority in October 2012—the Water Security Agency of Saskatchewan (WSA SK)—calls were made to involve various stakeholders in the water governance processes and management activities. These calls were made under the Section 6 of the newly created Water Security Act of 2013, which outlines the operations and regulatory responsibilities of the WSA SK [36]. These calls created the impetus for exploring collaborative planning for LD, since collaborative water governance is purported to benefit the capacity to manage water resource use conflicts and result in water reforms that benefit the users [6–9,29,37].

As such, the purpose of this paper is to present an exploratory and participatory study that engages a wide community of water users in exploring conflicts originating from diverse water uses to better facilitate collaborative planning and water governance of LD.

Water uses help to contextualize the nature of conflicts at LD. As stocks of water resources, lakes tend to have multiple uses within close proximities of a localized area, which are also competing in nature [28,29,38,39]. The competitive nature of such multiple uses of water result in conflicts among the water users, especially when they are not involved in the planning, development, and management decisions at the lake location [28,29,38,40]. To overcome the perceptive and potential conflicts, as well as contention to actual water uses, scholars of lakes and reservoir water resources have called for collaborative planning for these stocks of water resources, as an important initial problem setting phase that accedes to the participation of multi-users of water resources in decision making [23,29,40,41]. Collaborative planning refers to “an interactive process of consensus building and implementation using stakeholder and public involvement” [42] (p. 237). Unlike the rigid top-down (rational) approach to planning that is carried out for water systems by government actors alone [43,44], which has failed to establish transformational water governance and management practices in the eyes of diverse water users, and to bring about implementation of needed water reforms [1,11,25], collaborative planning is heralded as an important step for effective water resources management [42,45].

However, collaboration in water governance and management is not a panacea. Challenges that may hinder collaborative decision-making processes have been identified. Galvez et al. [1] state that these challenges are related to the starting conditions for the collaborative processes. These starting conditions have not been explored empirically for different water systems, compared to the documented research analyzing the role of the collaboration process itself, as a driving factor for successful outcomes for water management [5,6,46,47]. Consideration of the starting conditions of the collaborative process is important since it may offer valuable insights on how to successfully initiate collaborations for the various stages of water management [1,4]. Starting conditions include (i) prehistory of cooperation or conflicts, and (ii) incentives and constraints for participation in governance [1]. These two conditions are among others that have been identified as critical aspects for successful initiation, and implementation of collaborative planning, development, and management of water resources effectively [10,11,13,46].

Analysis of the prehistory of cooperation or conflicts, as a starting condition, offers insights on ongoing water-issues of concerns and builds awareness of these issues among the water users’ groups or communities. Conflicts or cooperation reflect the social-environmental interactions of the water systems at play, and the context arising from the governing regulations and policies, peoples’ needs and history, ecosystem responses, and other situational aspects that shape a particular water resource [2,7,30,48,49]. Ansell and Gash [4] state that the existence of both persistent conflicts and water issues awareness are relevant aspects for collaborative landscape setting. They also act as a powerful incentive for participation in collaborative governance regimes by water resource users [4,18]. Moreover, de Boers et al. [21] emphasized that conflicts demonstrate how the collaborating actors make use of policies and programs available to them, and how they interact with each other as a way of responding to changing conditions. They argue that collaboration is generally goal-oriented, whereby there are incentives for participation, and a vision or output to be achieved.

Incentives and constraints for participation in governance are predictors of the starting conditions for successful collaborative governance efforts as well. This is because, despite the good intention of the collaborative process itself, the governance approach (as per Ogada et al. [15] definition) may lack supportive instruments to initiate these collaborative efforts [1,21,50]. The supportiveness nature of a governance approach is exhibited by the coherence of its instruments, such as how regulatory instruments (in this paper governance instruments of interest are the regulatory instruments, which are defined as laws, and both policies and plans, which are procedural tools developed to operational-

ize the laws) reinforce rather than contradict each other in achieving water resources management outcomes that have been envisioned by the water resource users [9,13,21]. Bolognesi and Pflieger [50] have loosely defined coherence of governance as the clarity, compatibility, and interaction of public policies (broadly used to include regulations, policies, plans, guidelines, and contracts) to the water resource uses of a particular place. They argued that when the scope of such public policies fits together with the established water uses, the water users see incentives for participating in the governance of those uses. Analysis of regulatory instruments to understand the incoherence exhibited in the governance approach may help unveil the incentives or constraints for participation in collaborative governance. That is to say, the incoherence in existing regulatory instruments can reveal the ongoing paradox that creates constraints for participation in decision making by those whose water uses are not supported by the governance approach in place [15,21,48,50,51]. For instance, Ogada et al. [15] showed that, despite the existence of diverse stakeholders in the collaborative governance regime of Lake Naivasha, Kenya, only a few were active participants, while many others were ‘isolated’ from the collaborative governance processes. They went on to show those who were empowered via regulations occupied central positions in participatory tasks that contributed to decision making on the uses, conservation, and development of that lake. Those who lacked supportive regulatory instruments for their water uses and interests did not participate in the betterment of the lake. This indicates that regulatory instruments may act as enablers or hinderances in reaching success in both initiation of collaborative decision making, and implementation of those decisions.

In this paper, we argue that understanding the starting conditions, such as prehistory of conflicts and the incoherence of regulatory instruments, is pivotal to ensuring a successful initiation of collaborative planning and water governance. This argument puts forward two important contributions. First, it adds to the research that moves away from collaboration as a ‘panacea’ and simplistic assertions of collaborative processes as meeting all manners of purposes, to that which considers nuanced understanding of the specific empirical context in which such collaborations may occur. Second, it contributes to the revelation of contextual starting conditions from those who would tentatively shape a collaborative governance effort. What has tended to occur, which has contributed to the growth of uncritical research which treats collaborations as a ‘panacea’, is gathering lists of lessons learned with limited understanding in which water governance process or management activities transformational changes are expected to occur when collaboration is formed. Such limitations have resulted in minimal implementation success and practical application of these gathered lessons [13,20,46].

The next section, the LD case study is elaborated. This section is divided into three sub-sections noting the lake’s physical characteristics, the LD region and the evolution of governance regulatory instruments pertaining to water resources management in SK and LD, respectively. Section 3, on methods, describes the data collection and analysis with emphasis on the participatory approach of the study design and the description of community of water users of LD. Section 4 provides key results. The discussion of results in Section 5 highlights the lessons learned for advancing collaborative planning for LD and provides a way forward on how collaborative planning can advance governance and management of LD under the new coordinating mechanism, the WSA SK. The conclusion presented in Section 5 demonstrates why it is necessary to move from the current status to a future where the lake is sustainably governed and its multi-uses are well managed. It also elaborates how the understanding of the starting conditions, specifically the prehistory of conflicts in the LD region, can advance collaborative planning for the lake.

## 2. LD Case Study

### 2.1. Physical Parameters of the Lake

The physical parameters of LD in Table 1 show its size as a large lake. Some of the dimensions of these physical parameters, such as watershed drainage area, its area of

coverage, maximum depth, and storage capacity, are comparable to the dimensions of the Great Lakes of the North America, particularly Lake Huron and Lake Erie [52]. The shoreline length is similar to that of Lake Ontario, which provides numerous opportunities for essential recreation for both personal enjoyment and economic activities [52]. As such, given these dimensions of its physical parameters, LD is a significant water storage, supply, and distribution system, occupying a vital role in meeting the social, economic, and environmental needs of the multiple water users in the Canadian Prairie region.

**Table 1.** Physical parameters of LD showing its size as a large man-made lake.

Physical Parameter	Size
Area coverage	430 km <sup>2</sup>
Watershed drainage area	126,000 km <sup>2</sup>
Shoreline length	760 km
Maximum depth	58 m
Elevation (above sea level)	552 m
Storage capacity	9.4 billion m <sup>3</sup>

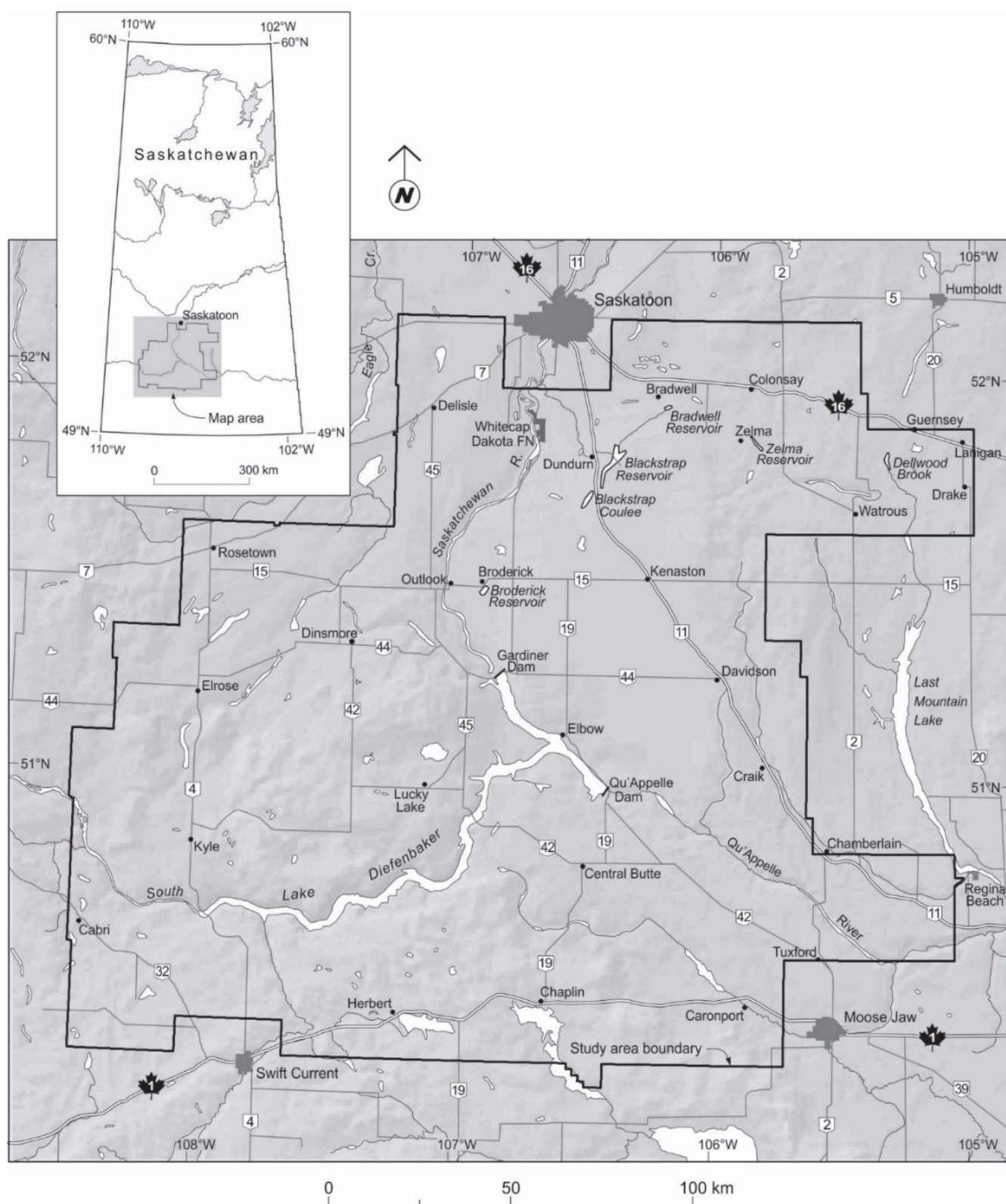
Sources: [31].

The lake is situated within the South Saskatchewan River (SSR) (Figure 1). As a bifurcation lake, it has one dam, the Gardiner Dam, along the SSR, and another—the smaller, earth-filled Qu’Appelle Dam—that blocks the lake along the Qu’Appelle River (Figure 1). The Gardiner Dam’s main purpose is to produce hydroelectricity as well as act as an important flood-controlling infrastructure along the SSR [35]. The Qu’Appelle Dam also controls water that is further diverted from LD through inter-basin transfer into the Qu’Appelle River basin (upper and lower sections), where a system of lakes also exists (Buffalo Pound, Last Mountain, The Four Fishing Lakes—Crooked, Echo, Mission, Katepwa, and Round Lake). Particularly, the Qu’Appelle River basin is home to 16 bands of the First Nations of Canada [53], who rely on the lakes found within this basin for multiple uses as well [53]. These bands are: Kawacatoose, Gordon, Muskowekan, Piapot, Muscowpetung, Pasqua, Standing Buffalo, Peekeekisis, Okanese, Star Blanket, Little Black Bear, Sakimay, Cowessess, Kahkewistahaw, Ochapowace, and Carry the Kettle [53]. Even further, the lake is connected via underground pipelines to smaller reservoirs, including Broderick, Blackstrap, Bradwell, Zelma and Dellwood, to facilitate water distribution within the demarcated region (Figure 1).

## 2.2. LD Region

The lake forms a complex water supply and distribution system connecting natural and man-made infrastructures over an expansive area in Southern SK. The study area, which is termed the LD region, includes the region directly serviced with water supply from LD and the lake location (Figure 1). The LD region lies within the Canadian Prairie region that crosses two ecoregions. An ecoregion is a geographical location identified by topography, climate, vegetation, and other easily recognized natural patterns of the landscape [54]. These two ecoregions are the moist mixed grassland and mixed grassland with a flat topography. The two ecoregions have few natural areas due to their long history of agricultural use [54,55]. The mixed grassland ecoregion represents the driest area of SK with an absence of native trees and scarcity of permanent water bodies. Annual precipitation in these two ecoregions is between 200 mm–500 mm, and it frequently experiences droughts [56]. There were also two recent floods—in 2011 and 2013—that occurred in this region [57,58]. These droughts and floods in the recent years are exacerbated by the changing climatic conditions, which also suggest a looming water resource availability crisis in the near future [56–59].





**Figure 1.** Study area of the LD region showing the man-made lake itself, the rural municipalities (RM) boundary (blackline) and the three major cities of Swift Current, Moose Jaw and Saskatoon (darken locations outside the RM boundaries). Map created by Keith Biglow, University of Saskatchewan cartographer.

The land mass within the LD region covers 35 rural municipalities, 44 villages and towns (urban municipalities) and three (3) cities of Saskatoon, Swift Current and Moose Jaw. Throughout the lake's 760 km shoreline there are three (3) provincial parks, four (4) regional parks and ten (10) resort villages [60]. Even though there are Treaty Land Entitlement (TLE) parcels and reserve lands for First Nations (In this paper the term First Nations is used to describe Indigenous people who are one of the three groups of Indigenous peoples recognized under Canada's Constitution. It is important to note that from a legal standpoint, First Nations have specific rights that are *sui generis*, i.e., a distinct set of inherent rights that existed prior to European colonization of what is now Canada. Indigenous scholars show that these rights confirm self-determination of First Nations as nations, outside the Indian Act, which is imposed by the Canadian state upon them, and this Act affects water rights and water resources governance participation [61–63]. Full water rights and water governance in Canada is beyond the scope of this paper) of Canada within the SSR watershed [61], only one reserve—residence or settlement of a community of First Nations—the Whitecap Dakota First Nation (a non-treaty First Nation), exists within the spatial boundaries of the study area (Reserves are governed by the Indian Act, and residence on a reserve is governed by band councils as well as the Canadian federal government [64]. First Nations see themselves as having retained the rights and responsibilities of nationhood, because they never relinquished their traditional territories, and therefore they have nations that pre-existed, and still continue to exist, despite European colonization of Canada). It is located 26 km south of the City of Saskatoon. It draws its raw water from the same canal system which extends water from LD to the City of Saskatoon; however, it treats the water at an onsite Integrated Biological Reverse Osmosis Membrane (IBROM) water treatment plant, for commercial and residential uses within the reserve [65].

The water uses of LD are rapidly changing, driven by economic, social, and environmental needs [34,66]. The lake supports intensive agricultural economy within its region. As of 2010, about 100,000 acres of both two (2) privately operated irrigation schemes and nine (9) provincially operated Irrigation Crop Diversification Corporation (ICDC) existed. These irrigation schemes are supplied with water from LD and represent approximately one third of the total irrigated land (342,064 acres) in the province of SK [67,68]. Moreover, there is now a newly approved multi-phases hydrological development infrastructure, which proposes to construct two new canal systems that will withdraw more than 850 million cubic meters of water from LD to irrigate another 500,000 acres of specialty crops over the next 50 years [69].

Alongside irrigation, industrial development is on the rise, and with it comes withdrawal of water for several purposes. Industrial volumetric amounts withdrawn are not released to the public [61]. Industrial water withdrawal has remained a controversial issue in SK especially given that the largest industrial sector is potash mining [70,71], which has a negative public perception because of environmental impacts such as water contamination and excessive water consumption [67,71]. Finally, there is ambiguity surrounding the current management of the fish farm located in LD. Concerns raised elsewhere about fish farming includes spread of disease from farmed fish to local fisheries; predation of fish fry by accidental release of farmed fish, excessive nutrient loading into the lake from fish feed and feces, and changes in fish behavior (fidelity) due to interaction of caged and non-caged stocks [72]. Overall, the aridity of the area, and the changing economic, social, and environmental demands, all point to the importance of effective LD water governance and management to ensure its sustainability into the future.

### 2.3. Evolution of Water Resources Governance for LD in Saskatchewan

Historically, water management in the province of SK was based on an institutional discretionary approach, whereby water resources governance did not always follow regulatory instruments, but was rather negotiated and harmonized between authorities responsible for some aspects of water resources management and their identified stakeholders [73,74]. For example, the SK Ministry of Environment and the SK Watershed Authority (SWA)—the

predecessor of the WSA SK—had similar responsibilities of “coordinating, developing, promoting, and enforcing policies and programs relating to the conservation, preservation, management, protection, and development of water resources” [75] (p. 3). This discretionary approach was meant to create complementarities between these two provincial water authorities; however, the very nature of their horizontal interaction (same level within a polycentric governance system), brought about unclear expectation in the managerial and procedural rules for conducting management activities “on the ground”. As a result, incoherence in terms of the extent to which they should conduct their obligations with their respectful stakeholders surfaced.

The newly formed WSA SK has inherited some level of this previous informality, however, it has a more specific mandate compared to its predecessor, the SWA [70,76–78]. This mandate states that the WSA SK ideally “ensures water management and decision-making processes are coordinated, comprehensive and collaborative” [78] (p. 12). Its responsibilities include to manage the province’s water supply, protect water quality, ensure safe drinking water, ensure treatment of wastewater, manage the operations and maintenance of dams and associated water supply (conveyance) channels, and to help reduce floods and droughts impacts to communities at risk [77]. This being the case, learning of the existing incoherence from historical and current regulatory instruments to reveal incentives and constraints for participation by stakeholders of interest in the governance of LD is of essence to elucidate the starting conditions that would favor collaborative planning for LD water uses. Menard et al. [51] have observed that when the discretionary approach to decision making operationalizes well intended policies in governance regimes that have both formal and informal institutional approaches, confusion tends to occur causing misalignment and favoring clientelist decisions making processes to manifest. This clientelist tendency distorts the implementation of the needed water management activities and may act to undermine the existing well-functioning regulatory instruments.

The LD was constructed before many of the existing provincial water management Acts and regulations were enacted [73,79]. It was constructed during a time when water running freely downstream of the SSR was considered as being ‘wasted water’ [66]. This was also during an era when large dams as means of storing water did not utilize the full scope of both environmental regulations nor the considerations of the water users’ concerns as important sources for understanding the challenges of both water management and dam operations [66,80,81]. Table 2a,b below shows the main Acts and regulations during the two phases, which are the SSRP construction phase (1958–1967) and post-SSRP phase (1969—current to 2020), respectively.

**Table 2.** (a). Foundational water resources Acts and regulations in SK: During the SSRP construction phase. (b). Foundational water resources Acts and regulations in SK: Post SSRP phase (current to 2020).

(a)		
Water Governance Instruments During the SSRP Phase		
Acts and Regulations	Governing Authority	Responsible Areas for Management
SSR Development Commission Provincial Act of 1958	SSR Development Board formed between 1960 and 1963 by provincial and federal government representatives	For developing the shoreline of LD and acted as a coordinating agency for the Conservation and Development Branch of the Department of Agriculture. It also coordinated the federal government’s involvement in SSRP.
SK Water Resources Act of 1964	SK Water Resources Commission	Outlined responsibility for hydroelectricity, water rights and development of irrigation districts. The Commission also began water planning processes.



Table 2. Cont.

(b)		
Water Governance Instruments Post SSRP Phase		
Acts, Regulations, and Agreements	Governing Authority	Responsible Areas for Management
Master Apportionment Agreement of 1969 (AB, SK, MB)	Multi-government representative board formed in 1948.	Water allocation among the three provinces of AB, SK, and MB to ensure volumetric allocations from the SSR are met.
Conservation and Development Act of 1978 (amended in 2005 to SK Watershed Authority Act of 2005)	Department of Environment which was formed in 1972. After amendment, SK Watershed Authority (SWA) formed in 2002.	Facilitated infrastructure development such as dams and canals. It also facilitated development of agricultural land such as diversion of water to more irrigation districts and land drainage. Identified areas for conservation purposes. Responsibilities carried forward from previous acts.
Crown Corporation Act of 1984 which legislated the formation of specific crown corporations act: Saskatchewan Water Corporation Act of 2002, (amended in 2004 and 2005)	SK Water Corporation formed in 1983. Water Appeal Board formed in 1983.	To manage, administer, develop, control, and protect the water and related land resources throughout SK. To promote the economical and efficient use, distribution and conservation of the water and related land resources of the province; and to maintain and enhance the quality and availability of the water and related land resources for domestic, agricultural, industrial, and recreational purposes. In 2002 the SK Water Corporation (SaskWater) began ownership and operations of the water works in most communities except in two major cities of Regina and Saskatoon where the municipal water works are operational. The Water Appeal Board was specifically responsible for drainage permits applications and flooding complains from dams operated by the SK Water Corporation.
Public Health Act of 1994 (amended 2002) under which formed: Health Hazard Regulations of 2002	Regional Health Authorities under the SK Ministry of Health.	To direct drinking water safety and to monitor compliance in semi-public works to ensure community health.
Environmental Management and Protection Act of 2002 under which formed (amended 2010): Water Regulations of 2002	SK Ministry of Environment.	To regulate drinking water systems which have flow rate of over 18,000 litres or more per day. To protect the air, land, and water resources of the province through regulating and controlling potentially harmful activities and substances.
Saskatchewan Watershed Authority Act of 2005	(SWA) formed in 2002.	Issuing surface and groundwater permits for water allocation for various water uses (except domestic/municipal) and diversion. The establishment of reservoir development and special flood hazard areas, and handling complains regarding drainage works. Formed 29 watershed committee which consisted of watershed councils and SWA officials to create source water protection plans for drinking water. These plans, however, do not have regulatory authority, but instead identify issues and recommend regulatory and program needs where completed.
Water Power Act of 2005 (amended 2018) Water Power Regulations of 2016 Water Power Rental Regulations of 2018 (amended 2020)	SWA formed in 2002.	To control the development and use of Hydropower, which includes licensing dam construction and commission. The Water Power Rental Regulation established a new charge scheme for water used to produce every megawatt hour of hydroelectricity.

Table 2. Cont.

(b)		
Water Governance Instruments Post SSRP Phase		
Acts, Regulations, and Agreements	Governing Authority	Responsible Areas for Management
Water Appeal Board Act of 2005	Gave SWA rights over the management of Water Appeal Board formed in 1983.	To hear appeals regarding drainage for agriculture and any other wetlands drainage for infrastructure development.
Water Security Act of 2013 Industrial Water Use Amendment Regulations, 2020	Water Security Agency of SK (WSA SK) formed in 2013. Water Appeal Board formed in 1983.	<p>The WSA SK replaces SWA. The agency may reallocate water to meet instream flow needs by canceling or not renewing licences granted after 1984. In addition, the WSA SK follows the corporate format of the SK Water Corporation in terms of issuing water rights for use. It has a wide scope in terms of mandate: “Lead management of the province’s water resources to ensure safe sources for drinking water and reliable water supplies for economic, environmental and social benefits for SK people” (SWA, 2012b, p. 1)</p> <p>WSASK has also taken the responsibilities of ministry of the environment under the Environmental Management and Protection Act of 2002. This is now responsible for fisheries and fish habitat. Amends the responsibilities under the Water Appeal Board Act of 2005 to be considered under the Water Security Act of 2013.</p> <p>To address shoreline and riparian alteration permits and potential impacts on aquatic habitat. The Industrial Water Use Regulation of 2020 empowers the WSA SK with ability to change industrial water use charges.</p>
The Water Security Agency Amendment Act of 2017	Water Security Agency of SK (WSASK) formed in 2013.	<p>Addressing the Agricultural Water Management Strategy in areas of drainage works such as licensing and complain handling.</p> <p>Removes agricultural water complains going through the Water Appeal Board.</p>

Sources for Table 2a,b: [36,73,74,79,82,83].

As indicated in Table 2a,b, there have been very few governing instruments for LD despite the significance of LD as an important water storage, supply, and distribution system. The SSR development board that existed between 1960–1963 was assigned a mandate for operations related to LD during the construction, but did not set any operational rules governing future access or use for the water resource [33]. Under the SK Water Resources Commission, which was the provincial government authority that provided oversight for hydroelectric production, a new legislation—the SK Water Resources Act of 1964—was created to outline responsibilities patterning to the newly constructed Gardener Dam. These two oversight bodies did not manage any other aspects of LD during the SSRP-Construction phase (Table 2a), showing under-regulation of water uses that may have arisen from this newly constructed hydrological development infrastructure (a lake and its associated large dam). It is well established that when a new lake and a dam are formed, stakeholder interests and additional demands also appear [28,38,81]. As such, a lack of complementing regulatory instruments to such demands propagated the fragmentation of such instruments. Such fragmentation led to a lack of clarity and integration, which initiated contradictions among the existing regulatory instruments [13,21,50,73]. The lack of clarity and integration of existing regulatory instruments to water uses introduced a problem of incoherence in governance [10,13,50,51] and muddled the vision of how to proceed towards the management of LD.

More regulations came about for water resources management in the province of SK during the post-SSRP phase (Table 2b). Even though this was a case, incoherence in regulatory instruments for LD water multi-uses continued to be observed during this phase (Table 2b). For instance, when the SK Water Management Framework was developed by the provincial government in 1999 [84], there was continued absence of the lake's management and governance directives. This framework emphasized the importance of source water protection for just drinking water, ignoring other uses of LD that have evolved dynamically. For example, this lack of specific regulatory instruments left LD vulnerable to inconsistent management decisions by the Gardiner Dam managers, who dictated the actions required for its operations [32,58]. Kennedy [80] has identified that internal management decisions by dam managers rarely recognize the other water users nor do they reflect the impacts such decisions they may have on both water quality and quantity within the basin, and to the downstream communities. Such inconsistent decision making has been ongoing for LD, as reported by Pomeroy [85] following a review of LD management and Gardiner Dam operations in 2011. For example, it was revealed that a comprehensive water use master plan for LD that considers all its uses has never been prepared. A water use master plan generally contains the level and types of activities such as water allocation, as well as outlines the levels of impacts permitted for a water resource such as a lake [86,87]. As such, the management of LD continued to be narrowly focused and not aligned with the ongoing water uses, while excluding the participation of the water users due to incoherence among the existing regulatory instruments and the water uses in the first place. Henceforth, it can be seen that the lack of ongoing planning, management, and overall governance efforts has resulted into LD being 'stuck' in top-down, state-centered, command-and-control management [80,81], while water uses are expanding and water users' dynamics within its region are constantly changing. These water users' dynamics and the historical governance and management of LD cause various levels of water use conflicts.

### 3. Methods

The methodology employed qualitative research design guided by a participatory approach. This participatory approach offered a way of collecting contextual details from a community of water users within the LD region, to examine LD water multi-use conflicts and contentious issues.

#### 3.1. Definition and Participation of the Community of Water Users

In water resources governance, planning, and management, the term community has long been understood to mean a community of meaning and interest, which emphasizes a common purpose instead of a specified group of individuals bounded by politico-administrative boundaries alone [13,88–90]. Even further, in times of water crisis or when ongoing conflicts are propelled by environmental water concerns such as droughts, floods or over-allocations, Bouilly [90] showed that rarely is 'community' formed from a pre-defined geographical area alone, but rather, is issue driven, interactive, and maybe short-lived. Furthermore, as shown by Dalby and Mackenzie [91], the contemporary literature on community and identity formulation suggests that the dynamics of conflicts as an outcome of resource use are important parts of the process of community formation.

For this exploratory study, the term 'community of water users' was defined as per O'Fallon and Dearry [92], whose definition encapsulates what the region of LD represents. It was defined as "a socially constructed network, whereby the individuals have a sense of identification and emotional connection to a place and other members through common interests and commitment to address shared concerns" [92] (p. 157). This community of water users is therefore normative. Its corollary goal is to demonstrate that it is impacted by the LD governance and management decisions or lack thereof. Inversely, its water uses impact the sustainability of the water resources of LD, as well as other downstream users. It consists of various individuals, and individuals within organizations found in the LD region (Section 2.2). It is comprised of farmers, irrigators, cottagers, aqua-culturists,

outfitters, various industries, and business owners. Hence, the community of water users constitutes a necessary social-environmental interaction, which is well positioned to reveal the conflicts and contentious issues related to LD water uses from diverse voices.

Moreover, the methodology employed in this study follows participatory approaches in natural resources governance and management. In such fields of study, the purposes of the participatory approaches is to emphasize ‘voices to influence’ decision making that may lead to contributions in social processes, governance instruments (i.e., policies, plans, and regulation) or in desired environmental outcomes for the communities involved [6,7,13,17,18,47,93]. In his review of participation, Cornwall [94] emphasized not only the need for deep and wide participation, but also for having specificity on the activity for which participation is considered, so as to identify the important community to invite to the decision making ‘table’. In this research study, this specificity is anchored on the process of collaborative planning.

In recent years, there has also been an emphasis on deeper and wider community participation in collaborative water governance of mature democracies, beyond the ‘rhetoric of participation’, so as to go beyond the collaboration panacea [1,46]. Moving beyond panaceas and formulaic goals emphasizes the need to examine issues from context and pragmatism, which bring about needed nuances to the understanding of water resources’ governance and management, such as for LD. The nuanced understanding of the prehistory of conflicts within the LD region is analyzed by engaging its community of water users. In Canadian water governance and management regimes, wider and deeper participation is also overlaid with important questions of how the First Nations of Canada can effectively participate in water resource decision making on-reserve and beyond, so that they can access water for their needs [61,62,95]. The jurisdictional separation between federal government responsibilities for on-reserve and other Crown lands, and the provincial government responsibilities outside these demarcations, has created a patchwork of regulations and other non-statutory instruments (such as land codes) that cause impasses for deep participation by the First Nations of Canada [61–63,95,96]. For SK, Baijus and Patrick [61] clearly state that the jurisdictional divide potentially excludes the First Nations of Canada from provincial planning practices, due to the partitioning of watershed planning according to political boundaries and property lines.

### 3.2. Focus Groups Data Collection and Inductive Thematic Analysis

Focus groups were the main method of qualitative data collection. Focus groups allow for novel ideas to be discussed by a range of stakeholders, often with divergent perspectives [97,98]. This method permits participants to speak their mind on various views and allow them to bring up any issue they feel is important or significant, which can result in many perspectives on issues [98]. A total of nineteen (19) focus groups and two (2) interviews were conducted with ninety-two (92) community of water users in the LD region (Table 3). Two (2) interviews were organized to accommodate participants whose schedules conflicted with all organized focus group sessions.

To further ensure interested participants could be reached easily, a system of zones was used to select meeting locations. Eight zones were created that traversed the entire LD region (Table 3). One off-site focus group was conducted to accommodate those who were from LD region but had employment responsibilities in the province’s capital city of Regina.

Recruitment of participants was extensively done for a period of 6 months. Non-re-entry was used as a control measure for enhancing external validity, improving participants’ representativeness, and reducing ‘elite biases’—well informed and high-status individuals who can influence the goals of the focus group by ‘hijacking’ the conversation to lead towards their individual or specific group mandate [97]. Direct and indirect recruitment approaches were used. Direct approaches included research poster (which included research purpose and contact information of the main researcher) display at churches, libraries, villages and rural municipal offices, inns, and motels within the study area. It also included cold-calling individuals listed in public local telephone directories, village and

town councils' websites, business websites, and government directories. In addition, both emails and postal mail invitations to businesses, watershed groups, and non-governmental organizations were sent out as well.

**Table 3.** Zones, locations, number of sessions and total number of participants who took part in the focus groups and interviews.

Zone	Sessions Per Zone	Number of Participants
1: Saskatoon and Rosetown (Includes 1 interview)	6	23
2: Conquest and Outlook	4	15
3: Elbow	2	9
4: Colonsay and Watrous	2	4
5: Demaine	1	5
6: Swift Current	1	6
7: Riverhurst	1	12
8: Moose Jaw and Central Butte (Includes 1 interview)	3	11
Offsite: Regina	1	7
Total	21	92

Two indirect recruitment approaches were applied. The first was 'snowballing' via requests to individuals to refer others, and organizations to let their representatives participate [91]. For example, a recruitment poster was emailed to invite the Federation of Sovereign Indigenous Nations (FSIN), which represents 74 bands of the First Nations People in the province of SK (<https://fsin.ca/> accessed on 30 May 2021) given that a direct attempt to invite on-reserve communities of First Nation Peoples was not successful due to the above inferred jurisdictional complications. However, this indirect approach was an important consideration for three reasons: (i) most of the Canadian water governance regimes (both federal and provincial processes) do not recognize Indigenous water rights and responsibilities of the First Nations of Canada that predates the colonization of the Canadian state, resulting into 'water tension' between the Canadian State and the nationhood of the First Nations [95,99]; (ii) the historical disproportionate effects that water contamination and insecurity has on the First Nations People of Canada, resulting into inequitable water supply and distribution for their uses [95,100]; and event more specifically, (iii) the lack of effective consultation regarding water governance and management decisions that considers needs of First Nations People at local levels, in both urban and rural areas of the province of SK [96,100,101].

The second indirect approach used was a delivery of presentations about the study to environmental and planning groups as well as research groups within the study area, which included: Saskatchewan Environmental Network, WaterWolf Planning Incorporated (a district planning commission for rural municipalities within the study area) and the Safe Water for Health Research Team (a conglomerate of several water research hubs which operate within the study area: (<https://sph.usask.ca/research-and-training/sph-research-units.php#SafeWaterforHealthResearchTeam> accessed on 2 May 2020).

Focus group sessions ran between 45 min to three (3) hours. All questions were open-ended to allow maximum input from participants and included topics such as: the importance and meaning of water to the participants, water resource issues of concern and which caused conflicts to the participants, and on their understanding of the multiple uses of the water resource from LD. All focus groups and the two interviews were transcribed separately in Word documents and analyzed following thematic analysis and grounded theory with the use of Nvivo 10 and 11<sup>®</sup> software [97,102]. Themes are derived from the data either inductively, by isolating patterns and processes found in it, or deductively from a pre-existing prepared codes that align with the noted patterns and process in the collected data [97,103]. The themes can then be interpreted and reported as research findings and contribute to new knowledge for a given research topic. Thematic analysis



of water resource issues and concerns from diverse research participants is a common practice when discerning and establishing significant perspectives that inform a research topic [95,96,104].

Grounded theory analysis is a social science approach that enables inductive generation of qualitative data from semi-structured and unstructured discussions carried out with research participants [103,105]. Through this process, these discussions undergo data condensation, whereby their ‘meaning’ from discrete facts and propositions offered by participants are organized in a decisive manner, such as by the use of codes [97,102]. This process of condensing data is part of analysis rigour that helps to draw conclusions and verify research evidence that ties more than one participant’s discussion to the topic being studied [97]. The tying together of research evidence shows saturation of major themes and integrates the meaning collected to form a theory—a new knowledge about the topic under study beyond the list of themes themselves [103].

Nvivo 10 and 11<sup>©</sup> software were utilized in this inductive grounded theory analysis to delineate specific trends and patterns observed in the text fragments of the focus groups and interviews transcripts. Codes were used to capture plausible meanings and enable further synthesis of the rich qualitative data collected from ninety-two (92) participants. According to Birks and Mills [103], a code is a “form of shorthand that researchers repeatedly use to identify conceptual reoccurrences and similarities in the patterns of participants’ experiences” (p. 173). The Nvivo 10 and 11<sup>©</sup> software allow the creation of such codes from various qualitative data inputs to demonstrate the scope and depth of data by ensuring the range of context, perspectives, timeframes, view of actions of participants, and richness within the data are captured in the produced codes [102,103]. The use of codes helped to categorize and organize themes, which further helped in the demonstration of research evidence, interpretation of the collected data, and also in minimizing some degree of fuzziness that is commonly understood to be the case for semi-structured and unstructured discussions such as in interviews and focus groups (unlike a structured survey questionnaire) [102,103,105]. After a series of coding levels, final core codes were generated. These were taken as emergent themes for reporting and were interspersed with several quotes from the participants to demonstrate the perspectives captured [97,103]. These were kept anonymous to protect the participants’ privacy as specified in the ethics protocols for the conduct of research. Given the richness in the discussions, ninety-two (92) participants were sufficient to demonstrate themes saturation, richness of contents and perspectives within the data [97].

#### 4. Results

Seven (7) themes emerged from the data analysis (Table 4). The themes are arranged in Table (4) according to the frequency of how many sessions out of 21 sessions, and how many participants out of the total 92 participants discussed them. Both the frequency of focus groups and the number of the participants in those sessions emphasize the magnitude and the importance of a particular water use as a theme. It should be stated that within the focus groups, the same participants may have expressed agreeable views on one water use and opposing views on another, constituting an axis of conflict between themes. As such, for each of these seven (7) themes, the various participants perspectives are revealed, showing differing and confounding dichotomies which emphasize the contention and conflicts within LD water uses. These themes are further discussed below in light of informing starting conditions for initiating collaborative planning for LD.

##### 4.1. Irrigational Water Use

Two important concerns emerged over irrigation. The first one was the fact that some participants saw that there was competition between irrigation and municipal/residential water usage. As one participant explained, “Earlier agreements for irrigation outfits that were set up have resulted in priority over portable water usage and compete with

it". Similarly, another participant expressed the fear of excessive water withdrawal for irrigation and said,

"If I wish to irrigate, I pay a \$10 permit to drop a pump in, and there's no limit of what I can remove. This worries me when I think about [what will happen to] our drinking water when they keep on expanding irrigation".

On the contrary, other participants did not see that irrigation possessed a threat. One of these participants stated "We have millions and millions of dollars of irrigation potential sitting wasted," then added "With the quantity of water in Lake Diefenbaker, we can irrigate another five hundred thousand and that really makes no significant effect on the volume of water that flows through the lake on a yearly basis". In general, participants' concerns about the over-allocation of water from the lake were polarized. This polarization is the source of potential conflict, given that the processes by which water use priorities are determined are unclear to participants.

**Table 4.** Emergent themes and statistics of those who discussed the themes.

Theme	Number of Focus Groups That Discussed the Theme	Frequency of Focus Groups That Discussed the Theme	Participants of the Focus Groups That Discussed the Theme
Irrigation water use	21	100%	92
Industrial water use	19	90%	87
Reservoir water level for flood control and Hydroelectricity	19	90%	89
Sewage and lagoon management	18	86%	66
Recreational water use	17	81%	74
Regional water development projects	15	71%	69
Fish farm operation	15	71%	63

The second concern regarding irrigation water use involved maintaining sufficient environmental flow for the SSR. Participants saw the expansion of irrigation as potentially devastating to the lake and its environment. One participant noted that "I think the debates that would have to happen now would be to think as a society—are we going to have adequate flow?" Another added: "My concern is that government tends to look at the original uses and weight them based on their priority back in the early 1970s. I believe that certainly some uses have changed dramatically". This participant concluded by saying "I think there should be re-evaluation of the use of LD to include environmental needs".

#### 4.2. Industrial Water Use

A dichotomy of perspectives which indicated contention in industrial water use were expressed by participants. On one hand, the predominant concerns were the lack of an overarching policy that regulated the water allocation and licensing procedures for industrial use, whereby participants perceived a level of obscurity, especially in the potash mining operations. One participant remarked; "I see the biggest threat is potash mining because that industry is just huge and is really water intensive". Another participant also said, "I haven't heard or seen much analysis about how to quantify their [industrial] water use and policies. I haven't seen reports or data to give me confidence that we've got a good handle on that (water use)". On the other hand, some participants saw that placing too great a restriction on industrial water use would be detrimental to economic growth. A participant in this camp noted, "We should be having the long-term discussion on the fact that potash is keeping this province going. This is the time that we should end the blame game of one sector blaming the other". The same participant then added: "Water from this lake is important for all of [the industries] and this is their right". Both these perspectives point to the pronounced desire to provide clarity to participants about water allocation of LD for industrial use.

#### *4.3. Reservoir Water Level for Flood Control and Hydroelectricity Production*

Participants believed SaskPower, the provincial power generator that operates the Gardiner Dam located on LD, did not share appropriate and timely information about water flow changes, and consequently flood control options. This opinion was voiced in light of the devastating 2011 flood [85]. This perspective was commonly voiced and seen as unfair treatment of downstream lake communities who experienced the devastation as one participant commented by saying, "... somehow there has to be [a] very concerted effort of coordination. I mean this system the way it is right now, we're seeing it's not working". Another participant added: "I think the main challenge to the lake [flood] level is power generation. [SaskPower] maybe was a little too greedy with that". This participant further added, "Maybe that has to change; we need to sit and talk and understand other users that are impacted by it [the Gardiner dam]".

Participants also expressed their disapproval of the operation of Gardiner dam outside the flood period, due to consequences of the water levels and speed with which water is released. This is because these two aspects produce slumping of lake shore edges, which increases silts and sediments that damage the water pumps and filtration devices that are widely placed in the lake for residential water pumping. A participant stressed this concern and said, "When the level fluctuates, the filtration get plugged and it's difficult to control the filtration system and that impacts the water quality at our homes" and then added, "... When the lake level hits low like it is right now, we are left with 100 feet from an intake, and we can hardly pump water". These statements provide insight into how the hydroelectricity production schemes and fluctuating water levels (real or perceived) directly impact water supply in the region, resulting in further contention between residential water users and the hydroelectricity generation authority.

#### *4.4. Recreational Water Use*

There was perception of conflict on how much recreational development should be pursued for the lake without impacting on its value to those who live close by it. Some participants supported the idea of maximizing recreational uses. As this one participant explained, "To me, it means a very important resource in an area of the province where there is not a lot of water. It's a drawing card and selling point for tourism into the area". Then added, "It is a huge resource and if it were any other place in the world, it would be far more utilized for cottage development, and recreation," then conclude, "It's just a huge resource that we don't fully use for that purpose". Other participants, however, were concerned and opposed to further development of the lake as a touristic attraction. A participant stated: "I don't know how that would affect the whole area, whether it will remain just as it is right now or maybe not," while another participant elaborated about the fear around reckless tourism growth in the area and said:

"I cross the lake to get home every day, and right now, the amount of ice fishing that is out, I probably could count between fifty and sixty ice jacks; and in the summer, the number of boats that go up and down to the lake is immense, and definitely recreation is not governed very well here".

Both these views demonstrate a spectrum of contentious issues surrounding recreational water use that need further planning. Some participants within the community of water users want to preserve the serenity of the lake for personal enjoyment; some want to see rapid tourism growth; and still others would prefer to have control parameters for tourism set first, prior to expansion.

#### *4.5. Wastewater and Lagoon Management*

There are infrastructure and human resources capacity gaps identified by participants in areas of wastewater and lagoon management. Due to these gaps, the community of water users expressed anxiety about possibilities of biological pollution to the water of LD that would go undetected while having a negative impact on their health. On infrastructure capacity lag, one participant said, "Our municipalities don't have the teeth to dig in and

do proper infrastructure, so we are still operating septic tanks on the banks and lagoons that aren't properly lined". This participant went on to say, "Who knows if these things are already affecting our water?" In terms of human—resources capacity gap, the expressed concerns were that there are currently inadequate public health officials to enforce compliance to the quality of effluent discharged into the lake as well as monitoring of defective lagoons within small municipalities surrounding LD. Such lack of personnel capacity is feared to have caused human health problems as indicated by this other participant's statement: "Sewage disposal is always a big obstacle here and pretty much guarantees that some of it is in the lake". Then the participant added:

"We can get to a point where we are going to be seeing a lot more health impacts and just general water quality deterioration. We could find out, but we just don't know because there is nobody working to find that out".

Such pragmatism about capacity gaps in infrastructure and public health personnel exposes the need to think about public health risks in lake use planning which is not the case at the current time.

#### 4.6. Fish Farm Operation

A fish farm that has been operating in LD since 1992 remains a contentious issue. Participants in this study expressed polarized views regarding its impacts to water quality and its importance to the rural economic growth. Those who are against the fish farm operation frame their concerns in relation to drinking water safety. One participant summed these concerns by saying, "I think it's fair to say it's quite unusual to have a fish farm in a drinking water reservoir". Those in support of the fish farm see it as a vital operation with economic benefits to rural communities. One participant said,

"Polluting the lake water seems to be the biggest concern but they [who are against the fish farm] have no scientific background to support that claim. So, until there is a reason to complain, I think it's important to reserve all judgment as we need this fish farm".

While another participant added to this economic argument and said, "A business like a fish farm being located where it is, is kind of a good thing for people who don't own a farm, and if I lived near it, I would want a job". These two opposing perspectives emphasize the ongoing obfuscation of priorities of water uses of LD.

#### 4.7. Regional Water Development Projects

The Upper Qu'Appelle Water Supply Project (Qu'Appelle Conveyance), that aims to enable inter-basin water transfer through open and upland canal of 87 km from LD to another lake (Buffalo Pound Lake, located downstream along the Qu'Appelle river) [106] was a prevalent topic discussed. There was perception from participants that due to this water withdrawal, future impacts to the water of LD were not well understood. A participant expressed this view by saying, "So my concern is that I think this water project is being assessed individually, and not being assessed for cumulative environmental effect on the lake. I think managing this Qu'Appelle project as a whole [environmentally and economically] needs to be done," while another participant indicated similar concerns and stated, "I think we have to be careful of keeping our reservoir and not depleting it with this [Qu'Appelle Conveyance] project". Similarly, another participant stated the withdrawal of water by saying, "The big issue in moving water from LD into [the Qu'Appelle Conveyance] system, especially when dealing with the kind of flows we have been dealing with in the last few years, is knowing how does this affect things? It's not a simple solution as it seems". These statements show the desire for a comprehensive strategic regional development planning that encompasses a water uses plan of LD, as well as better understanding of environmental impacts of such water withdrawal to the lake.

## 5. Discussion

### 5.1. Impediments to Collaborative Planning with the Community of Water Users

Contentions and conflicts are common for many multi-use lakes [15,28,38], especially in the absence of participation in the planning, developing and managing of such resources by those who depend upon them for livelihood and well-being [28,47]. Our analysis of the divergent perspectives of whose water use is of priority in the seven water uses investigated stipulates that the existence of the prehistory of conflicts in the multi-uses of LD water are due to three shortfalls in the lake's governance and management regime to date, which are impeding the potential for a collaborative planning with the community of water users of LD at the current time. First, there is conflation of the effects of the bygone era of the LD governance and management, prior to the formation of the WSA SK as a coordinating authority, which have continued to impose constraints for participation of the LD community of water users in decision making. The conflation is attributable to the presence of incoherence and lack of complementarity of the existing regulatory instruments (Table 2a,b) which have generated misalignment between the context of water uses to the regulatory instruments themselves. This scenario has resulted in contradictions of rules governing such water uses and excluded the users from being considered as important stakeholders [21,50,51,107]. Pahl-Wostl [13] and Lemos and Agrawal [107] have shown this phenomenon to be common in water governance and management, whereby a 'hybrid' in governance forms unintentionally and contributes to conflicts when collaboration is expected.

Second, the LD governance and management regime did not consider societal concerns of the community of water users when the lake was formed (SSR—Project period) or the period that followed (Post SSR- Project period), ignoring the water users' dynamics and concerns resulting from the social-environmental interactions with LD. As such, the rigid top-down and command -and- control governance, and the management of narrowly focused LD water uses, created water use conflicts that have been propagated into the current time as 'hot button issues'. Lubell et al. [108] have defined 'hot button issues' in water resources governance as those which create more conflicts among resource users and require forums with multiple actors (i.e., water authorities and others water resource users in the civil society) for deliberations to devise agreeable conflict resolution strategies. They argue for the need of water users' participation in collaborative planning processes if such actors perceive 'conflictual zero-sum payoffs' from their outstanding hot-button issues, a situation similar to what was observed by participants in this study. A comparable approach of learning from conflicts among water users on how to improve collaborative planning has taken place in Australia, New Zealand, and in both developing and developed nations [15,17,38]. In these places, collaborative planning was shown to be a meaningful way towards broaden the ideologies that drove the perceptions of water use problems, and improved the evidence-based decisions about water use trade-offs among various water user groups [17,90]. The participation of the community of water users of LD in steering their collaborative planning process and in negotiating their water multi-uses trade-offs will help dissipate the observed conflicts, which may improve the governance of such uses.

Third, the lack of a clear and shared vision for LD's current and future water uses, development, and conservation is another shortfall that impedes collaborative planning. As demonstrated by de Boers et al. [21], since collaborations in water governance and management are goal-oriented, if there is a lack of clearly understood vision or output to be achieved, collaborative efforts tend to fail. Furthermore, in analysis of collaborative innovations for water governance and management, Porter and Birdi [46] revealed that a clear and shared vision was a success factor for 18 of the 48 empirical papers that they reviewed. Galvez et al. [1] also showed that the lack of a shared vision caused both barriers in starting a collaborative approach and in establishing leadership for achieving collaborative outcomes in a basin ridden with water use conflicts, making long-term collaboration between water users and governing authorities impossible to achieve. The conflicts expressed by



participants of this LD study in the seven water use areas demonstrate the ongoing lack of vision and entry points for collaborative planning purposes.

In view of the above and as a means of initiating a successful collaborative planning that will acknowledge water use contexts behind contentious issues and conflicts, as well as follow a process that will build consensus in the community of water users of LD, a focus must be to: (i) improve water allocation to dissipate consumptive water use conflicts; (ii) improve regulatory instruments to fill under-regulation for contemporary water uses; and (iii) develop LD water use master plan as a shared vision to improve participation in governance. This study suggests that these three areas are starting conditions [1,4] that would enable a successful collaborative planning for the seven areas of water uses, and would ensure the current and future needs of the community of water users while avoiding reactive ways of solving water problems in the LD region.

### *5.2. Improve Water Allocation to Dissipate Consumptive Water Use Conflicts*

Consumptive water uses are those which withdraw water from a supply and distribution system such as a lake. To reach consensus, the water allocation decisions need to be reflective of diverse needs of the community of water users of LD in terms of such consumptive water uses. Water allocation schemes are responsible for determining withdrawals of water, and for sharing available water across known demand areas [86,109,110]. They set rules and procedures whereby access to and distribution of water is determined, and the priorities for water withdrawals are set [86,109,110]. Allocation of water establishes geographic or spatial patterns of water use, which can influence the types of economic activities that can have access to water, while affecting timing for usage for remainder of the water users [80]. The identified contentious issues and conflicts within consumptive water uses, such as for irrigation, industrial and residential uses, reveal the problems of water allocation and prioritization for LD, a situation which has been causing conflicts among users in Canada historically [86,111].

The current practices in SK after the introduction of the Water Security Act (2013) was to abolish seniority-based prior allocation schemes for permits issued after 1984 [83]. The prior allocation scheme had given full allocation rights to long-time and initial users such as irrigators [83]. Even though some reforms were introduced with the passing of this *Act*, obfuscation still exists in terms of re-allocation of water rights to accommodate new users such as rural residents, who now depend more on surface water withdrawals from LD [112,113] as substantiated in this study. Horbulyk [83] has long advocated for Canadian jurisdictions to reform policies that guide existing allocation to move to more flexible allocation schemes, so that similar new entrants, with new types of water uses, such as rural residents can be allocated water for their uses. It is a known fact that water allocations and re-allocations are controversial practices, especially when there is water availability crisis or looming water shortages [18,90,114]. As such, to help dissipate existing conflicts and create conditions for collaborative planning success, the WSA SK should aim for a wider participation of community of water users of LD in the water allocation decisions to improve the current allocation schemes. In this way, water use trade-offs can be discussed and decisions about priorities can occur in fair and transparent ways. Newly identified consumptive water uses may then be part of the water allocation schemes, which will help in minimizing conflicts among LD community of water users.

### *5.3. Improve Regulatory Instruments to Fill Under-Regulation for Contemporary Water Uses*

Non-consumptive water uses, such as for recreational purposes and for fish farm operations, are contemporary uses which were not greatly envisioned during LD's formation (1958 to 1967). The participants of this study have recognized the ambiguous ways the governance and management of these contemporary uses have been taking place over time, as a legacy of the SSR project caused by the lack of regulatory instruments in setting rules for such uses (Table 2a,b). Notably, the WSA SK has also acknowledged that there is still a need to better include the many values of water users to formulate a better lake

governance and management regime [31]. For instance, the seasonal water level elevation that is optimal for recreational uses is between 555–555.3 m (above sea level) during the summer months of June, July, and August [31,60]. However, at the current time, no changes to the water level above 555.3 m are made after July 1 of the year, because of the need for stable hydroelectricity production at Gardiner Dam [31]. Even further, wastewater and lagoon management were purported by the study participants as planning areas that are neglected within the LD region. Some of the study participants raised concerns over the management of these lagoons in relations to the impact they may have on the water quality of LD, and subsequently to human health and the environment. These concerns are valid to have, given the continuous struggles to meet wastewater service delivery, driven by the shrinkage of the rural communities' population size and the great distances among smaller communities in rural areas of SK [115]. As such, some municipalities share these facilities, while others utilize onsite septic tank systems.

These contemporary water uses demonstrate the expanding needs of the community of water users of LD. Heinmiller et al. [111] have shown such water uses cause contention and conflicts, since they are not easily accepted into the existing consumptive and dominant uses in multi-uses water systems. Collaborative planning that considers the dynamic context of the community of water users, together with the historical under-regulations of LD, which did not favour regulatory instruments to be established for such uses, can help legitimize these new water uses. Improved regulatory instruments can impose formality towards management of such uses, which will reduce the ambiguous and confusing ways they have been approached. When collaborative planning is poised as a process that contributes to not only economic needs, but also for the social well-being of communities of water users, such contemporary uses will find an avenue into the current governance and management regime [76].

#### *5.4. Develop LD Water Use Master Plan as a Shared Vision to Improve Participation in Governance*

To improve the participation of the community of water users of LD in the current governance regime, a strong, clear, and shared vision is required to ensure clarity to the collaborative planning process and its goals. Porter and Birdi [46] have defined a strong and clear vision as “everyone involved [in collaborative process] agrees on the purpose of the collaboration, the priorities and long-term goals, their role and responsibilities within it, and what is needed to resolve the problem at hand” (p. 103). In essence, a vision will improve the process by making collaborative planning inclusive and meaningful and create a supportive governance approach [5,9,21,42]. A shared vision for LD will help improve the perceptions of the problems, let the process be informed by the society-level dynamics and contexts of those problems (including historical barriers to participation), and embrace the diversity of information, interests, values, and knowledge which are represented in the community of its water users. A water use master plan could be the needed practical tool for the formulation of a shared vision regarding the water multi-uses of LD, especially at a strategic level whereby the water resource of the lake is linked to other development plans of the province of SK.

As shown by study participants, there is no ‘one-stop-shop’ for information on both operational aspects and environmental changes that affect LD and its water resource. Generally, a comprehensive water use master plan outlines details about water quantity demands, consumption, and impacts to ongoing water uses [73,83,116]. Crucially, these plans should be bound by water allocation schemes and supported by regulatory instruments, similar to other Canadian jurisdictions, such as in British Columbia, where water availability crisis has proven the needed support of such instruments to ensure the plans' effectiveness [76,116,117]. To inform such a plan for LD, two strategic uses, namely, the hydroelectricity production at Gardiner Dam [85] and the inter-basin hydrological transfer infrastructures linked with the Qu'Appelle River basin [106], should be considered in relation to impacts to the identified consumptive and contemporary uses of the lake. For example, Pomeroy [85] revealed the overdue need for a clear Gardiner Dam operational

strategy, which has also been identified by the study participants as a contentious issue. Specifically, the study participants questioned whether the hydroelectricity production at its current operational timing and rate were sustainable for all other uses of the lake that have evolved over time. Presently, the water stored in LD over the summer months is drawn down in late August to meet high power production demands in December, January, and February [33,85]. It was indicated by study participants that this current operation of the Gardiner Dam, which has not been modified since the lake's creation [33], affects the recreational uses as well as the optimal way the SARWP infrastructures can pump and supply water for growing residential uses.

The proposed Qu'Appelle Conveyance project, which aims to divert the lake's water into the Qu'Appelle River basin, renewed concerns among study participants regarding its impacts to the water resource of LD. Such concerns are bound to grow with an approved construction of another dual canal system that will withdraw more water from LD to supply irrigation over the next 50 years [69]. It is estimated that the amount of water transfer to the Qu'Appelle River Basin is expected to increase by 736% from the 2010 level [34]. Cooley et al. [87] proposes that such inter-basin water transfer can be consensus-based and agreeable among multi-users when a water use master plan exists for: (1) creation of flexible allocation strategies and water quality criteria; (2) agreement on response strategies for extreme events, such as floods and drought; (3) development of clear amendment and review procedures to allow for changing hydrologic, social, and climatic conditions or in response to new scientific knowledge; and (4) establishment of joint management institutions that can, for example, facilitate a climate vulnerability and adaptation assessment. These considerations offered by Cooley et al. [87] are important in light of the consequences to the Qu'Appelle River downstream users, especially the 16 bands of First Nations People who reside in its basin and are already having to contend with water quality degradation due to the current scheduling of water transfers between LD and this basin [70]. As such, a water use master plan for LD is a transparent way of setting strategic goals collaboratively and gaining participation in governing of the lake by those who use its water resource.

## 6. Conclusions

Understanding collaboration and participation of diverse stakeholders in the governance of water resources in the face of conflicts among users, diffuse responsibilities, and misaligned governance instruments is a frontier that can transform water governance and management, and establish reforms where needed [3,6,108]. Understanding the starting conditions for collaborative planning potential for LD, which include the examination of prehistory of conflicts in seven water use areas, is influential in moving the lake's governance towards a collaborative regime. Demonstrating the prehistory of conflicts from water uses identified by the community of water users themselves, rather than doing so for few sector-based categories that are recommended by government-actors, provides an integrated approach to collaborative planning rather than a sectoral approach (i.e., water use for irrigators decided in the absence of other users such as recreationists). From the governance approach perspective, this view minimizes the 'silo-thinking' in water resources management [1,50]. As per Porter and Birdi [46], this 'silo-thinking' makes it hard for government actors to embrace new ideas and expand the scope of regulatory instruments to adopt areas that need large-scale changes, resulting into water management activities that stifle truly needed changes. From the collaborative view, the prehistory of conflicts unveils both the perceptions of the LD community of water users (study participants) towards joint decision-making possibilities, and the most contentious area of water uses that may need prioritization and better allocation.

The results of this study provides three areas of focus that will help overcome the challenges in achieving meaningful and representative collaborative planning processes for LD for the needed transformation of the lake's water governance and management. Pragmatic experiences in lakes and reservoirs water planning, management, and governance in the

United States and elsewhere have all indicated that the best way to overcome water use challenges is to ensure meaningful inclusion of those who utilize the resource throughout the planning process [24,38,40]. Therefore, the discussed contentious issues and conflicts in the water multi-uses of LD, and the incoherence of the regulatory instruments, can be starting conditions that are turned into opportunities for advancing participation in collaborative planning that considers the dynamics of the seven areas of water uses discussed by participants. Ensuring the sustainability of LD into the future is especially important since this lake lies within the arid Canadian Prairie region, which is facing impending water availability crisis due to climate change [59].

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