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Climate Change and Water: Law and Policy Options for Alberta

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Climate Change and Water: Law and Policy Options for Alberta

Preface

This Occasional Paper concerns the relationships between water management stemming from legislation and policy, and climate change. The Paper focusses on Alberta, provincial, and municipal legislative powers, but is meant to provide water management, and legal and policy information that may be useful to many jurisdictions. The Paper's overall objective is to provide law and supporting policy observations and suggestions relevant to a jurisdiction's being a climate change leader, but in a manner different from the most prominent focus of the 2015 United Nations Conference on Climate Change held in Paris, and the resultant Paris Agreement.

The most prominent focus of the Paris Agreement is emissions reduction, which is the major measure that the parties to the Agreement undertake to mitigate climate change. Climate change mitigation measures aim at lessening the human contributions to climate change, primarily through limiting emissions of greenhouse gases. However, another feature of the Paris Agreement deals with adaptation and resilience. Adaptation involves conducting risk management scenarios, anticipating the adverse impacts of climate change, and taking appropriate actions to prevent, minimize, or alleviate adverse impacts. By taking adaptation measures, a jurisdiction becomes resilient and reduces its vulnerability to climate change impacts.

Water-related trends and events form the core of major climate change effects – more frequent drought, extreme storms, and floods. These in turn cause or contribute to a myriad of climate change related impacts such as impaired water quality, decreased water quantity, altered aquatic habitat and ecosystems, increased runoff and flooding, and waterborne illnesses, to identify just a few. Climate change adaptation planning and implementation can help prevent, alleviate or minimize such impacts. However, such planning and implementation requires jurisdictions to scrutinize their laws and policies to ascertain if they facilitate climate change adaptation. If the laws and policies do not, then the jurisdiction must decide how to remedy this.

This Paper considers how climate change adaptation-ready is Alberta compared to a postulated ideal water law and policy framework that reflect such readiness.

Part 1 provides an overview of the Paper. Part 2 opens with a review of a broad spectrum of water/climate change connections, or as this Paper calls them "nexuses." As the Paper cannot cover all of them, it focusses on three nexuses:

- climate change, instream flow, and instream flow needs (sometimes called "environmental flow");
- climate change, drought, and water supplies; and
- climate change and stormwater management.

Part 3 considers each of the three selected nexuses in three segments. The first segment describes the focus of the nexus, the second sets out the nexus/climate change connections and impacts, and the third ventures forth what an ideal law and policy framework would contain to facilitate and better ensure adaptation and resilience to climate change with respect to the nexus.

Part 4 briefly sets out the law and policy framework in Alberta that may be relevant to climate change adaptation and water management. Part 5 provides an overview of where Alberta's

current laws and policies stand in relation to the postulated ideal framework. Part 5 concludes that although Alberta has come some way towards developing a law and policy framework involving water management that facilitates climate change adaptation and fosters resilience, the province still has a way to go to be an adaptation to climate change leader. The Paper offers recommendations and options for law and policy reform and ends with a Summary of Recommendations/Options.

1.0. Introduction

This Occasional Paper concerns the relationships between water management stemming from legislation and policy, and climate change. The Paper focusses on Alberta and Provincial legislative powers, but is meant to provide water management, and legal and policy information that may be useful to many jurisdictions. The Paper's overall objective is to provide law and supporting policy directions and options geared towards a jurisdiction being a climate change leader, but in a manner different from the most prominent focus of the 2015 United Nations Conference on Climate Change held in Paris, and the resultant Paris Agreement.[1]

The most prominent focus of the Paris Agreement is emissions reduction, which is the major measure that the parties to the Agreement undertake to effect climate change *mitigation.* Climate change mitigation measures aim at lessening the human contributions to climate change, primarily by limiting emissions of greenhouse gases. However, another feature of the Paris Agreement and of climate change management in general, deals with *adaptation* and *resilience.* Article 7 of the Paris Agreement, states that the

> Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change....

As stated by the European Commission Climate Action program:

> Adaptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimize the damage they can cause, or taking advantage of opportunities that may arise.[2]

Adaptation measures are aimed at producing or improving resilience to climate change by reducing vulnerability to climate change impacts. The European Commission provides the following examples of adaptation measures:

- using scarce water resources more efficiently;
- adapting building codes to future climate conditions and extreme weather events; building flood defences and raising the levels of dykes;
- developing drought-tolerant crops;
- choosing tree species and forestry practices less vulnerable to storms and fires; and setting aside land corridors to help species migrate.[3]

The Commission's examples cover a wide ambit of adaptation measures related to a variety of climate change impacts. This Occasional Paper focusses on adaptation and resilience as it relates to water and climate change, and what laws and policy changes Alberta might undertake for it to be a climate change leader in connection with the water and climate change nexuses.

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[1] Paris Agreement, (2015, in force November 4, 2016) UN Treaty Collection, Environment, Ch XXVII 7.D, online: << http://unfccc.int/paris_agreement/items/9444.php>>. The Paris Agreement builds upon the 1992 United Nations Framework Convention on Climate Change, (in force March 21, 994), UN Treaty Collection, Environment, Ch XXVII 7, online: < http://unfccc.int/essential_background/convention/items/6036.php>.
[2] European Commission, Climate Action, *Adaptation to Climate Change*, online: < https://ec.europa.eu/clima/policies/adaptation_en>.
[3] *Ibid.*

Part 2 describes the water and climate change nexuses that this Paper considers. Part 3 looks at each of the selected nexuses in three segments. The first segment describes the focus of the nexus, the second sets out the nexus/climate change connections and impacts, and the third ventures forth what an ideal law and policy framework would contain to facilitate and better ensure adaptation and resilience to climate change with respect to the nexus. The author's proposals for the ideal framework are based on, or follow from the observations of climate change and water management experts from the legal, policy, scientific, and technical literature, much of which is referred to in this Paper.

Part 4 briefly reviews the law and policy framework in Alberta relevant to water management and climate change. Part 5 provides an overview of where Alberta's framework stands in relation to a summarized and reframed ideal framework based on the more detailed ideal framework discussed in Part 3, and as appropriate makes recommendations or options for law and policy reform. Part 5 ends with a Summary of Recommendations/Options.

The author tried to make this Paper current as of February 2017, but the reader is warned that laws and policies are susceptible to change, names of government departments change, climate change policy innovations continuously occur, and websites that are here today may be gone tomorrow. As well, although this Paper contains general information about laws and policies, nothing in it constitutes a legal opinion or legal advice and readers should not take the information as such. Finally, views and opinions in this Occasional Paper are those of the author.

2.0. The water/climate change nexuses

2.1. The climate change link

A "nexus" is a "connection or series of connections linking two or more things."[4] The one constant in the nexuses this Paper considers is climate change. There are ample resources on the expected impacts of climate change in respect of water resources.[5] As succinctly put by the United Nations Inter-Agency on Freshwater:

> Water is the primary medium through which climate change influences Earth's ecosystem and thus the livelihood and well-being of societies. Higher temperatures and changes in extreme weather conditions are projected to affect availability and distribution of rainfall, snowmelt, river flows and groundwater, and further deteriorate water quality.[6]

Climate change impacts in Alberta will differ depending on the locale. There are excellent resources on regional impacts of climate change in the province.[7] Accordingly, some of the policy options set forth in this Paper will be more applicable to some areas of the province than others.

The following summary and commentary from *Climate Change Impacts in the Canadian Prairie Provinces*[8] illustrates the breadth of the connections between water and climate change, and climate change related impacts:

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[4] Oxford *Living* Dictionary, online: < https://en.oxforddictionaries.com/definition/nexus>.

[5] Examples include the Government of Alberta, *Climate Change in* Alberta, online: <https://www.alberta.ca/climate-change-alberta.aspx#toc-1>; U.S. Environmental Protection Agency (EPA), *Water Resources: Climate Change and Water Resources*, online http://www3.epa.gov/climatechange/impacts/water.html; Environment Canada and Climate Change, *Drivers of Impacts and Changes to Water Quantity*, online: <https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=578AC3D2-1>; information and reports posted by the Intact Centre on Climate Change Adaptation,(University of Waterloo), including *Climate Change and the Preparedness of Canadian Provinces and Yukon to Limit Potential Flood Damage* (2016), online: < http://www.intactcentreclimateadaptation.ca/recent-reports/>. With respect to the last mentioned, as noted on the Intact Centre webpage, the report is a " a survey of 103 government representatives across 91 provincial and territorial ministries, departments and agencies between December 2015 and April 2016. Assessments focused on the preparedness of provinces and Yukon to limit flood damage relative to current and future major rainfall events." As well, there is an emerging body of legal literature on how laws must adapt to climate change, e.g. Robert Adler, "Climate Change and the Hegemony of State Water Law" (2010) 29:1 Stanford Environmental Law Journal 10; J.B. Ruhl and James E. Salzman, "Climate Change Meets the Law of the Horse" (2013) 62:5 Duke Law Journal 975; Holly Doremus, "Adapting to Climate Change with Law that Bends Without Breaking" (2010) 2 San Diego Journal of Climate Change Law 45, 2013; Jesse Reiblicha1 Christine A. Klein, "Climate Change and Water Transfers " (2014) 41 Pepperdine Law Review 439; Katherine Trisolinia, "Holistic Climate Change Governance: Towards Mitigation and Adaptation Synthesis" (2014) 85 University of Colorado Law Review 615. Additional legal and other resources will be set out in this Paper.

[6] UN Water, *Water and Climate Change*, online: <http://www.unwater.org/topics/water-and-climate-change/en/>.

[7] E.g., A. Nixon, C. Shank, and D. Farr, *Understanding and Responding to the Effects of Climate Change on Alberta's Biodiversity*, (Edmonton: Alberta Biodiversity Monitoring Institute, 2015), online:< www.biodiversityandclimate.abmi.ca>.

[8] Norm Henderson and Dave Sauchyn (eds), *Climate Change Impacts in the Canadian Prairie Provinces: A Summary of Our State of Knowledge*, (Prairie Adaptation Research Collaborative (PARC), a collaborative of the Governments of Alberta, Saskatchewan, and Manitoba, 2008), online: < http://www.parc.ca/pdf/research_publications/summary_docs/SD2008-01.pdf>. See other resources on the PARC website for more information, e.g. B. Sauchyn, and S. Kulshreshtha, "Prairies; in From Impacts to Adaptation" Chapter Seven in *Canada in a Changing Climate* , edited by D.S. Lemmen, F.J.Warren, J. Lacroix and E. Bush (Ottawa: Government of Canada, 2007). online: <http://www.parc.ca/pdf/misc/nacc_prairies_ch7_e.pdf >.

- "There will be lower summer stream flows, falling lake levels, retreating glaciers and declining soil moisture. Less water will be stored as winter snow and ice – historically a reliable and important source of water. Water scarcity may constrain economic and population growth in Alberta.
- Within the framework of an environment that is tracking warmer and drier, there will be more flood events, severe storms and climatic extremes. The climate is becoming increasingly variable season to season and year to year.
- Droughts of extreme severity or long duration are an increasing threat to communities and industries, particularly agriculture.
- Generally, summers will be especially dry.
- Much of the projected temperature increase will occur in winter and spring. There will be reduced energy demand for heating and higher demand for cooling.
- A shorter, warmer, winter season will make winter ice roads less viable and will hinder some forestry and energy industry operations. Some agricultural and forest pests will survive warmer winters more easily – mountain pine beetle is a serious threat. Ice fishing, snowmobiling and skiing may decline.
- Higher potential forest, grassland and crop productivity from increased heat and atmospheric CO_2 will be limited by available soil moisture.
- There will be major ecosystem changes. Aquatic habitats will be stressed and some fish and waterfowl populations will decline. Non-native plants and animals will appear on the landscape, while some native species will decline or disappear entirely. The southern boreal forest is at serious risk.
- Some vector-borne diseases, such as West Nile virus and Hantavirus pulmonary syndrome, could become more common.
- The most vulnerable people to climate change impacts include the elderly, children, and the poor, those with underlying health problems, farmers, and Aboriginal peoples.
- Adaptation to climate change is necessary. Minimum tillage practices and crop diversification in the agricultural sector, infrastructure and water conservation programs across the Prairies, new water policy in Alberta, and re-engineering of the Red River floodway in Manitoba, have enhanced resilience and increased adaptive capacity.
- Climate change impacts are ongoing, and the acceleration of impacts is now inevitable. To avoid the most damaging, worst-case climate change impact scenarios, significant reductions in greenhouse gas emissions are urgently required."[9]

2.2. The water nexuses

As can be seen from the list under 2.1 above, the nexuses between water and climate change are many and varied. As this Paper cannot cover all of them, it focusses on key connections. Here are the nexuses on which this Paper focusses:

[9] Norm Henderson and Dave Sauchyn (eds), *Climate Change Impacts in the Canadian Prairie Provinces: A Summary of Our State of Knowledge*, *ibid* at 14.

- climate change and instream flow and instream flow needs/environmental flow;
- climate change, droughts, and water supplies;
- climate change and stormwater management.

3.0. The selected water/climate change nexuses: A closer look

3.1. Climate change and instream flow/environmental flow

3.1.1. About instream flow, and instream flow needs/environmental flow (IFN/EF)

"Instream flow" is a simple concept. It means water flowing in a watercourse. "Instream flow needs" (IFN), also characterized as "environmental flow" (EF), are more complex. IFN and EF comprise the "quantity, timing and quality of water flow required to sustain freshwater ecosystems and the human livelihoods and well-being that depend on these ecosystems."[10]

Determining how much instream flow, including timing and quality, is appropriate for IFN/EF, is analyzed in terms of key IFN/EF components. Although components and values are variously identified throughout the literature they may be summarized as instream biological habitat, connectivity, riparian vegetation, water quality, geomorphy, and accounting for human use requirements.[11] For Alberta, (and many other jurisdictions), one may add international and inter-jurisdictional requirements.

The following elucidates these components and values:

- The instream biological habitat component concerns water flows needed to maintain aquatic biological entities, such as fish and fish habitat in the subject watershed area, at different life stages.
- The connectivity component is the "flow, exchange, and pathways that move organisms, energy, and matter" through a river system.[12]
- The riparian vegetation component is related to the connectivity component. The riparian component refers to flows required to sustain healthy riparian vegetative communities (e.g. trees, plants), and the structure and abundance of these communities. The nature of the flow requirements will depend on system connectivity. For example, "Nutrients and organic matter transported from the floodplain to the river encourage the development of

[10] Brisbane Declaration (2007), Environmental Flows Are Essential for Freshwater Ecosystem Health and Human Well-Being. Declaration of the 10th International River Symposium and International Environmental Flows Conference, 3–6 September 2007, Brisbane, Australia, Appendix 1. A summary of key findings are online at: https://www.conservationgateway.org/Documents/Brisbane-Declaration-English.pdf.

[11] Here are some resources that identify IFN or environmental flow components:, North Saskatchewan Watershed Alliance, "Preliminary Steps for the Assessment of Instream Flow Needs in the North Saskatchewan River Basin," March 2014, online: <https://www.nswa.ab.ca/sites/default/files/documents/IFN%20Consolidated%20Report%20TEXT%20n%20%20APPEND%201.pdf>; the Government of Alberta Environmental Flows Program online: <.http://aep.alberta.ca/fish-wildlife/environmental-flows/about-environmental-flows.aspx>; Tom Annear et al, *Instream Flows for Riverine Resource Stewardship*, Revised Edition, (Cheyenne, Instream Flow Council, 2004), especially chapter two.

[12] Tom Annear et al, *ibid* at 32.

aquatic plants, plankton, and benthic invertebrates, and in turn, provide a rich food source for fish."[13]

- The water quality component concerns what water flows are required to maintain water quality including the physical, chemical (a key one being oxygen levels), biological, and temperature attributes of water.[14]
- Geomorphy relates to channel form that results from various water flow attributes including quantity, velocity, timing of discharges, and sediments within flow. Relating to IFN/EF, this means the flow and flow attributes required to maintain natural geomorphy.
- The human use component is important in determining how to maintain the quantity and other flow attributes to meet IFN/EF given human use. Human use involves removing water from watercourses through water allocations such as water licences, (e.g. for irrigation, industrial, municipal, commercial, and domestic use) and through alterations of natural flow such as through dams, channel diversions, weirs, hydroelectric power industry and other structures that affect the timing, quantity, quality, or velocity of flow.
- Following on the last point, the human use component includes land-based development in the watershed that impacts waterways. Alterations in a watershed area, such as logging, urban development, etc., can affect natural drainage into the waterways defining the watershed.[15] Of particular importance is development in headwater (source water) areas. Headwaters are the places where streams and rivers originate. Headwaters are characterized "by interactions among hydrologic, geomorphic, and biological processes that vary from hillslopes to stream channels and from terrestrial to aquatic environments areas."[16] Developments in headwater areas can seriously impact water systems in a range of ways including floods (e.g. from increased runoff), impairment of water quality, impacts on ecosystems and biodiversity, decrease in instream flow, and watercourse destruction or disappearance (e.g. from cutting off headwater sources or from sediment overload).[17]
- The international and inter-jurisdictional commitments component involves water sharing agreements that require a jurisdiction to leave water instream so that it will flow to another jurisdiction. An Alberta example is the 1969 Master Agreement on Apportionment, between Alberta, Saskatchewan, and Manitoba. As stated by Alberta Environment and

[13] Tom Annear et al, *supra* note 11 at 33, referring to W.J. Junk et al, "The flood-pulse concept in river-floodplain systems" 110-127 in D.P. Dodge (ed) *Proceedings of the International Large River Symposium. Special Publication of the Canadian Journal of Fisheries and Aquatic Sciences* 106 (1989).
[14] Tom Annear et al, *supra* note 11 at 29.
[15] A watershed is an area of land, also known as a catchment basin or area, or water basin, where all of the water that is on, or precipitates onto it, or is under it, flows and drains towards a single point, such as the same body of water. See, for example, the definition of "watershed" by Stephen C. Nodvin, in the *Encyclopedia of Earth* online at <http://www.eoearth.org/view/article/157017/>.
[16] Takashi Gomi, Roy C. Sidle and John S. Richardson, "Understanding processes and downstream linkages of headwater system (2002) 52:10 BioScience 905.
[17]See, for example, information from the Ontario Headwaters Institute, online: < http://ontarioheadwaters.ca/what-are-headwaters/>; Andrew J. Elmore and Sujay S. Kaushal, "Disappearing Headwaters: Patterns of Stream Burial Due to Urbanization" (2008) 6:6 Frontiers in Ecology and the Environment, 308-312; Stephen Legault, "We must protect waterways: Alberta's headwaters are under threat " *Calgary Herald* (7 January 2007) A13.

Parks: "Broadly stated, the principles affecting Alberta are that Alberta must pass one-half of the volume in each eastwards flowing stream (including the North and South Saskatchewan River basins) to the Province of Saskatchewan on an annual basis. The flow is determined at agreed-upon points near the boundary of the two provinces."[18] Water left instream for IFN/EF will be available for such commitments.

3.1.2. Instream flow, IFN/EF, and climate change connections and impacts

As mentioned, climate change impacts include "increased frequency and severity of drought, flood and extreme rainfall events."[19] These can have numerous and varied negative impacts on instream flow that governments, citizens, and stakeholders will need to cope with and address. Here are some of them:

- More frequent drought conditions can result in water shortages; water shortages mean less instream flow, and less water to support aquatic ecosystems including fish and fish habitat.
- Less water availability can have serious indirect effects. For example, one scientist relates that in "irrigation-constrained" regions, meaning regions "that are now heavily irrigated and are unlikely to have enough water in the future to support that irrigation, by the end of the century … between 20 and 60 million hectares of irrigated land in those regions would have to be converted into rain-fed..."[20]
- Less instream flow can result in impaired water quality, which can impact drinking water quality, and water for other uses, both instream uses to support aquatic ecosystems and instream recreational uses, and out of stream uses, e.g. for irrigation, industry, and commercial, and out of stream recreational uses.[21]

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[18] *Master Agreement on Apportionment*, 13 October 1969, available online from the Prairie Provinces Water Board < http://www.ppwb.ca/information/79/index.html>. The Alberta Environment and Parks' quote is from its website, Alberta's Transboundary Water Agreements, Prairie Provinces Alberta, Saskatchewan, and Manitoba, online: < http://aep.alberta.ca/water/programs-and-services/water-for-life/partnerships/albertas-transboundary-water-agreements/prairie-provinces/default.aspx>.

[19] Fraser Basin Council, *Climate Change & Water*, online: < http://www.rethinkingwater.ca/climate_impacts.html>. This online document nicely summarizes many of the climate change impacts on water. Some of the discussion in this section of the Paper is based on information from this website.

[20] Scientist Joshua Elliott continues "And the loss in productivity that we estimated from that is somewhere between 900 and 2,900 petacalories of total production. The moral of the story being that resource constraints and depleting irrigation water is potentially as big, or maybe even bigger than, the direct effects of climate change." See PNAS Science Sessions Podcast, *Climate Change and Irrigation Water*, 1 August 2016, online: <http://www.pnas.org/site/misc/joshuaElliottPodcastTranscript.pdf >.

[21] The adage "dilution is the solution to pollution" although generally true is sometimes not. Where water in a natural watercourse or water body is diluted through discharges from elsewhere, whether it is a solution to pollution depends on the quality of the water added to the non-diluted water, and the nature of the pollution. For example, discharging severely contaminated wastewater into a low-flowing stream likely will not improve water quality in the stream. But this is a different situation from reducing river flow to the point where water quality is negatively impacted. In this case the water quality is impaired owing to the reduction of pollution assimilation capacity owing to lower flows. See, for example, Mostafa Farhadian; Omid Bozorg Haddad, Samaneh Seifollahi-Aghmiuni, and Hugo A. Loáiciga, "Assimilative Capacity and Flow Dilution for Water Quality Protection in Rivers" (2015) 19:5 Journal of Hazardous, Toxic, and Radioactive Waste 04014027-1. Dilution being a solution to pollution is reflected in water quality discharge legislation, policy, as discharge permits may be based on pollutant concentration per

- Less instream flow can mean higher water temperatures and consequently change the composition of aquatic ecosystems so that fish and other biotic life that tolerate higher temperatures replace less tolerant species.[22]
- Less instream flow can lead to a rise in waterborne food poisoning due to higher water temperatures and bacteria growth.[23]
- Less instream flow may lead to government taking administrative and enforcement actions to limit water use.
- Less instream flow can lead to conflict among water users, resulting with pressures on government, and legal actions among users, or against government.
- Less instream flow can impact geomorphy and consequently riparian values.[24]
- Less instream flow can result in problems with meeting inter-jurisdictional water delivery requirements.
- Less instream flow can result in greater reliance on groundwater supplies, which in turn can impact surface water supplies where there is connectivity between surface and groundwater.
- More extreme weather events can result in flooding, erosion, and impacts to water associated infrastructure such as dams, weirs, reservoirs, and drainage systems.
- Drought, extreme weather events, and higher temperatures can compel changes in land use and associated land features. For example, the types of agricultural crops grown and agricultural pests present may alter, which can result in changes in the nature of non-point pollution into watercourses (e.g. from herbicides, fertilizers, and pesticides), and other run-off consequences from agricultural practices.[25]
- Less instream flow can affect Aboriginal water rights and use.

3.1.3. Instream flow- An Ideal Law and Policy Framework that is climate change ready and resilient

This section sets out, in a broad-brushed fashion, some of the elements that would be included in an Ideal Law and Policy Framework with respect to water management and instream flows. These elements are summarized and reframed in section 5 of the Paper for comparison with Alberta's current law and policy framework.

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volume of water, e.g. the Alberta Environment and Parks, *Industrial Release Limits Policy* (2000) online: <http://aep.alberta.ca/air/legislation/documents/IndustrialReleaseLimitsPolicy.pdf>.

[22] See, for example, Tom Annear *et al*, *Instream Flow for Riverine Resource Stewardship*, *supra* note 11 at 30-32.

[23] Seth Borenstein, Associated Press Science Writer, "Study links global warming to rise in waterborne illnesses," Associated Press, 8 August 2016, online: <http://www.bigstory.ap.org/article/fb6347864b9a43beaa2843465cb2fce2/study-links-global-warming-rise-waterborne-illnesses>.

[24] See. for example, for example, Tom Annear et al, *Instream Flow for Riverine Resource Stewardship*, *supra* note 11 at 17-21.

[25] For some potential climate impacts on agriculture see Agriculture and Agri-Food Canada, *Impact of Climate Change on Canadian* Agriculture, online: < http://www.agr.gc.ca/eng/science-and-innovation/agricultural-practices/agriculture-and-climate/future-outlook/impact-of-climate-change-on-canadian-agriculture/?id=1329321987305>.

A primary objective of the Ideal Law and Policy Framework is to render the jurisdiction to which it applies climate change ready and resilient so that communities and ecosystems are best safeguarded from adverse impacts. Accomplishing this requires the Framework to incorporate adaptation planning and measures. The Ideal Framework, it is safe to say, does not exist in its entirety anywhere on earth, though features of it are reflected in an array of jurisdictions.

- The Ideal Framework would reflect fairness. For example, the water rights system's water distribution rules within the Framework would enable those having the most need for water to receive water. The Ideal Framework would provide for vulnerable communities most susceptible to adverse water related impacts of climate change.[26] With respect to IFN/EF, if the aquatic environment is at risk because of low flows the Ideal Framework would allow the environment to receive and retain water even if other users might otherwise have an entitlement to it.
- The Ideal Framework would be flexible. For example, under the Framework there would be sufficient and flexible approaches for the government to respond to climate change, including to address aquatic ecosystem stress.
- The Ideal Framework would be based on climate change science and other reliable sources of information, including Aboriginal and community knowledge
- The Ideal Framework would provide an array of tools for restoring and protecting IFN/EF. The Ideal Framework would recognize achieving this requires both private and public efforts, especially in near and over-allocated areas, since water that the system needs may be already subject to privately held government issued water rights.[27]
- The Ideal Framework would incorporate adaptive management. As legal academic, J.B. Ruhl put it, "conventional environmental management methods [are] inconsistent with the "nature as flux" model of ecosystems as complex adaptive systems. … Whereas "front end" regulatory instruments lock in positions through fixed rules and standards, … an adaptive management framework is more experimentalist, relying on monitoring-adjustment "loops" of goal determination, performance standard setting, outcome monitoring, and standard recalibration."[28]

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[26] See, for example, Carmen Gonzalez, Alice Kaswan, Robert Verchick, Yee Huang, Shawn Bowen, and Nowal Jamhour , *Climate Change, Resilience, and Fairness*, (Center for Progressive Reform, 2016), online: < http://progressivereform.org/articles/Climate_Change_Resilience_Gulf_Coast_1603.pdf>. As related on its website the Centre's "50-plus Member Scholars are working professors at institutions of higher learning across the nation. They volunteer their time to the organization without compensation in order to advance a shared set of values around protection of health, safety and the environment." See Centre for Progressive Reform, online: < http://www.progressivereform.org/scholarGateway.cfm>. The scholars primarily are law professors from colleges and universities throughout the United States.

[27] See, for example, the Alberta Environment Minister's Advisory Group report *Recommendations on Improving Alberta's Water Management and Allocation* (2009) online: < http://aep.alberta.ca/water/water-conversation/documents/RecommendationsWaterManagement-2009.pdf>.

[28] J. B. Ruhl, "Taking Adaptive Management Seriously: A Case Study of the Endangered Species Act" (2004) 52 Kansas Law Review 1249 at 1263. Also see Elaine Hughes, Arlene Kwasniak, and Alastair Lucas, *Public Lands and Resources Law in Canada*, (Toronto: Irwin Law, 2016) 133-137.

- The Ideal Framework would direct the relevant authorities to develop and implement watershed management plans. The Framework would recognize the interaction of the elements in a watershed and how impacts to land or water in the watershed can affect water quality, quantity, ecological, social, and economic aspects of the watershed, and would have watershed management plans in place.[29]
- The Ideal Framework would facilitate conjunctive water management of groundwater with surface water. As further explained later in this paper, conjunctive water management is " … an adaptive process that utilizes the connection between surface and groundwater to maximize water use, while minimizing impacts to streamflow and groundwater levels in an effort to increase the overall water supply of a region and improve the reliability of that supply."[30]
- The Ideal Framework would broadly construe what activities require a water right. The Framework would not only include activities such as direct water withdrawals from the water source. It would also consider land-based impacts that reduce water flow to be water uses that require a water licence. For example, deforestation or rapid urban development may have the effect of decreasing groundwater or surface water flow. The Framework would require water licences for such developments, in addition to other required permits.[31]
- Recognizing the importance of assimilation capacity of a watercourse or water body, especially in times of drought, the Ideal Framework would regulate water quantity and water quality together.

3.2. Climate change, droughts, and water supplies

3.2.1. About climate change, droughts, and water supplies

By "water supplies", this Paper means sources of water that are currently water supplies, or that *could be* water supplies to serve water demand, given the appropriate enabling legislative framework. Depending on the water source, the legislative framework could involve water quantity, water quality, health, safety, building codes, or plumbing codes. Here is a partial inventory of potential water supplies:

- Water from natural sources such as watercourses, water bodies, and groundwater are primary sources of water supplies.

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[29] Elaine Hughes, Arlene Kwasniak, and Alastair Lucas, *Public Lands and Resources Law in Canada*, *ibid*, 129-132.
[30] There are many characterizations of conjunctive water management. This quote is from the Nebraska Department of Natural Resources, "Nebraska Water, Conjunctive Water Management," (no specific date provided but *circa* 2011) a power point by Jesse Bradley, Department Head, IWM, online: <http://dnr.nebraska.gov/media/iwm/pdf/BradleyRR_ConjunctiveManagement9711.pdf>.
[31] A recent scientific study involving landscape modelling with respect to a southern Alberta watershed states "The simulation results reveal that the rapid urbanization and deforestation create an increase in overland flow, and a decrease in evapotranspiration (ET), baseflow, and infiltration [into groundwater] mainly in the east sub-catchment of the watershed." See Gayan Nishad Wijesekara, Babak Farjad et al, "A Comprehensive Land-Use/Hydrological Modeling System for Scenario Simulations in the Elbow River Watershed, Alberta, Canada,"(2014) 53 *Environmental Management* 357 at 357.

- Runoff or diffuse surface water, i.e. water that gathers on the surface of land but is not a natural source as described in the preceding bullet (though the water may be travelling to a natural source in the watershed). If captured, runoff or diffuse surface water is a water supply source.
- Rainwater, before it hits the surface of the land that physically can be harvested though the use of rain barrels or other rainwater collection systems is a source of water supplies.
- Treated municipally supplied water (e.g. the water that comes out of a domestic water tap), or water supplied through a comparable water supplier, is a source of water supplies.
- Wastewater from domestic, commercial, municipal, or other sources that has the potential for reuse, with or without treatment or upgrading, can be a source of water supplies for a variety of uses, depending on water quality. This would include greywater, which is, as explained by a legal commentator,[32] "non-toilet household water which is reused in some way, including water from showers, baths, washing machines, laundry troughs, spas, sinks, hand basins, and depending on the local regulations, dishwashers and kitchen sinks.[33] Greywater is reused for local agriculture and watering lawns, and sometimes used for car washing and toilet flushing."[34]
- Desalinated water, meaning water from a saline source, such as sea water, that has been upgraded so that it may be put to a useful purpose, can be a source of water supplies.
- Produced water, meaning water resulting from the process of bringing oil or gas from their sources to the surface, can be a source of water supplies.[35]
- Conserved water, meaning water that results from water conservation methods can be a source of water supplies since conserved water is available for other uses. There are a multitude of water conservation methods including: xeriscaping landscaping; low flow toilets and low flow shower heads; water pricing as an incentive to water conservation; cutting evaporative losses through using water storage methods that do not expose water to heat or sun; using drip irrigation systems; generally cutting down water use at home, industrially, commercially, or at public and private institutions; fixing leaks in pipes, faucets, and water delivery systems; changing from high water consumption crops in agricultural operations to lower water consumption crops; and using substitutes for water in industrial and other operations.

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[32] R.F. Michael Snodgrass, "Greywater - The Reuse of Household Water: A Small Step Toward Sustainable Living and Adaptation to Climate Change, "(2009-2010) 22 Georgetown International Environmental Law Review 591.
[33] Snodgrass, *ibid*, at this point in the quote refers to the Victoria, Australia, Environmental Protection Authority, *Greywater Use Around the Home* (2008), 2-3.
[34] As noted in Snodgrass, *ibid* at 603-604, Arizona is a world leader in greywater regulation. Arizona employs a three tiered regulatory system where the lowest risk tier does not even require a permit (for greywater systems designed for less than 1514 litres per day, which meet thirteen requirements). The second and third tiers are for larger capacity systems and both require regulatory permits.
[35] See Arlene Kwasniak, "Waste Not Want Not: A Comparative Analysis and Critique of Legal Rights to Use and Re-Use Produced Water—Lessons for Alberta" (2007) 10:2 Denver Water Law Review 357. As stated in the article at 358, in 2003 the volume of produced water in Alberta was 1.6 billion cubic metres per day, which is about 10 million barrels per day.

3.2.2. Water supplies and climate change connections and impacts

The main nexuses/connections between water supplies and climate are:

- Higher temperatures will result in less water supply because of increased water evaporation.[36] This applies to not only natural sources such as rivers and lakes, but also to open irrigation works, and other sources of stored water susceptible to evaporation.
- In areas where climate change results in less precipitation there will be a corresponding decrease in water supplies.
- Higher temperatures, more evaporation, and less precipitation can result in reduced soil moisture, which can have an array of impacts, for example on agriculture and ecosystems.[37]
- Increased glacier melting eventually will lead to less instream flow where glaciers are source waters, and consequently less available water.[38]
- Climate change can adversely impact groundwater recharge (replenishment).[39]
- Climate change can result in population and demographic changes (e.g. though movement of climate change refugees), resulting in greater stresses on water supplies in some areas.[40]

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[36] For more information on water evaporation see, for example, Donald H. Burn and Nicole M. Hesch, "Trends in evaporation for the Canadian Prairies" (2007) 336:1&2 Journal of Hydrology, 61, and Lisa Lowe, J.A. Webb, Rory J. Nathan, and Teri Etchells, "Evaporation from water supply reservoirs, An Assessment of uncertainty" (2009) 376: 1&2 Journal of Hydrology 261.

[37] See, for example, Sonia I. Seneviratne, Thierry Corti, Edouard L. Davin, Martin Hirschi, Eric B. Jaeger, Irene Lehner, Boris Orlowsky, Adriaan J. Teuling, "Investigating soil moisture–climate interactions in a changing climate: A review" (2010) 99 Earth-Science Reviews 125.

[38] See, for example, Cameron Strandberg, "Columbia Icefields Shrinking Fast" (2010) Rocky Mountain Outlook, online:< http://www.usask.ca/ip3/download/Rocky%20Mountain%20Outlook%204%20Feb%202010%20-%20Columbia%20Icefield%20shrinking%20fast.pdf>. The article is on climatology research and contains interviews with water and climate experts Robert Sanford (Director of the Western Watersheds Climate Research Collaborative) and John Pomeroy (Canada Research Chair in Water Resource and Climate Change, University of Saskatchewan) and others. Sanford notes that the Athabasca glacier has shrunk 60% in the last century and a half. Although rapid melting will increase flows, Sanford notes that "The maximum melt from the icefield, which drains primarily into the Arctic, the North Saskatchewan River and a variety of other rivers that flow into the Prairies, has already happened and its deposits of meltwater are depleting fast." Pomeroy similarly notes "In a warming climate there is more ice melt than the winter snowfall can replenish and so streamflow increases compared to a stable climate glacier. The danger of climate warming … is that we got used to the extra water from the shrinking glaciers… But those flows are now smaller. The larger than normal flow volumes from the Columbia Icefield acted as a natural streamflow regulator … The flows essentially made the system "drought-proof," [but because] the icefield is much smaller now and because of warmer temperatures, the meltwater has fallen off substantially. The regulator is broken. Unfortunately, that is where we are now. ….Without the melt from the icefield, mountain rivers sustain much lower flows in drought years. This would be reflected downstream at times when water supply from the river is particularly important." Also see Garry Clarke, Alexander Jarosch, Faron Anslow, Valentina Radic, and Brian Menounos, "Projected deglaciation of western Canada in the twenty-first century" (2015) 8 Nature Geoscience 372.

[39] See, for example, Gene-Hua Crystal Ng, Dennis McLaughlin, Dara Entekhabi, and Bridget R. Scanlon, "Probabilistic analysis of the effects of climate change on groundwater recharge" (2010) 46:7 Water Resources Research WO7502.

[40] Robert McLeman, "Impacts of population change on vulnerability and the capacity to adapt to climate change and variability: a typology based on lessons from "a hard country"" (2010) 31:5 Population and Environment, Special Issue on Climate Change: Understanding Anthropogenic Contributions and Responses 286.

3.2.3. Water supplies - An Ideal Law and Policy Framework that is climate change ready and resilient

To prepare for climate change governments must inventory all potential sources of water supplies, plan for, and ensure that their laws and policies permit taking advantage of a variety of sources. Accordingly, an Ideal Law and Policy Framework with respect to water management and water supplies, one that includes provisions for being prepared for, adaptive, and resilient in respect of climate change, would have the following features:

- The Ideal Framework would include a water supply climate change management plan, including adaptation measures.
- The Ideal Framework would address evaporative losses, e.g. by requiring a water licence where a land use or development will accelerate evaporative losses, or will result in evaporative losses that would not naturally occur.
- The Ideal Framework would provide clarity with respect to water entitlements and rainwater, and runoff or diffuse surface water. The Framework would also set out how these sources may be used as alternate sources of water.[41]
- Taking appropriate account of health, safety and environmental issues, the Ideal Framework would provide for water reuse at domestic, commercial, and industrial levels.[42] Water reuse provisions would provide for different grades of water for different uses including greywater. The Framework would include the appropriate water quantity, water quality and other environmental, health, and safety legislation and policy, and would have building and plumbing codes to facilitate reuse.
- The Ideal Framework would provide for using produced water and desalinated water as appropriate as alternate water sources.
- The Ideal Framework would require water users to conserve water as appropriate.

3.3. Climate change and stormwater management

3.3.1. About stormwater management

The “stormwater” part of the term “stormwater management,” is a bit of a misnomer. On its own, it conjures a vision of heavy precipitation, which need not be all that imperiling or call for management. But the term has a much broader application and focusses not on precipitation but rather on runoff resulting from the entire ambit of precipitation that is not absorbed into the ground or intercepted by vegetation. This precipitation includes ordinary rain, storms, and snow. The “stormwater” that is managed, includes more than the precipitation itself. It also includes the materials that are carried with runoff such as sediments, nutrients, organic matter, bacteria, oil,

[41] For a discussion of legal issues concerning the right to harvest rainwater, see Arlene Kwasniak and Daniel Hursh, “Right to Rainwater - A Cloudy Issue,”(2009) 26 *Windsor Review of Law and Social Issues* 105.

[42] For a comprehensive source of information regarding water reuse in Alberta and its future potential see Kim Sturgess, (WaterSMART), *Water Reuse in Alberta: Case Studies and Policy Development to Support Economic Development*, (Calgary: WaterSMART, 2015), online: <.http://albertawater.com/docs/Water%20Reuse%20in%20Alberta%20Final%20Report_Feb_2015.pdf>.

grease, heavy metals, and other toxic and non-toxic substances.[43] These materials are called "non-point pollutants" because they are diffused in runoff and are not identified with any particular discharge point such as an outfall structure outlet through which effluent is discharged. Also, stormwater that is managed may include water that is directly from precipitation. It can be mixed with, for example, what is called "wastewater," that is, water that was used in some domestic, agricultural, or industrial activity, and then disposed of. Insofar as wastewater ends up as part of urban or rural runoff it can be part of stormwater management.

The "storm" part of the term "stormwater" is important because storms are more associated with runoff than other forms of precipitation because precipitation from heavy storms is likely not to be absorbed into the land surface. But this is only part of the story. Whether precipitation results in runoff critically depends on the kind of surface upon which it lands. If the surface is entirely impermeable-- like a non-porous asphalt road -- precipitation is bound to pool or form runoff. If a surface is quite permeable, e.g. a series of wetlands with their sponge-like properties, then runoff might be avoided even in heavy storms. If the surface is somewhere in the middle, e.g. a vegetated farm field, then precipitation may be absorbed into the ground or intercepted by vegetation and result in runoff only where there are more extreme storms.

Not all runoff follows a natural course to the lowest point in a watershed, -- a river, lake, wetland, or other body of water. Through simple to complex drainage infrastructure systems, runoff is diverted and conveyed to storage or other desired point. Here are some of the drainage control infrastructure (human made and natural) used in stormwater management.

Stormwater management may include the use of:

- curbs and gutters that contain and convey surface runoff alongside of a road.[44]
- catchbasins, meaning vertical structures, usually with a grate on top, that collect runoff and direct it to an underground runoff conveyance system.
- manholes, which are typically larger than catchbasins, and provide access for maintenance to underground systems including system juncture points.
- storm sewers, which are water tight pipes used to contain and convey stormwater underground.
- infiltration systems to manage runoff,[45] including those that use perforated pipes. Depending on their design, the pipes capture surface water and exfiltrate it to subsurface soils, or act as storm sewers and convey infiltrated water.
- roadside ditches, which are constructed longitudinal depressions that convey stormwater.
- swales, which are like ditches except that they are normally grassed lined, whereas ditches will be naturally vegetated. Ditches are also typically deeper and steeper than swales.

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[43] This information is based on the text from Pocono Northeast, Resource Conservation and Development Council, *Stormwater Management Handbook* (no date provided), at 8-9, online: <http://epcamr.org/home/wp-content/uploads/stormwater_handbook.pdf>

[44] The first eleven bullets in this list are closely based on, and sometimes verbatim from the text from *An Evaluation of Roadside Ditches and Other Related Stormwater Management Practices – Final Report* (2000), prepared for the Toronto Region Conservation Authority, sections 1.3-1.13, online: http://www.sustainabletechnologies.ca/wp/wp-content/uploads/2015/09/AnEvaluationofRoadsideDitches_2000.pdf>.

[45] Also see Jennifer Holman-Dodds et al, "Evaluation of Hydrological Benefits of Infiltration based urban Storm Water Management" (2003) 39:1 *Journal of the American Water Resources Association* 205.

- culverts, which are sections of pipes that run under roadways and other constructions to provide an uninterrupted flow of water through ditches and swales.
- check dams, which are earthen or log structures used in swales or ditches to reduce velocities and enhance infiltration.
- oil and grit separators, which are manhole structures that remove some sediments and pollutants including oil and grease from collected stormwater.
- infiltration trenches, which are shallow excavated storage structures that intercept surface water flows or groundwater. The intercepted water can be directed to subsurface soils or to another collection system.[46]
- overland conveyance systems in addition to ditches and swales, such as "eavestroughs on buildings and the concrete gutters that can be found behind houses in newer areas … [and] roads or lanes. The water is kept above ground until it reaches the nearest catch basin."[47]
- infiltration basins, which are vegetated depressions that store runoff and are designed so that it slowly infiltrates into the soil.[48]
- stormwater retention basins or ponds, which are constructed or natural and usually vegetated depressions in high water table areas where the soils enable infiltration of water. Retention basins or ponds are meant to be dry until significant storm events, at which time they will retain water until it infiltrates the soil or evaporates.[49]
- detention basins or ponds, which gradually release water to water sources such as a river, through an outfall structure, such as a pipe. Detention basins or ponds can be dry until inundated, or normally wet. An extended detention basin or pond "has an outlet structure that detains and attenuates runoff inflows and promotes the settlement of pollutants."[50]
- wetlands, which are land "saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophobic vegetation, and various kinds of biological activity that are adapted to a wet environment."[51] Wetlands include marshes, swamps, bogs, and fens. Wetlands are among the most valuable natural systems on earth. Wetlands store and release surface water, re-charge groundwater, and aid in flood control.[52] They reduce sedimentation and purify water, and they help control erosion.[53] They are hotbeds of biological diversity, and serve as important habitat for waterfowl and shorebirds

[46] Also see Sustrain (UK – The Community for Sustainable Drainage): Component, Infiltration Trenches, online: <http://www.susdrain.org/delivering-suds/using-suds/suds-components/infiltration/infiltration_trench.html>.
[47] City of Calgary, Storm Drainage Systems, online: < http://www.calgary.ca/UEP/Water/Pages/Water-and-wastewater-systems/Storm-drainage-system/Storm-Drainage-System.aspx>.
[48] Sustrain, supra note 46, Component: Infiltration Basin, online: <http://www.susdrain.org/delivering-suds/using-suds/suds-components/infiltration/infiltration-basin.html>.
[49] Power point presentation "Applied Hydrology RSLAB-NTU Lab for Remote Sensing Hydrology and Spatial Modeling 1 Hydrological Design of Detention/Retention Basins" by Professor Ke-Sheng, Department of Bioenvironmental Systems Engineering, National Taiwan University, slide #13 (no date provided). Available online through < http://slideplayer.com/slide/688314/>.
[50] Professor Ke-Sheng, *ibid*, slide 16.
[51] The quoted definition is from the Alberta Government, *Wetland Policy* (2013) at 25, online: < http://aep.alberta.ca/water/programs-and-services/wetlands/documents/AlbertaWetlandPolicy-Sep2013.pdf>.
[52] See, for example, T. Gabor et al, *Natural Values* (Oak Hammock Marsh: Ducks Unlimited Canada, 2004) at 4.
[53] *Ibid* at 5.

internationally, nationally, and provincially.[54] Wetlands that have been drained can sometimes be restored and their natural functions re-established, at least in part. Constructed or artificial wetlands are human made. Although constructed wetlands do not exhibit identical wetland functions of healthy natural wetlands, they can play important roles in stormwater and wastewater management.[55]

- Low Impact Development, which is "an innovative stormwater management approach with a basic principle that is modeled after nature: manage rainfall at the source using uniformly distributed decentralized micro-scale controls."[56] Low impact development approaches include "bioretention facilities, rain gardens, vegetated rooftops, rain barrels and permeable pavements."[57]

A distinction is made between "minor" and "major" stormwater management controls.[58] A minor system consists of "the pipes, catch basins and other hard infrastructure located underground" and the major system of "overland flow routes and storm water storage sites that use the surface of the earth."[59] Most of the elements in the above list are parts of the major system, e.g. curbs and gutters, ditches, swales, eavestroughs, surface basins/ponds, wetlands, and low impact development approaches. Both minor and major systems at work in an area account for management of precipitation, especially heavy and extreme precipitation.

The long list of stormwater management approaches exhibits how multi-layered and intricate is stormwater management, and reveals the need for inventories and reviews of stormwater management practices at private, public, and inter-jurisdictional levels, if climate change adaptation is to be taken seriously. The long list also brings to light the need for cautious and collaborative stormwater management.

Taking the long list above into account, imagine gazing on a municipal landscape and seeing and recognizing the various stormwater management controls and approaches such as wetlands, lawns and fields, manipulated grades and drains, and catchbasins and manholes leading

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[54] The *Convention on Wetlands of International Importance Especially as Waterfowl Habitat*, (February 2, 1971, 11 l.L.M. 969 (1972) (in force 1975)) (also known as the Ramsar Convention) is an international treaty to provide a basis for domestic and international action to conserve and properly manage wetlands, online: <http://www.ramsar.org/>. Worldwide there are wetland organizations and partnerships, a prominent one being the *North American Waterfowl Management Plan Partnership*. The NAWMP Plan, agreed to by Canada, the United States, and Mexico, is to return waterfowl populations to 1970s levels by conserving wetland and upland habitat. The NAWMP website contains more information, online: <http://nawmp.wetlandnetwork.ca/>. Most provinces have wetland conservation policies or legislation. Many of these may be accessed by linking to "Policies and Legislation" from the Wetland Network webpage, online: <http://wetlandnetwork.ca/>.

[55] See, for example, the Environmental Protection Agency, *A Handbook of Constructed Wetlands*, Vol 1, (no date provided) at 17 and 18. Online: < https://www.epa.gov/sites/production/files/2015-10/documents/constructed-wetlands-handbook.pdf>.

[56] Urban Design Tools, *Low Impact Development*, online: < http://www.lid-stormwater.net/background.htm>.

[57] Environmental Protection Agency, *Urban Runoff: Low Impact Development*, online: <https://www.epa.gov/polluted-runoff-nonpoint-source-pollution/urban-runoff-low-impact-development>.

[58] See, for example, Glen McGillvray (Managing Director of the Institute for Catastrophic Loss Reduction), "Wanted: New, and new generation, storm water infrastructure for Canadian cities," April 24, 2014, INS Blogs, online: <http://www.insblogs.com/catastrophe/wanted-new-new-generation-storm-water-infrastructure-canadian-cities/951>.

[59] *Ibid.*

to underground sewers, drains, and retention/detention ponds. Stormwater systems take on a life of their own, largely unrecognized unless sought and understood. An alteration here or there, e.g. constructing an impermeable road where a field existed, or draining a wetland and building a condo on the spot, will have ripple effects in the watershed. Stormwater velocities can change, sediment and toxic loads can alter, groundwater recharge can be affected, and water patterns over land can change. And these can have their own impacts such as flooding or lack of water, pollution, erosion or soil buildup, and impacts on stormwater management infrastructure such as sewers, drains, and ponds. Add the known impacts and the uncertainties related to climate change into the mix and the need for coordinated, risk and cumulative effects-based, precautionary, and adaptive stormwater management becomes clear.

3.3.2. Stormwater management and climate change connections and impacts

Climate change results in increased frequency and severity of drought, flood and extreme rainfall events. In the last few years, Alberta has the inauspicious reputation of being a leader in Canada on the extreme weather front having relatively more "heavy rains, hail and wind, including from major storms that ravaged Calgary, Edmonton, and the province's south."[60] Extreme weather can have numerous implications for stormwater management that governments, citizens, and stakeholders will need to cope with and address. Here are some of them:

- Infrastructure that was designed for "normal" weather and infrequent extreme storm events may not be able to handle more frequent and extreme storms. This can result in flooding, erosion, water pollution, damage to aquatic habitat, property and infrastructure damage, ruined crops, displaced people, widespread insurance claims and subsequent higher premiums or the inability to insure, and health, both mental and physical, issues suffered by victims of floods and flood impacts.
- Both higher water temperature and more frequent extreme weather events can increase the occurrence of waterborne illnesses such as cryptosporidium, E. coli, giardia, hepatitis A, legionella, vibrio cholerae and shigella.[61] As stated by the Canadian Safe Drinking Water Foundation, the "outbreak of E. coli in Walkerton, Ontario, is a good example of how excessive precipitation can increase the probability of water contamination.[62]
- Public bodies, including provinces and municipalities, and others responsible for stormwater management could face litigation by those injured through climate change impacts, for failing to take adequate precautionary and climate change adaptation measures.[63]

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[60] John Cotter, "Alberta Extreme Weather Loss Insurance Claims Lead Canada," The Canadian Press, posted May 8, 2013, updated July 8 2013, online Huffington Post: < http://www.huffingtonpost.ca/2013/05/08/alberta-extreme-weather-loss-insurance-claims_n_3238958.html>.

[61] Safe Drinking Water Foundation, *The Effects of Climate Change on Waterborne Diseases*, (no date provided), at 3, online: <http://www.bvsde.paho.org/bvsacd/cd68/effectclim.pdf>.

[62] *Ibid.*

[63] For more information on climate change related litigation see the Columbia Law School, Sabine Center for Climate Change, which has developed a U.S. and non-U.S. climate change litigation base, online: <http://columbiaclimatelaw.com/> link to resources.

3.3.3. Stormwater management: - An Ideal Law and Policy Framework that is climate change ready and resilient

An Ideal Law and Policy Framework with respect to stormwater water management that includes provisions to be prepared for, adaptive and resilient in respect of climate change would have the following features:

- The Ideal Framework would require municipalities, of all kinds --rural to cities – to engage in climate change planning and adaptation in respect of all aspects of municipal authority including stormwater management. Municipal plans would require that potential climate change impacts and adaptation be taken into consideration in all relevant municipal decisions, and set out when and how climate change and adaptation considerations will lead to particular decision-making. Municipal plans would provide a roadmap as to how this will be done. For example, climate change and adaptation considerations could require that low impact development techniques be used in order to achieve subdivision plan approval.
- The Ideal Framework would require municipalities to carry out risk assessments regarding existing stormwater management infrastructure. Maintenance and replacement would be planned and carried out in view of climate change risks. For example, in the City of Toronto, a number of areas slated for storm sewer upgrades will be incorporating a "stringent new design standard. Whereas the old pipes were meant to capture the volume of water rushing off roofs, driveways, and streets during the kind of storm that would occur on average every 2-5 years, newer pipes are tailored for more frequent, the so-called 100-year storms."[64]
- The Ideal Framework would require municipalities to plan for more frequent floods, and to be proactive to reduce severity of damage, in addition to being prepared to implement defensive and reactive measures. This is especially important for urban municipalities because, as explained by the Global Water Partnership, "… land cover and vegetation are stripped away in the process of urbanization to make way for buildings, roads, parking lots, and other impervious structures. The natural storage capacity of the soil in the area is diminished or even eliminated. Constructed (and inadvertent) drainage channels alter the existing hydrology and flow regimes, such that precipitation flows rapidly across the surface in short, intense, high-volume bursts rather than sinking into the soil."[65]
- Proactive, defensive, and reactive measures include:
    - Engaging in what is called "integrated flood management" (IFM) planning and implementation. IFM seeks to "Manage the water cycle as a whole; Integrate land

[64] R. Kessler, "Stormwater Strategies – Cities Prepare Aging Infrastructure for Climate Change," Environmental Health Perspectives, 119:12 (Dec, 2011) 514-519, at 514.
[65] World Meteorological Association (WMO) and Global Water Partnership (GWP), *Urban Flood Management in a Changing Climate*, Integrated Flood Management Tools Series, Issue 14, February 2012, 5 at para 2.2, online: < http://www.apfm.info/ifm_tools.htm>, link to *Urban Flood Management in a Changing Climate.*

and water management; Manage risk and uncertainty; Adopt a best mix of strategies; Ensure a participatory approach; and Adopt integrated hazard management approaches."[66] IFM would require the involvement of all potentially affected government stakeholders within a basin, including urban and rural municipalities, the provincial and federal governments given their respective legal jurisdiction over water management related matters, Aboriginal communities, profit and non-profit stakeholders, and citizens.

- Carrying out IFM based risk management and vulnerability assessments for areas and restructured floodplain management, including redefining floodplains and restricting or prohibiting development on them by municipal bylaw, or provincial directive. Implementing this aspect of IFM may require land expropriation, return of floodplain land to natural processes, and restoration of natural wetlands to assist in flood management.
- Incorporating other IFM approaches such as: developing bylaws or codes regarding the height of buildings from the ground; setting requirements for green roofs, pervious driveways and other surfaces; providing for onsite domestic stormwater drainage such as a rainwater collection systems, and generally supporting developments aimed at retaining or mimicking the functions of natural drainage systems.[67]

- The Ideal Framework would prohibit future combined sewer systems and would contain provisions for upgrading existing ones.
- The Ideal Framework would require municipalities to engage in low impact development procedures and processes as appropriate and to consider watershed impacts when permitting developments. As mentioned earlier, low impact development includes "bioretention facilities, rain gardens, vegetated rooftops, rain barrels and permeable pavements."[68]
- The Ideal Framework would require municipalities to conduct wetland inventories and to develop wetland policies and bylaws to stem wetland destruction and impacts in subdivision and development processes.

4.0. Current law and policy water rights and management framework in Alberta

4.1. Introduction

This Part provides a broad stroke overview of the legislative jurisdiction over water management in Canada, focussing on Alberta. Additional details are provided as necessary in Part 5.0, which

[66] *Ibid*, at 16, para 4.11.
[67] For municipal examples using some of these techniques see *Climate Change Adaptation, A State of the Practice Report - Preparing for the Impacts of Climate Change on Stormwater and Floodplain Management: A Review of Adaptation Plans and Practices*, A report prepared by the Toronto and Region Conservation Authority for the Region of Peel, February 2009, online:< http://www.sustainabletechnologies.ca/wp/wp-content/uploads/2013/01/CC-on-SW-and-FP-Mgmt.pdf>.
[68] See Environmental Protection Agency, *Urban Runoff: Low Impact Development*, *supra* note 57.

looks at where Alberta's law and policy framework stands in relation to the ideal frameworks discussed in Part 3.0.

4.2. The Constitution, water management, and climate change

4.2.1. About the Constitution

Legally speaking, the most basic power to manage land lies with those possessing the right to regulate and set policy for its various aspects – land, water, air, wildlife, plants, other biota, and the relations among them. Determining who or what has the right to regulate and set policy for these aspects is no different from determining who or what has the right to regulate or set policy for any other matter in Canada. The place to start is with the Canadian Constitution as set out in the *Constitution Act, 1867*.[69]

The *Constitution Act, 1867* allocates "heads of legislative power" between the federal and the provincial governments. The framers of the Constitution intended the allocation to be exclusive in the sense that if the Constitution gives one level of government the right to legislate a matter, it excludes the other level from legislating that matter. If one level of government passes an enactment governing a matter over which the Constitution gives the other level exclusive power to legislate, a court may strike down the law as being *ultra vires*, meaning beyond the authority given by the Constitution.

4.2.2. Federal and provincial legislative heads of power

To determine which level of government – federal or provincial – has the right to regulate matters concerning water in Alberta requires looking at which level of government holds constitutional power to regulate matters concerning land and resources such as water. These powers include:

Federal Constitutional Powers - the federal government may legislate:

- the public debt and federal public property (s 91(1A)),
- trade and commerce (s 91(2)),
- to raise money by taxation (s 91(3)),
- navigation and shipping (s 91(10)),
- seacoast and inland fisheries (s 91(12)),
- regarding Indians and lands reserved for Indians (s 91(24)),
- the criminal law (s 91(27)),
- extra provincial works and undertakings (s 92(10)(a)),
- works for the general advantage of Canada (s 92(10)(c)),
- to establish peace, order and good government (opening and concluding clauses of s 91), and

[69] *Constitution Act, 1867*, formerly the *British North America Act, 1867*, (UK) 30 & 31 Vict, c 3. This Part of the Paper is largely based, with appropriate changes and updates, on various writings of the author including, Arlene Kwasniak, *Alberta's Wetlands: A Law and Policy Guide*, Second Edition (Calgary: Canadian Institute of Resources Law and the Alberta North American Waterfowl Management Plan Partnership, 2016).especially Primers 1, 8 and Chapter 5.

- to implement any international treaty which Great Britain entered on behalf of Canada (s 132).[70]

Provincial constitutional powers - Provinces may legislate:

- the management and sale of provincial public lands including timber and wood thereon (s 92(5)) ("land" is deemed to include water),
- local works and undertakings (s 92(10)),
- property and civil rights in the provinces (s 92(13)) and local or private matters (s 16), penalties for violating provincial law (s 92 (15)), and
- the exploration, development, management, and subject to overriding or conflicting federal legislation, the export to other provinces and taxation of non-renewable natural resources and electrical energy (s 92A).

4.2.3. Constitutional legislative powers in relation to environment and natural resources

As a result of various court decisions on heads of power throughout the years, legislative jurisdiction relevant to environment and natural resources, such as land, water, wildlife, and vegetation, and activities relating to environment and resources, may be summarized as follows:

The federal government has the right to legislate:

- all federal lands (e.g., National Parks and other federal lands) and generally all resources on these lands (e.g., timber, water, range, wildlife, and mines and minerals),
- natural, commercial sport, or recreational fishery habitat in Canada, whether on federal or non-federal lands, and whether on privately owned or public lands,
- navigation on any waters that potentially can be navigated anywhere in Canada,
- Aboriginal persons and Indian Reserves, subject to Aboriginal rights and entitlements,
- ocean pollution and ocean mammals, and
- migratory birds and to a limited degree, migratory bird habitat (whether on federal or non-federal lands and whether on privately owned or public lands).[71]

Provincial governments have the right to legislate:

- provincial Crown lands and all resources relating to these lands (except where a matter is under federal jurisdiction, e.g., fisheries),

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[70] List adapted from Alastair Lucas, "Natural Resources and Environmental Management: A Jurisdictional Primer" in Donna Tingley, ed, *Environmental Protection and the Canadian Constitution: Proceedings of the Canadian Symposium on Jurisdiction and Responsibility for the Environment* (Edmonton: Environmental Law Centre, 1987).

[71] The federal government power relating to migratory birds and migratory bird habitat arose under the 1916 *Migratory Birds Convention* between Great Britain, on behalf of Canada, and the United States. The federal government may through legislation implement this treaty throughout Canada under section 132 of the *Constitution Act, 1867*, which gives the federal government power to implement British Empire treaties. Now that the United Kingdom no longer enters into treaties on behalf of Canada, the current legal view is that the federal government may no longer rely on section 132 to pass legislation applying throughout Canada to implement treaties. The current legislation that implements this treaty is the *Migratory Birds Convention Act, 1994*, SC 1994, c 22.

- wildlife, wherever it occurs in the province, whether on public or private lands, and generally on federal lands , and
- matters regarding land uses such as land titles systems and planning and development law on any land in a province, except for federal or reserve lands.

Although provinces have the right to legislate and set policy for air and water pollution and soil contamination within provincial borders, the federal government also has the right to legislate some aspects of pollution such as interprovincial and international pollution as well as toxic substances, wherever they occur.[72]

Although there is no definitive case, clearly both levels of government may legislate in regards to climate change, though their respective legislation must be within the ambit of a constitutional head of power for that level of government. Provinces and the federal government have passed climate change related legislation. [73]

4.2.4. Unclear Constitutional jurisdiction

In 1867 when the heads of power lists were developed, not every possible subject matter was or could be considered (e.g., environmental matters generally, aeronautics, telecommunication). Where it is not clear which level of government has jurisdiction over a subject matter, our courts use methods to resolve the question.[74]

First, they seek to determine if the matter truly falls within the power of only one of the two levels. In determining this, courts will apply interpretation rules where they first characterize the essence of the regulated subject matter. Then they consider whether the subject matter falls under provincial or federal constitutional authority. For example, they might ask whether a provincial law prohibiting timber imports into a province in essence deals with regulating provincial property, timber resources, (a matter within provincial authority) or whether it really has to do with trade and commerce (a matter within federal authority). If the essence of the law is the former, they will find the provincial law to be valid, but if it is the latter, they will declare the law to be *ultra vires* the Constitution. *Ultra vires* means beyond authority. A court may strike down or declare inapplicable, a provincial law that is *ultra vires* provincial constitutional authority. Similarly, a court may strike down or declare inapplicable a federal law that is *ultra vires* federal constitutional authority. But sometimes carrying out this first step will not yield a definitive resolution.

Second, courts could find that both levels may validly legislate some aspect of the matter. For example, consider water pollution. Provinces may pass legislation regulating water pollution, since provinces have constitutional right to legislate to protect provincial and private property and

[72] The Supreme Court of Canada confirmed the federal government's right to regulate toxic substances throughout Canada in *R v Hydro-Quebec*, [1997] 3 SCR 213.

[73] E.g. Alberta's *Climate Leadership Act*, SA 2016, c 16.9, Alberta's *Climate Change and Emissions Management Act*, SA 2003, c C-16.7, Manitoba's *The Climate Change and Emissions Reductions Act*, CCSM 2013, c C135, Ontario's *Climate Change Mitigation and Low-carbon Economy Act*, SO 2016, c 7, *An Act to amend the Environment Quality Act and other legislative provisions in relation to climate change*, SQ 2009, c 33, and the federal *Kyoto Protocol Implementation Act*, SC 2007, c 30. Note that all of these statutes focus on mitigation, not adaptation.

[74] This Paper presents a brief summary of the rules. For more analysis and information, see a constitutional text, such as, for example, Peter Hogg, *Constitutional Law of Canada*, 5th ed (Toronto: Carswell, 2013).

civil rights. As well, the federal government may pass legislation regulating water pollution that interferes with fish habitat since it has constitutional right to legislate over inland and coastal fisheries. Both levels of laws may operate concurrently. However, if they directly conflict, our courts will apply the doctrine of paramountcy to confirm the operation of the federal law and to declare the provincial law to be inoperative to the extent that it conflicts with the federal law.

Third, courts may observe that the Constitution does not clearly confer legislative authority to either level of government. In such case, a court may find that the federal government should have legislative authority since the Constitution gives it the right to regulate residual matters under the peace, order, and good government provision. Courts have taken this route where there are gaps in constitutional authority, matters of national concern, situations where single provinces are unable to adequately deal with the subject matter, and emergencies.[75]

Fourth, courts may find that the doctrine of inter-jurisdictional immunity applies. Under this doctrine, a law of a province cannot operate to significantly trench upon and impair the core of a head of constitutional jurisdiction of the federal government, whether or not the federal government has legislated the matter in question.[76]

4.3. Selected federal water related legislation relevant to the climate change and water nexus

This Paper focusses on provincial constitutional powers. However, it should be kept in mind that the federal government has considerable legislative authority over matters relevant to climate change adaptation. As well, the federal government may use its budgetary and spending powers to direct and finance climate change adaptation initiatives.

For the readers' information, here is a list and short description of some legislation that may be relevant to the climate change and water nexus:

- The Canadian *Environmental Protection Act*, 1999,[77] which, among other things, regulates toxic substances that may be discharged in water.
- The Canada *Water Act*,[78] which, among other things, authorizes the Minister of Environment and Climate Change, with Cabinet approval, "For the purpose of facilitating the formulation of policies and programs with respect to the water resources of Canada and to ensure the optimum use of those resources for the benefit of all Canadians … enter into an arrangement with one or more provincial governments to establish, on a national, provincial, regional, lake or river-basin basis, intergovernmental committees or other bodies."[79]

[75] See Peter Hogg, *Constitutional Law of Canada*, 3rd edition (Toronto: Carswell, 1992) c 17, 435-466.
[76] A statement of the rule may be found in *Marine Services International Ltd v Ryan Estate*, 2013 SCC 44.
[77] *Canadian Environmental Protection Act*, 1999, SC 1999, c 33
[78] *Canada Water Act*, RSC 1985, c C-11
[79] *Ibid*, s 4.

- The Fisheries *Act*,[80] which, among other things, manages "threats to the sustainability and ongoing productivity of Canada's commercial, recreational and Aboriginal fisheries"[81] including though an authorization system.
- The *Navigation Protection Act*,[82] which, among other things, "regulates interferences with the public right of navigation [and] … works and obstructions that risk interfering with navigation in the navigable waters listed on the schedule to the Act." The Act "also prohibits the depositing or throwing of materials that risk impacting navigation in navigable waters and the dewatering of navigable waters."[83]
- The *Safe Drinking Water for First Nations Act*,[84]which, among other things, authorizes the federal government "to develop, in partnership with First Nations, enforceable federal regulations to ensure access to safe, clean, and reliable drinking water; the effective treatment of wastewater; and the protection of sources of drinking water on First Nation lands."[85]
- The *Canadian Environmental Assessment Act, 2012*, [86] which, among other things, sets out when the federal government will require an assessment of the environmental effects of a proposed project that touches on federal jurisdiction, and governs the environmental assessment process.

4.4. Selected Alberta water related legislation relevant to the climate change and water nexus

This section summarizes some Alberta legislation relevant to water and climate change. Later sections of the Paper provide further detail as appropriate.

- The 2009 *Alberta Land Stewardship Act*[87] (ALSA), which together with the provincial Land Use Framework (LUF), provides the provincial government with unprecedented legislative and policy tools to comprehensively plan and manage public and private lands and interests, including landscapes, and water bodies and watercourses within them. The LUF is an innovative government policy approach for land use planning and management in the province. The LUF pertains to both private and public lands and designed to facilitate watershed management.

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[80] *Fisheries Act*, RSC 1985, c F-14.
[81] From the Department of Fisheries and Oceans website, *The Fisheries Protection Provisions of the Fisheries Act: Before and after the 2012/2013* Amendments, online <http://www.dfo-mpo.gc.ca/pnw-ppe/changes-changements/index-eng.html>.
[82] *Navigation Protection Act*, RSC 1985, c N-22.
[83] From Transport Canada's website, Frequently Asked Questions, Question Two, What is the *Navigation Protection Act*, online: < https://www.tc.gc.ca/eng/programs-622.html>.
[84] *Safe Drinking Water for First Nations Act*, SC 2013, c 21.
[85] From the Indigenous and Northern Affairs website, *Safe Drinking Water for First Nations*, online:<*wehttps*://www.aadnc-aandc.gc.ca/eng/1330528512623/1330528554327>.
[86] *Canadian Environmental Assessment Act*, 2012, SC 2012, c 19, s 52. The *Fisheries Act*, as well as the *Navigation Protection Act*, and the *Canadian Environmental Assessment Act*, currently (March 2017) are under review and revised or new legislation is expected to be introduced in 2017 or 2018.
[87] *Alberta Land Stewardship Act,* SA 2009, c A-22.8 [ALSA].

- Regional plans developed under the ALSA are legislative and they prevail over conflicting provisions in any Alberta regulations, and over regulatory instruments, including municipal bylaws, policies and government policies and codes of practices.[88] This means that where there is a conflict between, for example, a regulation made under a statute and a regional plan, the regional plan applies and not the regulation. Or, if there is a conflict between a municipal bylaw and a regional plan, the regional plan will apply and not the municipal bylaw. Regional plans may also affect what are called "statutory consents," which includes "… a permit, licence, registration, approval, authorization, disposition, certificate, allocation, agreement or instrument issued under or authorized by an enactment or regulatory instrument …" other than certain exceptions.[89] Accordingly, dispositions under the *Water Act*, such as water licences, and under other Alberta public resource management legislation, are statutory consents under the ALSA, and could be affected by regional plans.[90] However, to affect a statutory consent a regional plan must do so expressly, and prior to affecting a statutory consent, the relevant Minister must give the holder or holders of the statutory consents affected, reasonable notice, and opportunity to propose alternate ways of achieving the policy objective.[91]
- Part III of the ALSA provides an array of Conservation and Stewardship Tools. These include authorization of economic instruments, which are approaches that use market forces to meet environmental objectives. Economic instruments commonly include taxes, fees, emission or discharge trading systems, subsidies, grants, and charges for environmental services or amenities.[92] Part III also authorizes conservation easements[93] and offers new economic instruments and stewardship tools including agricultural easements, transfer of development credit programs, and conservation offset opportunities. As well, it permits government to permanently protect and manage land through the use of conservation directives.[94] The ALSA provides various discretions and mechanisms for

[88] ALSA, *ibid*, s 17(1).
[89] ALSA, s *ibid*, 2(aa). The exceptions are any of the mentioned interests under the "(a) the Land Titles Act, (b) the Personal Property Security Act, (c) the Vital Statistics Act, (d) the Wills Act, (e) the Cemeteries Act, (f) the Marriage Act, (g) the Traffic Safety Act, or (h) any enactment prescribed by the regulations." (ALSA, s 2(2)).
[90] ALSA, *ibid*, s 11.
[91] *Ibid*.
[92] Denmark is a pioneer in using economic instruments to meet environmental objectives. The Denmark Environmental Protection Agency has useful information on economic instruments. See, Environmental Protection Agency, *Economic Instruments for Environmental Protection*, online: < http://www.statensnet.dk/pligtarkiv/fremvis.pl?vaerkid=4973&reprid=0&filid=32&iarkiv=1>.
[93] A conservation easement is a statutorily created interest in land. A conservation easement is constituted through a voluntary legal agreement that a landowner enters into with a person authorized by legislation, to protect the natural or other values specified in the legislation, regarding all or a part of their land. A conservation easement protects values by containing terms and conditions (such as development restrictions) designed to realize the conservation easement objectives. When properly registered with the appropriate land registry, a conservation easement runs with the land and terms and conditions are enforceable in accordance with agreement and legislation. In Alberta, conservation easements were first authorized in 1996 under the *Environmental Protection and Enhancement Act* (currently RSA 2000, c E-12) but then moved over the ALSA, *supra* 87.
[94]ALSA, *supra* note 87, Part 3, Conservation and Stewardship Tools.

compensation when private interests are adversely affected and for objections to regional plans.

- The *Environmental Protection and Enhancement Act*[95] (EPEA) is the primary Alberta statute that governs development and activities that can adversely impact the quality of the environment in the province, including air quality, water quality, and land quality. The EPEA sets out environmental assessment processes, and approval and other statutory authorization processes to enable and regulate activities that can adversely affect the environment. It regulates conservation and reclamation of land, release of substances, hazardous substances and pesticides, wastewater systems, waste minimization, recycling, and waste management, and provides for potable water standards.
- The right to use water in the prairie provinces has been regulated since 1894, when the federal *Northwest* Irrigation *Act* of 1894[96]was enacted. The current water allocation and management legislation in Alberta is the *Water Act*,[97] enacted in 1990. The *Water Act* carries forward many of the principles set forth in the 1894 legislation.
- The *Water Act* primarily governs water quantity in Alberta, in contrast to water quality. In the Act, just as in predecessor legislation, the Crown claims ownership of water resources in the province and sets out a water allocation system to enable the diversion of water for uses permitted under the Act. The right to use water under the Act is called a "water right." The main types of water rights under the *Water Act* are specified exemptions, such as a limited annual quantity of water for household use for riparian owners or occupiers; registrations, a special registered water right for a limited annual quantity of water for agricultural users to water livestock and apply pesticides; and licences. Unless an exemption applies, a licence is required for anyone who wants to use groundwater or surface water for a purpose set out in the regulations, such as for agricultural, industrial, commercial, recreational, and other purposes. Priorities for water use in times of water shortage for licences and registrations are based on first in time first in right, which means the holder of an earlier dated government issued or registered water right (including licences issued under predecessor legislation) has the right to use the entire amount of water allocated under the water right before more junior allocators.
- Water licences are legally tied to land or works (a relationship called "appurtenancy") so that when land or works are transferred to a new owner, the water licence transfers as well. Provisions in the 1990 *Water Act* permit applications to transfer a licensed water allocation without a land or works transfer.[98]
- In 2006, the Alberta Crown reserved all unallocated water in portions of the South Saskatchewan River Basin and, with narrow exceptions, effected a moratorium on issuing new surface water licences for portions of the South Saskatchewan River basin.[99]

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[95] *Environmental Protection and Enhancement Act*, RSA 2000, c E-12.
[96] *Northwest Irrigation Act*, 57 & 58 Vict (1894) c 30.
[97] *Water Act*, RSA 2000, c W-3.
[98] *Water Act*, *supra* note 97, ss 80-83.
[99] This was effected the 2007 *South Saskatchewan River Basin Water Allocation Order*, Alta Reg 171/2007.

- The *Water Act* also requires a statutory authorization called an "approval" for developments and activities that can affect water and its ecological environment, unless exempted by the Act.[100]
- The *Water Act* provides for water management planning and water management plans, including Cabinet approved plans that can permit water transfers and up to a 10% holdback from the allocation to be transferred to help supplement instream water flow.[101]
- Part 5 of this Paper further explains provisions of the *Water Act* pertinent to this Paper.

4.5. Municipalities

The *Constitution Act, 1867* does not give municipalities a head of legislative power. Municipalities derive their powers from provincial legislation. Accordingly, municipalities may have no greater constitutional authority to regulate matters than provinces. Provincial legislation has given municipalities considerable regulatory powers relating to lands and water, including watercourses and water bodies.

The Alberta statute that creates municipalities and provides the major legal framework under which they may operate is the *Municipal Government Act*[102] (MGA). This section provides a broad overview of municipal regulatory powers. Part 5 zeros in on some provisions of the MGA relevant to this Paper.

The reader is warned that Bill 21, the Modernized Municipal Government Act, will make significant amendments to the MGA.[103] The Bill was passed in late 2016, but at the date of writing (February 26th, 2017), has not yet been proclaimed into force. This Paper assumes that Bill 21 will be proclaimed, but notes when a discussion concerns a provision from Bill 21 that is not present in the current MGA.

The MGA defines the word "municipality" broadly to include a city, town, village, summer village, municipal district or specialized municipality, a town under the *Parks Town Act*[104] (in a national park) and a municipality formed by a special Act of legislature.[105] Differences among these designations mainly involve number of residents and powers conferred by the MGA. For example, a city may be formed under the MGA where there is a population of at least 10,000 and a town where there is a population at least 1000.[106] Regarding powers, with some exceptions, cities own and control roads within their boundaries, whereas the Alberta Crown owns roads within other types of municipalities.[107] In this Paper, the word "municipality" is used in the broad sense defined in the MGA unless the context requires otherwise.

The MGA gives municipalities considerable mandate to regulate private land use. It permits them to control a variety of matters to better assure public safety, welfare, and health. The Act requires municipalities to map out its land use objectives. It charges municipalities with the

[100] *Water Act*, *supra* note 97, Part 4, Div 1.
[101] *Water Act*, *supra* note 97, Part 2.
[102] *Municipal Government Act*, RSA 2000, c M-26 (MGA).
[103] Bill 21, *Modernized Municipal Government Act*, Second Session, 29th Legislature, 65 Elizabeth II.
[104] *Parks Towns Act*, RSA 2000, c P-2.
[105] MGA, *supra* note 102, s 1(1)(s).
[106] MGA, *ibid*, ss 82 and 81.
[107] MGA, *ibid*, s 16.

duty to pass bylaws specifying what kind of developments it will allow and it will prohibit. The MGA regulates private land uses through its planning, development and subdivision authorities. Through these statutory mandates and powers, municipalities can affect water and watershed protection and conservation.

Despite the broad authorities of municipalities set out in the MGA, caselaw has firmly established that municipalities, like all statutory creations, have no authority beyond the powers expressly or implicitly conferred by legislation. If a municipality acts beyond conferred powers, a court may determine any purported action to be *ultra vires* -- beyond authority -- and accordingly without legal effect.

5.0. Alberta's Law and Policy Framework in relation to the Ideal Framework

5.1. Introduction

This Part of the paper compares current Alberta laws and policies that are relevant to water and climate change with the Ideal Frameworks characterized within the subsections of Part 3.0 -- climate change and instream flow and instream flow needs/environmental flow (IFN/EF); climate change, droughts, and water supplies; and climate change and stormwater management.

As some elements of the Ideal Frameworks were very detailed, and some occurred under more than one of the subsections, for simplicity purposes section 5.2 below sets out a list that reframes the components of an Ideal Framework. In reframing the list, the components of an Ideal Framework from Part 3.0 were combined and summarized as appropriate.

Section 5.2 looks at each component of the reframed Ideal Framework, and compares Alberta's current law and policy approaches. Section 5.2 also makes recommendations or presents options where Alberta's approaches could be improved to make it more climate change ready and resilient.

It is important to note that the reframed list is not comprehensive in that it does not contain all of the components that an Ideal Framework would require for a jurisdiction to be climate change resilient with respect to water management. The list is limited to three nexuses on which this Paper focusses, namely climate change and instream flow and IFN/EF, water supplies, and stormwater management. Even then, given the breadth of these topics, the discussion necessarily is circumscribed.

5.2. The Reframed Ideal Framework List

Here is the summarized and reframed Ideal Framework:

The Ideal Framework would include a comprehensive water and climate change adaptation management plan that would be part of a larger climate change adaptation plan.

1. The Ideal Framework would reflect fairness, would be flexible, and would incorporate adaptive management.
2. The Ideal Framework would provide an array of tools for restoring and protecting IFN/EF. The Framework would recognize restoring and protecting IFN/EF requires both private and public efforts, especially in near and over-allocated areas, as water that the system needs may be already subject to government issued water rights.

3. The Ideal Framework would facilitate conjunctive water management of groundwater with surface water, and would regulate water quantity and water quality together. As well, the Framework would incorporate a watershed management approach.
4. The Ideal Framework would address evaporative losses, e.g. by requiring a water licence where a land use or development will accelerate evaporative losses, or will result in evaporative losses that would not naturally occur, and the Ideal Framework would otherwise broadly construe what activities require a water licence. As well, the Ideal Framework would provide clarity with respect to water entitlements and return flow, rainwater, runoff or diffuse surface water.
5. The Ideal Framework would provide for water reuse at domestic, commercial, and industrial levels. The Ideal Framework would also incorporate for use other appropriate alternate sources of water such as produced and desalinated water.
6. The Ideal Framework would provide for and require, as appropriate, water conservation methods and approaches.
7. The Ideal Framework would require municipalities, of all kinds - rural to cities - to engage in climate change adaptation planning in respect of all aspects of municipal authority, in particular, authority that relates to stormwater management. Municipal climate change adaptation plans would contain a number of elements including climate change risk assessments, planning for more frequent floods, adaptation measures including stormwater infrastructure improvements, separating combined sewer systems, embracing low impact development, conducting wetland inventories, and developing and implementing wetland policies.

5.3. The Alberta Framework compared to the Reframed Ideal Framework and Recommendations/Options

Re 1 Discussion:

The Framework would include a comprehensive water and climate change adaptation management plan that would be part of a larger climate change adaptation plan.

The Georgetown Climate Centre's website graphically displays the status of state and local level climate change adaptation planning.[108] At the state level, fifteen of the fifty U.S. states have finalized adaptation plans, though many other states have plans in development. The plans' goals vary as do the states' respective progress towards implementation.[109]

Although there is web-based summary information on Canadian provinces progress on climate change mitigation efforts,[110] the author was unable to find a comparable web service for provincial adaptation plans in Canada. However, a perusal (January 2017) of web-available material from the government sites of the eleven Canadian provinces and the three territories

[108] Georgetown Climate Centre – A Leading Resource for State and Federal Policy, *State and Local Adaptation Plans, online:* <http://www.georgetownclimate.org/adaptation/plans.html>.
[109] The number is on the basis of a search on January 17, 2017.
[110] E.g. the Delphi Group, *The Provinces and Canada's Climate Change Agenda*, online: <http://delphi.ca/who-is-driving-climate-change-in-canada/>.

disclosed that although the lion's share of climate change plans concern mitigation, there is considerable governmental activity across the country on adaptation. These plans are largely in the development stage, rather than the implementation stage, but there has been progress towards taking actual adaptation action, including with respect to water/climate change nexus adaptation. The footnote to this discussion very briefly outlines some provincial and territorial initiatives.[111]

Alberta is a leader in Canada with respect to climate change mitigation, but it has not, at least not yet, carried through the same leadership with respect to climate change adaptation. On the water management legislation front, there is nothing in the *Water Act* or regulations that

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[111] British Columbia has developed a *Climate Change Adaptation Strategy*, online: <http://www2.gov.bc.ca/gov/content/environment/climate-change/policy-legislation-programs/adaptation> though many policy change related steps remain to be developed and implemented. Saskatchewan's October 2016 *White Paper on Climate Change*, online: <https://www.scribd.com/document/328041639/Saskatchewan-White-Paper-on-Climate-Change#from_embed > recognizes adaptation as a necessary and important approach, though there is not yet a developed plan. The Manitoba government states that it is in the process of developing an agriculture and climate change adaptation plan, information online: < http://www.gov.mb.ca/agriculture/environment/climate-change/adaptation.html>. Ontario's *Five Year Climate Change Action Plan*, 2016 – 2020, online: <http://www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf>, is mainly about mitigation, but adaptation features in that the province intends explore legislative amendments to make it mandatory that municipalities include climate change considerations into official municipal plans (page 32), and to include climate change considerations in environmental assessment processes (page 53). It also sets out its goal to update the *Ontario's Adaptation Strategy and Action Plan*, 2011-2014, in 2017-2018 (page 70). Quebec's 2013-2020 *Government Strategy for Climate Change Adaptation* sets out objectives and plans for climate change adaptation, such as continuing to "modify the content of laws, regulations, policies, strategies and planning tools" (page 21) (including water use and quality and land use legislation) to include climate change adaptation considerations. The New Brunswick May 2016 *Discussion Guide, Building a Stronger New Brunswick Response to Climate Change*, online: <http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Climate-Climatiques/BuildingAStrongerResponseToClimateChange.pdf> mainly concerns mitigation but also discusses potential adaptation approaches. Nova Scotia's *Climate Change Adaptation Fund* "was launched in 2010 to support efforts and actions by communities in order to: 1. Identify and assess the threats and opportunities related to climate change in Nova Scotia; 2. Build Nova Scotia's capacity to become better suited to new and different climatic conditions. The fund has supported groups and individuals, including non-profit organizations, municipalities, universities, and businesses, conducting efforts to help build a stronger community." See Fund Reports online: < https://climatechange.novascotia.ca/what-ns-is-doing>. Prince Edward Island is in the process of developing an adaptation strategy with the Climate Research Lab at the University of Prince Edward Island, online: <. https://www.princeedwardisland.ca/en/service/climate-change-mitigation-strategy-public-consultation>. Newfoundland and Labrador Government's *Charting Our Course: Climate Change Action Plan 2011*, online: < http://www.turnbackthetide.ca/files/government-action/climate_change.pdf>, which mainly concerns mitigation, promises that the government will continue to develop and implement adaptation initiatives. Some initiatives are set out online : < http://www.env.gov.nl.ca/env/waterres/climate_change/programs.html>. The website of the Atlantic Climate Adaptation Solutions (ACASA) Project, which is a partnership among the provincial governments of Newfoundland and Labrador, Nova Scotia, Prince Edward Island, and New Brunswick, contains further climate change initiatives of the Atlantic Provinces, online: < https://atlanticadaptation.ca/en/home>. Canada's territories also are involved in adaptation initiatives, e.g. Yukon's *Climate Change Adaptation* web pages and links, online: < http://www.env.gov.yk.ca/air-water-waste/Climate-Change-Adaptation-Information.php#notes>, Nunavut's Climate Change Centre's *Climate Change Adaptation*, information web pages, online: < http://climatechangenunavut.ca/en/understanding-climate-change/climate-change-adaptation> , the work of the Nunavut Climate Change Regional Adaptation Collaborative, online: < http://climatechangenunavut.ca/en/project/nunavut-regional-adaptation-collaborative> , and the Northwest Territories *Climate Change Strategic Framework*, online: << http://www.enr.gov.nt.ca/node/3697>. The second pillar of the last mentioned is Adaptation and Resilience (knowledge is first, and mitigation, the last pillar, is third). The three territories also are collaborating in an adaptation the initiative *A Northern Vision: Building a Better North* online: < http://www.anorthernvision.ca/strategy/>.

specifically mandate climate change considerations with respect to water management, or require the development of climate change adaptation management plans.

At a policy level, the government has made some progress, for example, the 2003 *Water for Life.* The policy's three objectives are healthy aquatic ecosystems, reliable, quality water supplies for a sustainable economy, and safe, secure drinking water supply.[112] The policy website states "*Water for Life* reflects a change in the thinking toward how water is managed in Alberta. It represents a shift from a government centred regulatory approach that focuses on water allocation, to one that incorporates principles of place-based management, watershed management, and a shared responsibility for the stewardship of resources."[113]

The original 2003 policy does not mention climate change. Although the 2008 renewal of *Water for Life* mentions it, it does not prescribe climate change adaptation actions.[114] The 2009 *Water for Life, Action Plan* goes a bit farther by including the following as planned actions:

- Address the water management and policy risks associated with a changing future water supply resulting from the impacts of changing climate regimes
- Develop future hydro-climate scenarios for major watersheds
- Develop strategies to deal with the management of changing future water supplies through the provincial Climate Change Adaptation Strategy [discussed below] and through implementation of the Land-use Framework and watershed planning.[115]

The *Water for Life, Progress Report (2008-2011)* notes the following progress on the Action Plan:

Hydro-climate modeling and variability analysis have been completed, and then were coupled to form a full picture of future variability scenarios for the following basins:

- Athabasca Basin "Upper" and "Lower" portions
- Beaver River Basin
- South Saskatchewan Basin (the South Saskatchewan Basin is made up of sub-basins: the Bow River Basin, the Oldman River Basin, and the South Saskatchewan Sub-basin).[116]

Although not *government*, Watershed Planning and Advisory Councils formed under the *Water for Life* policy, urge the provincial government and local stakeholders to engage in and implement concrete water management adaptation strategies. For example, the Battle River Watershed

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[112] Government of Alberta, *Water for Life*, (2003), online: < http://aep.alberta.ca/water/programs-and-services/water-for-life/strategy/documents/WaterForLife-Strategy-Nov2003.pdf>.
[113] Government of Alberta, *Water for Life*, web information, online: < http://aep.alberta.ca/water/programs-and-services/water-for-life/strategy/default.aspx>.
[114] Government of Alberta, *Water for Life, A Renewal*, (2008), online: <http://aep.alberta.ca/water/programs-and-services/water-for-life/strategy/documents/WaterForLife-Renewal-Nov2008.pdf>.
[115] Government of Alberta, *Water for Life, Action Plan* (2009), online: <http://aep.alberta.ca/water/programs-and-services/water-for-life/strategy/documents/WaterForLife-ActionPlan-Nov2009.pdf>.
[116] Government of Alberta, *Water for Life, Progress Report (2008-2011)*, at 34, online: < http://aep.alberta.ca/water/programs-and-services/water-for-life/strategy/documents/WaterForLife-ProgressReport-Jan2012.pdf>.

Alliance, 2013 *Drought Adaptation and Management: Policy Advice*[117] contains a number of no-nonsense recommendations and directives, e.g.:

- Agriculture sectors must explicitly recognize the impacts of short-term climate variability and long-term climate change impacts to agricultural operations.
- Drought management plans should be developed before a drought occurs, and fully implemented during drought periods. Implementation should occur in a reasoned and systematic way, remembering that a degree of flexibility in responses should be part of plan implementation.
- Government and community leaders must explicitly recognize the impacts of short-term climate variability and long-term climate change impacts…Government and community leaders must recognize when their community is experiencing drought and begin implementing response plans aimed at supporting individual, family and community wellbeing. [118]
- People with land management decision-making authority must unambiguously recognize that management of natural areas is of primary importance to the mitigating effects of drought. Drought management strategies are implemented to maintain the health of natural areas during periods of drought.[119]
- With respect to water quantity, all users of the water resource must explicitly recognize that during water shortage periods it is probable that not all water licence holders will be able to access and utilize the water resource. Drought management strategies should be implemented with a view toward reducing the impact of water scarcity on other water licence holders.
- With respect to water quality, all users of the water resource must recognize that the ability of receiving waters to assimilate contaminants is greatly impaired. Drought management strategies should be implemented to deal with increased concentration of contaminants in the aquatic environment through improved water treatment facilities and land management practices.[120]

The Battle River Watershed Alliance's 2013 *Drought Adaptation and Management: Implementation Guidelines* sets out concrete adaptation actions for all "four orders of government (municipal, provincial, federal and First Nations), urban and rural residents, agricultural producers, business and industry, environmental and community organizations, academia, recreational users, and watershed stewardship groups."[121] This innovative, and "no punches pulled" document is

[117] Battle River Watershed Alliance (2013), *Drought Adaptation and Management: Policy Advice*, online: < http://aep.alberta.ca/water/programs-and-services/water-for-life/partnerships/watershed-planning-and-advisory-councils/documents/BattleRiverDroughtAdaptation-Sep2013.pdf>.
[118] *Ibid* (all three bullets) at 3.
[119] *Supra* note 117 at 4.
[120] *Ibid* at 5.
[121] Battle River Watershed Alliance (2013), *Drought Adaptation and Management: Implementation Guidelines*, online: < http://www.battleriverwatershed.ca/sites/default/files/FINAL%20-%20Drought%20Adaptation%20and%20Management%20Implementation%20Guidelines%20BRSC%20watersheds%202014.pdf>.

telling and valuable. An unfortunate reality is that although the Watershed Alliance has moral authority, it has no legal authority over the persons and entities to which the Guidelines are aimed. To make many of the Guidelines effective regulatory action at governmental levels is required.

Back to the provincial government, Alberta has developed a Climate Change Adaptation Framework. This is what the government website says about it:

The Climate Change Adaptation Framework is a risk management process developed for Alberta Environment and Parks (AEP) to:

- Assess the impacts of climate change on department core business areas
- Provide a tool to help department business areas adapt to climate change impacts

A guidance manual for the Framework was developed for AEP to structure climate change adaptation planning. This manual is available for use by other government or non-government organizations interested in developing a climate change risk management process.[122]

At the date of writing (January 23, 2017), the Framework itself does not appear to be available online. Accordingly, the Framework is not assessed in this paper.

In 2010 however, the province developed the *Climate Change Adaptation Framework Manual* "intended to help organizations address climate change risks in a comprehensive and consistent manner."[123] The Manual anticipates the development of a climate change adaptation strategy, but it appears that the Strategy has not yet been developed or at least not posted online. The more recent (August 2015) *Climate Leadership Discussion Document*, which focusses on mitigation, in its closing section states, "Alberta's new government is also committed to developing a provincial adaptation strategy to help ensure the province is better prepared for and more resilient to a changing climate. The strategy will be developed with input from Albertans through a separate engagement process that recognizes the unique challenges and opportunities of adaptation." [124]

The even more recent (November 2015) *Climate Change Leadership Report to the Minister*, [125]which focusses on mitigation, directs attention to adaptation because of its unique importance to Aboriginal communities. The Report states:

> Given their relationship with the land the Assembly of First Nations has been advised that, "it is expected that First Nations will experience the impacts of climate change in ways that most non-Aboriginal Canadians will not, due to a heavy reliance on the environment, their locations, their economic situations."[126]

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[122] Alberta Environment and Parks, *Climate Change Adaption Framework*, description online: < http://aep.alberta.ca/forms-maps-services/publications/climate-change-adaptation-framework.aspx>.
[123] Alberta Environment and Parks, *Climate Change Adaptation Framework Manual*, (2010), Executive Summary, online: < http://aep.alberta.ca/forms-maps-services/publications/documents/ClimateChangeAdaptationManual-Apr1-2010.pdf>.
[124] Alberta Environment and Parks, *Climate Leadership Discussion Document*, (2015) at 67, online: < https://www.alberta.ca/albertacode/images/Climate-Leadership-Discussion-Document.pdf>.
[125] Alberta Environment and Parkes, *Climate Change Leadership Report to the Minister*, (2015) online: < https://www.alberta.ca/documents/climate/climate-leadership-report-to-minister.pdf>.
[126] The quoted material from the Report at this point refers to the Centre for Aboriginal Environmental Resources, "How Climate Change Uniquely Impacts the Physical, Social and Cultural Aspects of First Nations" Prepared for Assembly of First Nations, March 2006.

> The Alberta Government has made a renewed relationship with Aboriginal peoples a priority, and has asked all government departments to integrate the tenets of the United Nations Declarations on the Rights of Indigenous Peoples (UNDRIP) into actions and policies. With respect to the policies, programs, and mechanisms suggested here, the most relevant Articles from UNDRIP are likely Articles 29 and 32, which state:
> *Article 29.1: Aboriginal peoples have the right to the conservation and protection of the environment and the productive capacity of the lands or territories and resources. States shall establish and implement assistance programmes for Aboriginal people for such conservation and protection, without discrimination; and Article 32.1. Aboriginal peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources. Article 32.2. States shall consult and cooperate in good faith with the Aboriginal peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources. Article 32.3. States shall provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact.*
>
> … In the Panel's interactions with Aboriginal peoples, in specific engagement sessions held in Calgary, Edmonton and Fort McMurray, at our public sessions, and in several technical stakeholder sessions, the principles laid out above were frequently brought to our attention. Therefore, we feel it is important to restate their importance here. …Our panel believes it is critical that new climate policies, and the changes they bring to Alberta, remain the subject of genuine engagement with Aboriginal communities and organizations, and that this engagement be continuous throughout the process, including implementation and monitoring. This will require a defined process in which government works directly with Aboriginal communities and knowledge systems as defined by those communities.[127]

Alberta is engaged in other climate change adaptation initiatives. As mentioned earlier,[128] Alberta is a participant in the The Prairies Regional Adaptation collaborative (PRAC), which is "built on shared themes and a similarity of expected climate change impacts and vulnerabilities related to a changing moisture balance across the three Prairie Provinces."[129] The PRAC has developed reviews of the status of each of the three province's climate change adaptation projects and strategies. The review for Alberta (2011), although evidencing some progress in the area, identifies a number of constraints and limitations that impede the development of a comprehensive climate change adaptation implementation plan, including lack of departmental leadership, budgetary constraints, lack of capacity, and direction and opportunities for collaboration among departments,

[127] *Ibid* at 27-28.
[128] *Supra* note 8.
[129] See Prairie Adaptation Research Collaborative, online: <http://www.parc.ca/rac>.

the public and stakeholders. [130] The province needs to overcome these constraints and limitations in order to succeed in adaptation planning and implementation.

Re 1 Recommendations/Options:

- It is recommended that the province develop and implement a comprehensive climate change adaptation plan. A water management and climate change adaptation plan should be part of a larger climate change adaptation plan.
- The provincial climate change adaptation plan should be based on science and other reliable sources of knowledge including Aboriginal traditional knowledge and community knowledge. In addition to being a climate change adaptation for all Alberta, its sectors, and communities, the plan would recognize the unique adaptation needs of some sectors and communities, for example, Aboriginal communities. The plan would demonstrate the province's commitment to UNDRIP.[131] The plan would also recognize and incorporate legal and international obligations owed when devising and implementing a climate change adaptation plan. As well, the plan would be adaptive to respond to changing circumstance and knowledge development.
- Recognizing that water management is a public/private responsibility, included within the plan should be the establishment of an Alberta climate change adaptation fund, to help fund groups, individuals, municipalities, industries, businesses, landowners, and universities to develop and implement climate change adaptation tools, and to become more climate change resilient.
- It is recommended that Water for Life be revised and renewed to more fundamentally incorporate climate change adaptation measures. Legislators should consider the Battle River Watershed Alliance's work in setting out concrete climate change adaptation measures.
- It is recommended that the comprehensive climate change adaptation plan and any sub-plans and implementation actions be incorporated not only into government policies, but also into legislation.

Re 2 Discussion:

The Framework would reflect fairness, would be flexible, and would incorporate adaptive management.

Fairness

As mentioned earlier (section 4.4.), core to the Alberta water management legal framework is that the earlier the water right, the better the priority to water in times of shortage. This priority system is sometimes called, first in time first in right, or FITFIR. There are two exceptions to FITFIR.

[130] J. H. Archibald Consulting, *Review of Alberta Climate Change Adaptation Projects within the Prairies Regional Adaptation Collaborative (PRAC) and Recommendations for Future Action on Climate Change Adaptation in Alberta* (2011), online: <http://www.parc.ca/rac/fileManagement/upload/Review%20of%20Alberta%20CC%20Adaptation%20Projects.pdf >.

[131] See section 5.3. Re1 Discussion.

The first one is that under the *Water Act* is that a person who diverts water as a household user has priority to divert water over holders of licences, registrations, or approvals.[132] To be a household user a person must own or occupy land directly adjoining a natural watercourse or water body (riparian) or divert water from a groundwater source on their property. With respect to surface water, the household user right is not available to a person who can receive a water supply from a municipality or community supplier. The household user right is limited in quantity and in purposes for use.[133] The household user priority is very limited as few people, relative to the population as a whole, live directly on a watercourse or water body or over accessible groundwater. Even if there were more people who were riparian owners or occupiers or groundwater users, the concept of "fairness" hardly applies to their highest priority in times of shortage. How can it be fair that household users are entitled to water before other users, for example, a stressed aquatic environment, which is the life blood for all other uses, or municipalities, which serve the domestic water needs for humans generally? The second exception is that some water rights, e.g. certain rights exempted from the licensing requirements, have no priority at all in times of shortage.[134] There is nothing in the *Water Act* that permits the water administrator (usually the Director, or the Minister) to choose among users and uses to ensure that those with the greatest need receive water during a shortage. There also is nothing that would permit the water administrator to require a "sharing of the shortage" among users, including the aquatic environment.[135] The Alberta situation may be contrasted with federal and state Australian water law reforms that have ousted previous water rights frameworks and substituted water entitlements based on volumetric "sharing the shortage," after accounting for critical human and environmental needs.[136]

As legal commentator David Percy has forcefully expressed in his *Water Law in Alberta, Q & A's, Executive Summary, Water Act*, water licences do not create property rights. In his words:

> … as a matter of law water licences are surely no more than statutory or regulatory permissions[137] that grant the licensee the right to divert and use water, activities which

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[132] *Water Act*, *supra* note 97, s 27(b).

[133] The *Water Act* gives a household user, namely a person who "owns or occupies land that adjoins a river, stream, lake, natural watercourse or other natural water body" the right to divert up to 1250 cubic metres of water a year for "household purposes," meaning "household purposes" meaning for "human consumption, sanitation, fire prevention and watering animals, gardens, lawns and trees;" *Water Act*, *ibid*, ss 21 and 1(1) (x) and (y). The *Water Act (Ministerial) Regulation*, Alta Reg 205/1998, s 8 states that the household user exemption does not apply to those who have the right to receive water from a municipal or community water supplier.

[134] Examples include an exempted agricultural user. An exempted agricultural user is a person who owns or occupies riparian land, or land under which there is groundwater, and who on January 1, 1999 diverted water from such a water source for the purpose of applying pesticides or raising animals. Section 19 of the *Water Act* permits an exempted agricultural user to continue the diversion, up to 6250 cubic metres a year, without a licence. If such a person had registered the use prior to January 1, 2002, then, under section 74 of the *Water Act*, the water right is called a "Registration" and has a priority as of date of first use. Other exempted uses that carry no priority are set out in the *Water Act (Ministerial) Regulation*, *ibid*, s 5 and Schedules 3 and 4.

[135] There are provisions for water licensees and holders of registrations to enter into a water sharing agreement in times of shortage, but there is nothing that enables the government to direct a sharing. See *Water Act*, *supra* note 97, s 33.

[136] See, for example, the *Council of Australian Governments, Intergovernmental Agreement between the Commonwealth and States on Implementing Water Reform in the Murray-Darling Basin*, and linked documents, online: < https://www.coag.gov.au/about-coag/agreements/intergovernmental-agreement-implementing-water-reform-murray-darling-basin>, 33–34.

[137] Percy here refers to Alastair R. Lucas' work, *Security of Title in Canadian Water Rights* (Calgary, Canadian Institute of Resources Law, (1990) at 31. This claim is made only of licensed water allocation rights and not of

> would otherwise be illegal. Unlike the situation that occurs when government action deprives a person of an interest in land (where there is a presumption that compensation is payable), the government can potentially cancel or amend a water licence, provided that the legislation provides the necessary power to do so. If the government exercises this type of power, there is no presumption that the affected licensee has any right to obtain compensation, unless the legislation contains express provisions that permit compensation.[138]

Although, as Percy says, provincial legislation could provide the power to cancel or amend licences with or without compensation, under current legislation such authority is limited. Section 55(1) of the *Water Act* permits cancellation for an offence under the Act, or violating licence terms, or for total non-use for three years where use reasonably will not recommence, but these have little to do with ongoing *Water Act* powers to facilitate adaptation to climate change. Section 55(2) comes a bit closer in this regard. It states "Subject to the regulations, the Director may suspend or cancel a licence issued under this Act if, in the opinion of the Director, a significant adverse effect on the aquatic environment occurred, occurs or may occur that was not reasonably foreseeable at the time the licence was issued, and compensation may be payable… "Issued under this Act," means issued after December 31, 1998, as the Act came into effect January 1, 1999. Accordingly, it will not apply to older water licences with the highest priorities. Also, the provision does not mention *amendments* – only suspensions or cancellations. This is unfortunate, as the power to amend, even temporarily, could be useful in implementing climate change adaptation measures.

Notwithstanding the limited powers conferred on the Director in section 55, provincial Legislature, being supreme, could change the *Water Act*. It could for example, explicitly amend section 55(2) so it applies to all licences, not just post-*Water Act* licences, and it could remove or alter the compensation provisions. The *Water Act* also could be changed in many other ways to better facilitate climate change adaptation and resilience. For example, it could give the appropriate statutory delegate the power to order a "share the shortage" or to make other orders to better equip government to fairly deal with climate change. It could even scrap FITFIR altogether and set forth a fair and flexible water management framework that incorporates provisions for climate change adaptation.

Would the government have to pay compensation to current water rights holders if rights are affected by changes? As Percy points out, water rights are not property rights and "the government chose to make provision for the payment of compensation for cancellation [in section 55(2)], but it was under no legal obligation to do so."[139]Although not property rights, water rights are valuable to their holders and one assumes that government would be reasonable and fair in making in changes. One must remember too, that sharing the shortage provisions would only apply when there is a shortage, but at other times, it would be business as usual.

Other provisions that government might look at when better assuring that its legislation facilitates climate change adaptation and resilience concern the *Water Act's* special privileges it confers on "deemed licences," which primarily are water licences in existence when the *Water Act*

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water rights generally. Riparian rights for domestic use have, in a limited manner, survived water resource legislation and they are usufructory property rights.

[138] David Percy, *Water Law in Alberta, Q & A's, Executive Summary*, online: < http://albertawater.com/docs/Alberta_WaterLawQASheets.pdf>.

[139] David Percy, *Water Law in Alberta, Q & A's, Executive Summary, supra* note 138 at 2.

came into effect. The *Water Act* states that the priority, terms, and conditions of a deemed licence prevail over the *Water Act*, if inconsistent with the Act.[140] The deemed licence provisions can greatly constrain government action when implementing climate change adaptation measures (e.g. share the shortage) and gives deemed licensees a undefined but ostensibly superior advantage over other users.

There is precedent for governments changing legislation in the public interest that affects statutory or regulatory permits. Australian legislation has already been mentioned. Closer to home, as mentioned in section 4.4., regional plans under the *Alberta Land Stewardship Act* (ALSA) can affect statutory consents, which include water licences, and other water rights under the *Water Act*. Under the ALSA any compensation payable in this regard will be that established under other enactments, e.g. the *Water Act.*[141]

It should be mentioned that the *Water Act* contains emergency provisions permitting the authorized statutory delegate to suspend the operation of particular licences and other authorizations when there is "an immediate and significant adverse effect on the aquatic environment, human health, property, or public safety.[142] As well, the Act authorizes Cabinet to declare an emergency and more generally suspend the operation of authorizations when Cabinet determines there is an emergency. In the emergency case, compensation may be payable.[143] However useful these powers might be, they simply are not sufficient as climate change adaptation measures. First, the point of implementing adaptation measures is that they be implemented to avoid emergencies, and to deal with climate change impacts in an ongoing manner, and not only in emergencies. As well, Canadian case law indicates that courts usually will allow executive exercise of legislated emergency powers only in extreme situations of clearly unforeseen emergencies and that the powers may only be exercised during the emergency and no longer.[144] Climate change is foreseen and we need to be equipped now to deal with its impacts. For example, climate change adaptation may require ensuring more water generally stays instream to protect an ecosystem from being degraded by climate change, rather than to wait until the ecosystem is gasping for survival.

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[140] Sections 18(1) and (2) of the *Water Act*, *supra* note 97 state "18(1) Every authority or licence other than a temporary authority, agreement, permit, interim licence, updated and reissued interim licence and supplementary interim licence, granted under a predecessor Act that on January 1, 1999 authorizes the diversion of water, is a deemed licence that has a priority number that corresponds to the priority number of the original authority or licence.

(2) A person who holds a deemed licence under this section may continue to exercise the right to divert water in accordance with

(a) the priority number of the deemed licence, and

(b) the terms and conditions of the deemed licence and this Act, and if a term or condition of the deemed licence is inconsistent with this Act, that term or condition prevails over this Act."

[141] ALSA, *supra* note 87, ss 2(3) and 11(2)(c).

[142] *Water Act*, *supra* note 97, s 106.

[143] *Ibid*, s 107.

[144] See, e.g., Kuypers v. Langley, [1992] CarswellBC 9, paras 6, 21, 22, 52 (Can.). In Kuypers, the defendant township declared via by-law a state of emergency pursuant to emergency powers in municipal legislation with regard to the frequency and severity of unprovoked attacks by "dangerous dogs, "paras 16, 21-23. Justice Hogarth of the British Columbia Supreme Court determined that there was no "emergency," as defined in the Shorter Oxford English Dictionary definition of emergency as "the sudden or unexpected occurrence (of a state of things)."

Flexibility

The need for flexibility in water management is often cited to deal with climate change however, what "flexibility" means varies in the literature. This Paper adopts the characterization of flexibility set out by commentators Kara N. Di Francesco and Desiree D. Tullos:

> We define flexibility for the field of water resources management as the inherent ability of the human and physical elements of a system to cope with, adapt to, or alter to better suit uncertain and changing conditions, in a timely and cost-effective manner. Given that, unlike the related characteristic of adaptive capacity, flexibility of a system is determined by its inherent characteristics that are independent of future conditions.[145]

The commentators identify the following indicia of flexibility in water management:

- Slack – meaning surplus capacity, e.g. in reservoirs and related water conveyance and storage infrastructure, to cope with uncertainty and changing conditions, including increased demand, and more frequent floods.[146]
- Redundancy – meaning having multiple options to perform the same function, e.g. to address ecosystem disturbance owing to climate change.[147]
- Connectivity – meaning the water management system is capable of utilizing its redundancy in a number of ways, including: using natural water connections and human made infrastructure to move water across systems (including conjunctive water management); connecting and incorporating soft path approaches such as reducing demand, implementing water conservation, using water markets, and including environmental protection throughout the connections; and ensuring connectivity among government agencies, water users, and other stakeholders whose actions can impact or influence water management.[148]
- Compatibility/Coordination – meaning the water management system has the ability to, and carries out the sharing of information, data, research, weather forecasts, warnings, water management information, etc., with government and non-government water managers, water researchers, water users, other stakeholders, and the public;[149]
- Adjustability – meaning the ability to adjust legal or regulatory constraints to permit flexibility to anticipate and respond to climate change.[150] Constraints could range from reservoir and dam operations to terms and conditions on particular water allocations.

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[145] Kara N. Di Francesco and Desiree D. Tullos, "Flexibility in Water Resources Management: Review of Concepts and Development of Assessment Measures for Flood Control Systems," (2014) Journal of the American Water Resources Association, 1-13, at 10, online: < http://rivers.bee.oregonstate.edu/sites/default/files/2014_difrancesco_and_tullos_flexibility_in_water_resources_management-_review_of_concepts_and_development_of_assessment_measures_for_flood_managemen.pdf>.
[146] *Ibid*, 4-6.
[147] *Ibid*, 6-7.
[148] *Ibid*, 7-8.
[149] *Ibid*, 8.
[150] *Ibid*, 8-9.

Adaptive Management

Adaptive management research pioneers Carl Walters and Crawford (Buzz) Holling distinguish between active adaptive management and passive adaptive management.[151] Active adaptive management is the most comprehensive approach. Active adaptive management begins with uncertainty regarding which environmental management activities will best meet management objectives. With active adaptive management, resource managers select a range of alternative models to test to determine how to best achieve environmental management objectives. Each model is tested, monitored, evaluated, and revised as appropriate. In the end, managers choose the model or models that will achieve management objectives, bearing in mind that future monitoring and unforeseen uncertainties may require modification of the chosen management actions.[152] For example, suppose that a sustainable aquatic ecosystem management objective is to increase declining freshwater fish stocks in a river reach. Alternative response models might include varying harvests, or hatchery rates,[153] limiting effluents from local industries, limiting agricultural pesticide and fertilizer runoff, and increasing flows. After testing these various models (singly or in combination) the one (or ones) with the best results are chosen as the correct policy choices. Again, the ideal project model will be designed to be adaptable in case predictions prove to be in error.

With passive adaptive management, a single response model based on historical data to an environmental management issue/problem is assumed correct and is chosen and implemented. Like active adaptive management, passive adaptive management is monitored, evaluated, and revised as appropriate. An example of passive adaptive management would be issuing a water licence subject to certain conditions on the assumption that exercising the water right under the licence and conditions will not impair aquatic ecosystem values. A water licence that included adaptive management conditions would permit alteration of the licence if exercising the water right nevertheless resulted in impairment of ecosystem values in order to address the environmental issue. Passive adaptive management is related to the adjustability indicia under flexibility, discussed above. A flexible water management framework would permit appropriate adjustments to water allocations if required because of the impacts of climate change.

How does Alberta's water management legislation and supporting policy fare with respect to flexibility and adaptive management?

Neither the *Water Act* nor regulations under the *Water Act* require flexibility or adaptive management. Indeed, aspects of the legislative water management regime impede flexibility and adaptive management. One of the main impediments concerns the limited ways the *Water Act* provides to cancel, suspend, or amend water licences, especially deemed licences, even if there were an urgent public need and interest to do so. There are no provisions to amend deemed licences to enable climate change adaptation, or even to respond to climate change impacts. As mentioned earlier, there is a limited provision to suspend or cancel post December 31, 1998 licences in view

[151] C. J. Walters and C.S. Holling, "Large-Scale Management Experiments and Learning" (1996) 71: 6 Ecology 2060.
[152] C.J. Walters and C.S. Holling, *ibid* at 2061; C. Murray & M. Nelitz, *Review of the Diavik and EKATI Adaptive Management Plans* (2008) (prepared for Fisheries and Oceans Canada), online: < http://www.monitoringagency.net/LinkClick.aspx?fileticket=5ucjCF4oG0U%3D&tabid=89&mid=425>.
[153] Example from C.J. Walters and C.S. Holling, *supra* note 151 at 2061.

of significant adverse effects on the aquatic environment, with compensation, but this is far cry from adaptively managing water licences, without suspension or cancellation.

As discussed under Recommendation 1, Alberta water management *polici*es (in contrast to laws) have come a way towards recognizing that climate change considerations must be incorporated into water planning and decision-making. However, the policies have not yet led to concrete water management climate change adaptation plans. And they have not resulted in a legislated water management framework that is flexible or adopts adaptive management.

Re 2 Recommendations/Options:

- It is recommended that the province amend the *Water Act* and regulations to ensure fairness, as characterized in this Paper, as a climate change adaptation measure. The province should keep an open mind about retaining or abandoning FITFIR. The Act could retain FITFIR as long as the Act provided sufficient discretion and authority for the appointed officials to implement adaptation provisions, such as re-ordering priorities as necessary, or issuing share the shortage directives, well before there is a dire need to do so.
- It is recommended that the province amend the *Water Act* and regulations to incorporate flexibility and adaptive management, as characterized in this Paper. This will require the authority to adjust issued licences and other authorizations as required to implement climate change adaptation measures.
- It is recommended that *Water for Life* and other water management policies be revised and renewed to more fulsomely incorporate fairness, flexibility and adaptive management as climate change adaptation measures.

Re 3 Discussion:

The Framework would provide an array of tools for restoring and protecting IFN/EF. The Framework would recognize restoring, and protecting IFN/EF requires both private and public efforts, especially in nearly and over-allocated areas, as water that the system needs may be already subject to government issued water rights.

Here are the provisions and tools from the *Water Act* that are relevant to restoring or protecting instream flow as part of implementing a climate change and water adaptation plan, as well as commentary:[154]

- The Alberta government has an Environmental Flows Program. The website contains summaries of environmental flow projects for the Athabasca River, Highwood River, Lesser Slave Lake and Lesser Slave River, North Saskatchewan River, Red Deer River, and South Saskatchewan River Basin.[155] From a brief review, clearly the government has made some headway in ascertaining IFN/EF but the program is not comprehensive, many

[154] Some of the text in the bullets and discussion in this section is from Arlene Kwasniak, *Quenching Instream Thirst: A Role for Water Trusts in the Prairie Provinces* (2006) 16:3 Journal of Environmental Law and Practice 211.

[155]Alberta Environment and Parks, *Environmental Flows*, <http://aep.alberta.ca/fish-wildlife/environmental-flows/default.aspx>

of the studies are not completed, and where IFN/EF determinations have been made, with some it is not apparent whether government has adopted them.

- The government has developed a desktop method to determine IFN/EF that it uses when determining out of stream diversion applications where no official IFN/EF is established.[156]
- Regarding the last two bullets, while IFN/EF determinations are a critical and necessary step in the IFN/EF policy process, they do not restore or protect anything. To actually restore instream water to the point that IFN/EF is met, water must be increased instream, for example, acquired from allocations of water rights holders, which may include releases from storage. Protection is best achieved under the current system by water being under a water licence and having a senior priority.
- As mentioned earlier, there are no general powers in the *Water Act* to cancel water allocations in the public interest and so licences cannot be in effect, expropriated to restore and protect instream flow.
- As mentioned earlier (section 5.3. Re 2) the Director may suspend, or cancel licences issued after December 31, 1998 to address unforeseen adverse effects on the aquatic environment (with potential compensation). However, by January 1, 1999 most of Alberta's water-short areas were already highly, or fully allocated so this provision is not very helpful to protect instream flow in these areas.
- As discussed earlier (section 5.3. Re 2) the *Water Act* contains emergency provisions but for the reasons given in that discussion, they cannot be used for general instream flow restoration or protection.
- Licensed water allocations may be subject to minimum flow conditions. Although a necessary tool in the government toolkit, such conditions will not greatly assist in maintaining instream flow unless first, they pertain to senior licences, (as junior licences will be cut off in times of shortage so that more senior licences may get their allocations), second, if the minimum flow reflects IFN/EF, and third, if such conditions are enforced. None of these appears to be the case. Minimum flow requirements were not inserted as licence conditions until later in the last century and so they do not apply to the most senior licences in over or fully allocated areas. Where they do apply to senior licences there are a number of complicated circumstances, which brought the author to elsewhere conclude that although the government has some regulatory power in respect of these licence conditions, "this power is clear only with respect to the most recent licences. It becomes less clear with older licences, and with respect to the oldest licences the power is

[156] Alberta Fish and Wildlife specialist, Alberta Environment and Parks, A.J. Paul, and before him Allan Locke (retired), are renowned experts on desktop methods. See for example T. Hatfield and A.J. Paul, "A comparison of desktop hydrologic methods for determining environmental flows" Canadian Water Resources Journal / Revue canadienne des ressources hydriques (2015) 40:3 303-318.Also see Alberta Environment and Parks' material on the desktop method to determine environmental flow needs at <http://aep.alberta.ca/fish-wildlife/environmental-flows/environmental-flows-projects-in-alberta.aspx>>

questionable."[157] Hence, enforcing licence conditions is not a consistently dependable regulatory option to address deficits in IFN/EF.

- The Minister (currently Environment and Parks) may reserve unallocated water and set out the purposes for which it may be used, including issuing the Crown an instream licence.158 Although the provision could be used to reserve and protect water for IFN/EF, it is of limited service in water-short areas, where instream flow needs are great, but there is little unallocated water to reserve. Water rights holders of allocated water still have full right to take their allocations. Indeed, there is a Crown reservation under the 2007 South Saskatchewan River Basin Water Allocation Order,159 which, as mentioned earlier (section 4.4.) provides that all unallocated water in such basin is reserved by the Crown. This Order effected a moratorium on government consideration of new applications for water licences, with only few exceptions. A climate change complication is that as natural flows decrease in the future because of climate change, the amount of water subject of the reservation (what is left over after accounting for allocated water) decreases.
- As mentioned earlier, new with the 1999 *Water Act* is the ability for a licensee to apply to a Director to transfer all or part of an allocation under a licence.[160] A transfer is possible only if transfers are authorized in the area in either an approved water management plan or, if there is no such plan, by a Cabinet order.[161] The Act enables the Director to hold back up to 10% of the amount transferred for instream purposes, if conservation holdbacks are authorized in an approved water management plan or by Cabinet order. Although taking holdbacks will help replenish IFNs, they alone cannot accomplish the job.[162]

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[157] See Arlene Kwasniak, "Instream Flow and Athabasca Oil Sands Development: Contracting out/waiver of legal water rights to protect instream flow – a legal analysis," 48:1 Alberta Law Review (2010), 1 at 24-25.
[158] *Water Act*, *supra* note 97, ss 35 and 51(2).
[159] Alta Reg 171/2007.
[160] *Water Act*, *supra* note 97, ss 81-83.
[161] *Water Act*, *ibid*, s 11.
[162] There are three important reasons for this. First, there must be a highly active market for the conservation holdback provision to have much impact. To date, there have been only a few transfers and it is unlikely that this will radically change. A conservation holdback was not taken in all of the transfers even though they all, or most, pertained to the South Saskatchewan River Basin (SSRB), a water-scarce area. As author B. Timothy Heinmiller remarks, only a small amount of water has been recovered through the holdback mechanism, but "it was anticipated that the volumes of water involved would be relatively small when the conservation holdback instrument was being developed." See B. Timothy Heinmiller, *Water Policy Reform in Southern Alberta: An Advocacy Coalition Approach*, (Toronto: University of Toronto Press, 2016) at 206. Second, a water allocation transfer market will establish only where transfers are needed for new users to get water. Otherwise new users will simply apply for a licence rather than obtain an allocation via a transfer. In the water-scarce SSRB, irrigation districts hold about 75% of the issued allocations. Unless districts get heavily involved in a transfer market not much water will be moving around through transfers. Although there have been some transfers from districts, generally speaking, there is little incentive for irrigation districts to transfer allocations. This is because their legislation, the *Irrigation Districts Act* (RSA 2000, c I-11), gives districts considerable powers to supply water for a variety of uses and not just for irrigation, provided that the district's licence with the province (which is subject to the *Water Act*) allows uses other than irrigation. Accordingly, there can be more incentive for districts to apply to the province to amend their licences to authorize a variety of uses, so that they can annually charge new users, rather than forever losing allocations through transfers. Many new users in the SSRB will fall within the water supply area of one of the 13 irrigation districts. If they can get water from a district they need not seek water through transfers. For further discussion of these issues see Nigel Bankes and Arlene Kwasniak, "The St. Mary's Irrigation District Licence

- Under the *Water Act* permissible licence purposes are listed in the regulations[163] On their faces, many of the purposes would support instream uses so that a person could apply for an instream licence to protect instream flow, or be transferred a water allocation such that following the transfer government would issue a licence to protect instream flow for the purpose. These potential instream purposes include management of fish; management of wildlife; habitat enhancement; recreation; water management, and any other purpose specified by the Director.[164] A demonstrated instream purpose is to implement a water conservation objective, but only the government may hold a licence for that purpose.[165] The problem for instream purposes is that water licences are for *diversions* of water and the Alberta government to date has interpreted "diversion" narrowly to permit the mentioned purposes only in respect of out of stream diversions, and not a diversion in the sense of taking control of water and enforcing a priority over it so that it cannot be diverted elsewhere. The *Water Act* defines "diversion" to mean the "the impoundment, storage, consumption, taking or removal of water for any purpose, except the taking or removal for the sole purpose of removing an ice jam, drainage, flood control, erosion control or channel realignment, and… any other thing defined as a diversion in the regulations for the

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Amendment Decision: Irrigation Districts as a Law unto Themselves" in (2005) 16:1 Journal of Environmental Law and Practice 1-18. Third, under the Act, conservation holdbacks keep the priority of the transferred allocation only where the government issues a licence for them. Under s 51(2) of the *Water Act* a Crown instream licence can only be issued to implement a "water conservation objective." Although the *Water Act*'s definition of "water conservation objective"(WCO) (*supra* note 97, s. 1(hhh)) suggests that WCOs should be equivalent to IFN/EF, the WCOs recommended by government almost invariably are considerably less than IFN/EF. For example, nearly all of the WCOs established for the SSRB (see the *Approved Water Management Plan for the South Saskatchewan River Basin* (Edmonton: Government of Alberta, 2006), online: <http://aep.alberta.ca/water/programs-and-services/river-management-frameworks/south-saskatchewan-river-basin-approved-water-management-plan/documents/SSRB-ApprovedWaterManagementPlan-2006.pdf>> are less than 1/2 of instream flow needs as established the government commissioned report by G. Clipperton, C. Kasey, W. Koning, A. Locke, J. Mahoney, B. Quazi, *Instream Flow Needs Determinations for the South Saskatchewan River Basin, Alberta, Canada*, (Edmonton: Alberta Environment, 2003), available online at < http://aep.alberta.ca/water/programs-and-services/south-saskatchewan-river-basin-water-information/studies/documents/InstreamFlowNeeds-MainReport-2003.pdf>. Accordingly, although Crown instream licences will help to restore IFNs, they cannot meet them where WCOs are less than them.

[163] *Water Act (Ministerial) Regulations*, *supra* note 133, s 11.

[164] Licences have been issued to under the *Water Act* to non-governmental persons for authorized purposes such as habitat management, recreation, water management, etc. For example, the St. Mary River Irrigation District 1992 water licence (discussed in *supra* note 162) was amended in 2003 to add a number of purposes (see amendment No. 00044590-00-01) as follows:

'13. The licensee may deliver water only for the following purposes:
a) municipal
b) agricultural
c) irrigation
d) commercial
e) industrial
f) management of fish
g) management of wildlife
h) habitat enhancement
i) recreation."

[165] *Water Act*, *supra* note 97, s 51(2).

purposes of this Act.[166] In a 2015 Alberta Queen's Bench Court decision, *The Water Conservation Trust of Canada v. The Environmental Appeals Board et al*[167]the Court, at least in *obiter*, found that in the circumstances the Director was "reasonable" in interpreting the *Water Act* definition of "diversion" so that it did not include controlling or taking control of water instream and enforcing a priority over it. The Trust had applied to the government to be the transferee of a water allocation held by an oil and gas company that wanted to transfer water that it had conserved from its allocation to the Trust to be held instream to help restore and protect IFN/EF. After years of negotiation, the government refused the Trust's application. The Trust appealed the refusal, eventually to the Court of Queen's Bench, which denied the appeal. It is important to note that in this case the Court found these matters on the basis of the reasonableness of the Director's decisions, and not on the correctness of them. This means that in the future, in the appropriate circumstances, a Director could be reasonable in permitting an application for permitted purposes that would be carried out instream, such as aquatic habitat enhancement. As well, the *Water Act* permits the Minister to further define the "diversion" in the regulations. Accordingly, the Minister could regulate that the term applies to a particular instream licence to permit an instream diversion.

- As discussed earlier, the government cannot restore and protect IFN/EF on its own. Much of the South Saskatchewan River Basin (SSRB) is over, fully, or nearly fully allocated and accordingly, government must engage the holders of water allocations, and relevant stakeholders, if it is going to successfully implement adaptation measures to restore and protect IFN/EF. This is not a novel observation. The first recommendation of the Minister's Advisory Group report *Recommendations on Improving Alberta's Water Management and Allocation* (August 2009)[168] is that it is urgent that water in our watercourses be legally safeguarded and protected for environmental needs. "Protected" in this context means legally protected, for example, by instream licence. The Report recommends a multi-pronged approach to do this, including by urging government to allow "private organizations, water trusts or individuals to acquire licences" for protected water, and to "assess the potential of water trusts for acquiring licences through the transfer system for WCO purposes."[169]

Re 3 Recommendations/Options:

- It is recommended that the government vigorously pursue IFN/EF determinations for all of Alberta. The government should continue its use of desktop methods as appropriate where full-blown IFN/EF determinations have not yet been achieved.

[166] *Ibid*, s 1(m).
[167] 2015 ABQB 686 (CanLII).
[168] Available online at: < http://aep.alberta.ca/water/water-conversation/documents/RecommendationsWaterManagement-2009.pdf>.
[169] *Ibid* at 2 and 3.

- It is recommended that the government develop and implement a comprehensive IFN/EF program that incorporates climate change adaptation and resilience. The program should also include an action plan setting out how and when government will meet restoration and protection objectives.
- It is recommended that the government revisit and rework the *Water Act* so that it clearly possesses a broad range of tools to restore and protect IFN/EF. The Act should recognize that such restoration and protection is a shared public/private endeavour and accordingly the Act should specifically permit privately held instream flow licences for authorized purposes. Privately held instream flow licences should be permitted both on an original application for a licence, or following a transfer of an allocation.
- It is recommended that in revisiting and reworking the *Water Act*, the government pursue greater cancellation and amendment in the public interest powers, including new powers to modify issued water rights, including deemed licences, to implement climate change adaptation.
- It is recommended that in revisiting and reworking the *Water Act*, the government remove the uncertain and potentially unwieldy special status for deemed licences so that it can straightforwardly and forthrightly develop and implement a water management climate change adaptation plan.
- It is recommended that government use its current powers to their fullest to restore and protect IFN/EF including reservations and Crown instream flow licenses to implement water conservation objectives.

Re 4 Discussion:

The Framework would facilitate conjunctive water management of groundwater with surface water, and would regulate water quantity and water quality together. As well, the Framework would incorporate a watershed management approach.

Conjunctive water management

As mentioned earlier, conjunctive water management is "… an adaptive process that utilizes the connection between surface and groundwater to maximize water use, while minimizing impacts to streamflow and groundwater levels in an effort to increase the overall water supply of a region and improve the reliability of that supply." [170] Conjunctive water management may involve the use of aquifer storage, for example, artificial aquifer recharge, or reservoir storage, to be optimally drawn upon in a groundwater/surface water integrated management system.[171]

Conjunctive water management may be more or less complicated to carry out contingent on a number of factors. Depending on a conjunctive water management strategy, these include whether there are both groundwater rights and surface water rights in the water management area, whether these rights are under a FITFIR system, and whether conditions on rights require specific

[170]Nebraska Department of Natural Resources. "Nebraska Water, Conjunctive Water Management," *supra* note 30.
[171] See discussion in A. Rivera, A. Sahuquillo, J. Andreu and A. Mukherji, "Opportunities of conjunctive use of groundwater and surface water," in Sahuquillo, J. Capilla, Luis Martinez Cortina, X. Sanchez Vila (eds) *Groundwater Intensive Use: IAH Selected Papers on Hydrogeology* (London: A.A. Balkema Publishers, 2002) 371-384.

diversion points.[172] Including conjunctive water management as part of a climate change adaptation water management plan might require flexibility in the exercise of water rights to most efficiently manage water resources. Although in the author's experience, water rights holders are loathe to contemplate changes in rights to permit more government water management flexibility, making rights more flexible to implement conjunctive water management should benefit water rights holders insofar as it maximizes water supplies.

The Alberta government recognizes the importance of exploring conjunctive water management. An action plan regarding conjunctive water management set out in 2013 *Our Water, Our Future, A Plan for Action*, directs government action as follows:

> Conduct analysis on conjunctive water use to inform future policy…. [Government] will work with Alberta Innovates…, the University of Alberta's Water Initiative, and others to examine difference applications of conjunctive use in other jurisdictions. The goal will be to explore innovative options for conjunctive water, such as temporary use of groundwater resources to offset surface water shortages or using an aquifer for underground storage of water from various sources for short and long-term periods. … Further study of how these uses might be applied in Alberta will be completed in 2014-15.[173]

The author's internet search on January 23, 2017 was not successful in finding or accessing any completed study, or how it might influence government water management policy.[174]

Integrating the regulation of water quality with water quantity

Although the 1999 *Water Act* took steps to recognize the impacts on water quality during water allocation processes, (e.g. by permitting a discretionary consideration of impacts on the aquatic environment),[175] water quality is primarily regulated under the *Environmental Protection and Enhancement Act* and water quantity under the *Water Act.* There appear to be no legislative links between water quantity and quality that enables government, for example, to suspend water withdrawals because of water quality concerns, except in emergencies, as discussed earlier. The government has indicated that it will take steps to link quality and quantity considerations with respect to the Lower Athabasca River Basin, where there is considerable oil sands development. The ALSA regional plan for the Lower Athabasca region, *Surface Water Quality Management Framework* states:

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[172] The Idaho Water Research Institute, University of Idaho, in *Water Rights and Conjunctive Management* (1998), online: < http://imnh.isu.edu/digitalatlas/hydr/addinfo/wtrghts.htm>, notes that "Application of the Prior Appropriation Doctrine [author's note: similar to Alberta's priority and FITFIR system] to conjunctively management surface and ground water is much more difficult than applications to the exclusively surface water systems for which it was initially adopted. Diversions of surface water from a stream impacts downsteam users in and amount nearly equal to the rate of diversion, of ten within a few days or less. Ground water pumping effects propagate through an aquifer in all directions. Ultimately, these effects may reach surface water bodies and result in depletion. Rates of depletion, however, often are less than pumping rates and extended over much longer periods of time."

[173] Alberta Environment and Parks, *Our Water, Our Future, A Plan for Action* (2014), online: <http://aep.alberta.ca/water/water-conversation/documents/WaterFuture-PlanAction-Nov2014A.pdf > at 19.

[174] The search did reveal that Netherlands student Tim Donkers was involved in such a study and that there was a report. The study was on conjunctive water management in Alberta, challenges and opportunities, and was a collaboration between the Dutch government, and the Alberta government, Alberta Water Initiative, and Alberta Innovates. See online: <http://www.acsn.nl/content/internship-project-tim-donkers-watermanagement-alberta>>.

[175] *Water Act*, *supra* note 97, ss 54(1)(b)(i).

Surface Water Quality and Water Quantity

> … comprehensive management of region's surface water resources will require the careful, integrated management of three linked ecosystem components: water quality, water quantity and the aquatic environment (species and habitat). In time, the intention is for management of all of these to be integrated for the Lower Athabasca Region. [176]

Watershed management

Water for Life, and ALSA Regional Plans and Water Act water management plans

Regarding watershed management, as mentioned earlier, the *Water for Life* policy and the ALSA both support land and water planning and management on a watershed basis. The *Water Act* also contains provisions for water management plans that could be at the water basin – watershed level. The *Water Act* defines seven "major river basins"[177] and there are sub-basins within these major watersheds. There are two Cabinet approved water management plans under the *Water Act* (for the SSRB and for the Battle River sub-basin in the North Saskatchewan River Basin) and a handful of other government connected or initiated watershed management plans.[178] Only the Cabinet approved plans are regulatory in that some of their provisions must be complied with during certain *Water Act* processes. Neither of the Cabinet approved plans incorporate climate change adaptation measures though the SSRB plan signals the potential need for adjustment, as climate change impacts are better understood.[179] Some of the other plans take climate change scenarios into account.

As well, regional plans under the ALSA could have distinctive and powerful roles in prescribing climate change adaptation actions at a watershed level. Of the two approved regional plans, Lower Athabasca and the SSRB, the latter expressly recognizes the importance of taking action on climate change adaptation. The SSRB states "Planning to support climate change adaptation and ensure preparedness for both drought management and flood response is essential to ensuring the region can be resilient and adapt to changing conditions over time."[180] However, the regulatory part of the SSRB Regional Plan does not prescribe specific adaptation provisions.

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[176] Government of Alberta, Lower Athabasca Region, *Surface Water Quality Management Framework* (2012) at 38, online < http://aep.alberta.ca/lands-forests/cumulative-effects/regional-planning/documents/LARP-SurfaceWaterFramework-Aug2012.pdf>.

[177] *Water Act*, *supra* note 97, s 1(1)(ff).

[178] See Alberta Environment and Parks, *River Management Frameworks*, online: <http://aep.alberta.ca/water/programs-and-services/river-management-frameworks/default.aspx>. The web page lists eight frameworks in total.

[179] Alberta Government *South Saskatchewan River Basin Approved Water Management Plan* (2006) at 17, online, *ibid.*

[180] Government of Alberta, South Saskatchewan Regional Plan, 2014-2024 *Implementation* at 79, online: <https://www.landuse.alberta.ca/LandUse%20Documents/South%20Saskatchewan%20Regional%20Plan%202014-2024%20-%20February%202017.pdf>>

Non-governmental collaboratives and watershed management, including the Bow River Project

The SSRB Regional Plan voices support for the *South Saskatchewan River Basin Adaptation Project* (SSRBAP).[181] The SSRBAP is a non-government initiated or lead multi-stakeholder collaborative initiative aimed at gaining the knowledge, legal, and practical experience necessary to implement efficient and cooperative watershed management. As stated in the Abstract of the SSRBAP Final Report:

> The South Saskatchewan River Basin Adaptation to Climate Variability Project brought together those who know the region's water systems best to look for opportunities to further enhance the resiliency of the Bow and Oldman-South Saskatchewan river basins. This initiative built on prior work in the Bow River Basin, and capitalized on the success of that project by bringing together the data, knowledge, information and experience of water resource managers, watershed and community stakeholders, scientists, and environmental advocates to create a robust foundation for improved river management outcomes under a range of climate variability scenarios.
>
> The integrated and collegial process applied to this work enabled participants to work collaboratively and creatively, drawing on each other's expertise and insights to explore practical options for adapting to climate variability and change. Because of this project and the work that preceded it, there is now a much better, and more integrated, understanding of the river systems. Given the collaborative experience of this initiative, engaged and committed stakeholders have created strong momentum and a sense of shared future. They identified practical and implementable solutions to improve resilience and adapt to current and future water management challenges.[182]

The Final Report contains a number of strategies for implementing adaptation options in SSRB sub-basins though it does not focus on legal and policy aspects that might be involved in implementation.

The project for the Bow River Basin (the "Bow River Project" or BRP) mentioned in the above quote from the SSRBAP Final Report merits further discussion. The Alberta Water Portal, a web-based water information source, says of the Bow River Project:

> In 2010, the Bow River Project Research Consortium was established to explore options for re-managing the river system from headwaters to confluence - the Bow River Project (BRP). Participants worked with an interactive, hydrologic simulation model to develop plausible and achievable scenarios for protecting the health of the river throughout the basin and meeting the needs of water users. The fully functioning, data-loaded Bow River Operational Model (BROM) is a very significant output of this project that will be publicly available for further analysis of the Bow River System and can be adapted for other river systems in Alberta.
>
> The key results of this project and the opportunities it identifies support the goals and principles of other major policy documents and approaches, including the "Water for Life"

[181] *Ibid* at 86. The SSRBAP is *South Saskatchewan River Basin Adaptation to Climate Variability Project* (Alberta Innovates – Energy and Environment Solutions and WaterSMART Solutions Ltd., 2014) online: <http://albertawater.com/work/research-projects/ssrb-adaption>> link to final report.

[182] *South Saskatchewan River Basin Adaptation to Climate Variability Project, ibid* Abstract at iii.

strategy, the Calgary Metropolitan Plan, and the South Saskatchewan Regional Plan being developed under the Land-use Framework. The Consortium's work shows that improvements in managing the Bow River System are realistic and doable with minimal economic impact on power generation revenues.

- Five specific opportunities were identified for consideration by the Government of Alberta and others with a stake in the way the Bow River System is used and managed:
    - Manage the Bow River System in an integrated, adaptive, end-to-end manner, considering all users, interests and values.
    - [Pursue and support discussions between the Government of Alberta
    - and TransAlta]
    - Identify and consolidate the functions required to enable integrated, adaptive management of the Bow River System.
    - Encourage and enable transparency and open data.
    - Continue working toward an improved and integrated Bow River Management System.[183]

The second bullet, in brackets, though included in the Bow River Project Final Report,[184] was not mentioned among the "Five specific opportunities" stated in the Alberta Water Portal. The author added it so that all five opportunities put forth in the BRP would be mentioned. Regarding the second bullet, the discussions between the Alberta Government and TransAlta would involve changes to TransAlta's hydro power operations including timing and flow of releases from reservoirs to better integrate the water management of the Bow River Basin. Discussions would also address potential compensation to TransAlta for lost revenues for variations in hydropower operations.

The Bow River Project Final Report sets forth four potential scenarios to integrate water management in the sub-basin. Scenarios included management actions such as lake stabilization, varying discharge flows, and creating a "water bank" from water taken from TransAlta reservoirs to be used to support instream flows and other uses.

The term "water bank," is not defined in concept in the BRB Final Report, but academic commentary characterizes it as:

> … a process established to facilitate the transfer of water allocated to specific users or uses, to other users and uses. At its simplest, a water bank is a single intermediary acting between buyers and sellers of water rights, whether that transfer is temporary (spot) or permanent. Water banks are typically managed by a public institution (e.g. water agencies). In such cases, water is transferred from certain users to others under the supervision of the public administration, which verifies that the water transactions fulfil all legal requirements, sometimes including constraints linked to environmental and social criteria.[185]

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[183] Alberta Water Portal, Bow River Project, online: <http://albertawater.com/work/research-projects/bow-river-project>> Link to the Bow River Project Summary Report (2010), Final Report (2010), and related documents for more information.

[184] Bow River Project Summary Report, Final Report, *ibid* at 45-59.

[185] G. Delacámara, C.M. Gómez, J. Maestu, "Water trading opportunities and challenges in Europe" In Routledge

Accordingly, with water banks, water rights holders sell or lease their rights through an intermediary. The process is aimed at boosting market activity and "fostering a more efficient resource allocation in both the short and long run."[186]

In the BRP situation, the water bank option appears to be limited. For example, with a preferred option:

> The water bank amounts to approximately 10% of TransAlta storage and capturable inflows in any given year. Under ideal conditions, this would be about 60,000 [acre feet] but this volume would likely not be reached every year. The water bank is not physically tied to any particular reservoir, but is rather an agreement that allows upstream water to be called upon, by request, to meet a particular need. The approach is intended to minimize negative environmental effects to the reservoirs and minimize costs to TransAlta by enabling the company to draw water from any of the reservoirs they wish, with the exception of the stabilized Lower Kananaskis Lake. The water bank water releases were intended to supplement in-stream flows below Bassano Dam, which were used as an indicator of adequate flow throughout the river system; that is, if flows were adequate in this reach of the river, it was likely that aquatic health in the rest of the river was also improved compared to the base case.[187]

This Occasional Paper presents information from the Bow River Project for several reasons.

- First, the Bow River Basin Project is a significant endeavor to develop and implement watershed management and is a remarkable and valuable achievement.
- Second, the Bow River Basin Project has opened up for investigation and potential use a number of novel approaches and tools (for example, water banks) to effect integrated and efficient watershed based water management, and that could be used to help restore instream flow.
- Third, although water management of the Bow River Basin is in the end a government responsibility the Bow River Project was not government instigated. In fact,government appeared to have only a "participatory" role. The Bow River Project Consortium members were the Bow River Basin Council, City of Calgary, Calgary Regional Partnership, County of Newell, Rocky View County, Western, Eastern and Bow River Irrigation Districts, Trout Unlimited, Ducks Unlimited, Alberta Water Research Institute, Alberta WaterSMART, HydoLogics Inc., and the Water and Environmental Hub (Universities of Lethbridge and Calgary).[188] The BRB Final Report stated that the Consortium "is a collaborative group of

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Handbook of Water Economics and Institutions; K Burnett et al, eds, (Oxen, UK: Routledge, 2015) at 281-295. The reference to G. Delacámara, et al is from Nazaret M. Montilla-López, Carlos Gutiérrez-Martín and José A. Gómez-LimónWater, "Water Banks: What Have We Learnt from the International Experience?" 8 Water 2016, 8, 466.

[186] Delacámara, et al, "Water Banks: What have We Learnt from the International Experience," *ibid* at 439 (3 of 19).

[187] South Saskatchewan River Basin Adaptation to Climate Variability Project Adaptation Strategies for Current and Future Climates in the Bow Basin Final Report at 13, available through the Alberta Water Portal online: <http://albertawater.com/work/research-projects/ssrb-adaption>.

[188] Information from Bow River Basin Council, power point titled "The Bow River Research Consortium" March 9, 2011, slide 3.

water users and managers whose members control approximately 95% of all water allocations and estimated water use in the Bow River Basin."[189]

- Fourth, and following on the last bullet, in the end management of a river basin must be done in the *public interest* and the fact that the Consortium consisted primarily of those holding private interests in the Basin (the holders of water rights) must be kept in mind when assessing the Report, including the Opportunities and Scenario options put forth in it. In determining the public interest, participation in developing options must be broader. It is expected that a government led review of management of the BRB and other sub-basins of the SSRB would include consultation with non-government organizations and others that did not hold a water right interest in the basin. A government led review would consult legal experts who specialize in water management in the public interest. The government would ensure that its Constitutional obligations to Aboriginal communities were met as well as the responsibilities the government undertook under UNDRIP (see section 5.3. Re 1). A government led review would also specifically consider the interests of riparian owners and occupiers who do not hold a water licence.
- Legal and policy water management issues were not prominent or even noticeably present in the Bow River Project Report. There was an occasional statement such as, how the Project was consistent with or supports *Water for Life,*[190] or that one Scenario option could be "implemented without affecting Alberta's existing priority water allocation system."[191] Perhaps the absence of overt consideration of legal issues facilitated an outcomes approach that reflected integrated resource management. Nevertheless, the fact that water management in Alberta involves an intricate web of legal and policy relations cannot be under-rated and the legality of the options, and their policy implications must be fully explored.
- Following on the last point, it is not clear from the reports whether there was a discussion of whether at law compensation is payable to TransAlta or under what situations it might be payable, and what legal principles would apply with respect to compensation. The Summary Report presents a preliminary estimate payable to TransAlta "for lost revenue from implementing the preferred scenario [to] range from $2-million to $2.5-million."[192] The problem is, although government could choose to pay compensation voluntarily if it alters a regulatory arrangement with a party, Canadian regulatory takings law rarely requires it. Moreover, even if compensation is payable, voluntarily or otherwise, it is not clear, without legal analysis, on what it should be based. Are lost revenues the appropriate measure, or something else?[193] Is compensation payable pursuant to some contract? The author has not done a legal analysis of how regulatory takings law might work in the Bow

[189] Bow River Project Summary Report, *supra* note 183 at 3.
[190] *Ibid* at 2 and 6.
[191] *Ibid* at 4.
[192] *Ibid* at 5. It is not clear whether this is an annual payment.
[193] See, for example, University of Alberta, Alberta Land Institute, *What is a Regulatory or Constructive Taking?* online: < http://propertyrightsguide.ca/what-is-a-regulatory-or-constructive-taking/>.

River Basin Project situation, but she assumes that government would undertake such an analysis before deciding on any compensation.

Watershed Planning and Advisory Councils

There are eleven Watershed Planning and Advisory Councils (WPACS) established in relation to the *Water for Life* policy.[194] As articulated by government "WPACs engage representatives of key stakeholders in the river basin area, including municipal, provincial and federal governments; industrial sectors; conservation groups; aboriginal communities; academia; and the public. In their work, they seek consensus on land and water resource management strategies that support the achievement of shared environmental, social, and economic outcomes for the watershed."[195] Of the various watershed planning and management approaches, ALSA regional plans and Cabinet approved water management plans have the strongest legal status, with ALSA regional plans having priority over *Water Act* plans if there is a conflict.[196] WPAC planning, studies, and recommendations, although of great value and moral persuasion, in and of themselves do not have the force of law.

Re 4 Recommendations/Options:

- It is recommended that government continue and complete its studies relating to conjunctive water management. It is further recommended that it include conjunctive water management in a water management and climate change adaptation plan. If implementing conjunctive water management requires more flexible water allocation rights, government should explore how to effect this without, as much as possible, injuring privately held allocation rights. This may require amendments to the *Water Act*. Logically, if implementing conjunctive water management improves rights by making it more likely that allocations will be met in times of shortage, there would be no injury or negative impacts on them.
- It is recommended that government finally regulate water quality together with water quantity, acknowledging that completing such an endeavor may take time. In the meantime regulatory and policy frameworks can continue to integrate quality and quantity legislation and policy, including in connection with water management and climate change adaptation.
- It is recommended that government continue its water management planning processes, in particular, Cabinet approved water management plans, for the major river basins and key sub-basins in the province. Climate change adaptation measures should be included in these plans. As well, current plans should be reviewed and updated to ensure that climate change adaptation scenarios and implementation are incorporated.
- It is recommended that government continue its development of ALSA regional plans and include climate change adaptation provisions. It should also ensure that its current ALSA

[194] Alberta Environment and Parks, *Water Planning and Advisory Councils*, online: <http://aep.alberta.ca/water/programs-and-services/water-for-life/partnerships/watershed-planning-and-advisory-councils/default.aspx>.
[195] *Ibid.*
[196] ALSA *supra* note 87, s 17.

regional plans incorporate climate change scenarios and adaptation measures. As well, it should continue its development of ALSA regional plans in this manner.

- It is recommended that government continue its support for the work involved in the SSRBAP and the Bow River Basin Project. However, it is recommended that the government conducts its own review and work on integrated water management for the SSRB and sub-basins and specifically build in climate change adaptation considerations. As well, it is recommended that in developing and implementing its own integrated water management scenarios for the Bow River Basin and other sub-basins in the SSRB, the government consult widely with interested persons and organizations whether or not they hold a water right to the sub-basin being studied. It is also recommended that the province carry out its Constitutional obligations to Aboriginal persons both in respect of consultation and accommodation, and to gather and use traditional knowledge in respect of the SSRB and sub-basins.
- To follow on the last point, it is recommended that the government conduct detailed legal and policy research into proposed integrated water management scenarios for the SSRB sub-basins that it develops, including regarding any legal obligation to pay compensation for alteration of water related activities.
- It is recommended that government review its policies with respect to WPACs to best ensure their full effectiveness. Government should support and fund WPAC initiatives to develop water related climate change adaptation plans, and government should adopt, as appropriate, WPAC recommendations into provincial laws and policies.

Re 5 Discussion:

The Framework would address evaporative losses, e.g. by requiring a water licence where a land use or development will accelerate evaporative losses, or will result in evaporative losses that would not naturally occur, and would otherwise broadly construe what activities require a water licence. As well, the Framework would provide clarity with respect to water entitlements and return flow, rainwater, and runoff or diffuse surface water.

Evaporative losses

What all of these have in common is that they support an all-inclusive, scientifically based, full hydrologic cycle, and watershed approach to water management. Water is a public resource nominally owned by government. Government’s permissions that enable others to use the resource should be based on what a user actually uses and what is returned to the water source. Also, what all of these have in common is that they are primary water sources in contrast to reuse water, discussed under recommendation six.

Regarding evaporative losses, as put by the United States Geological Survey (ESGS)

> No water budget would be complete without accounting for evaporation and related processes, such as transpiration and sublimation. Evapotranspiration, or "ET," refers to the combined flux of plant transpiration and evaporation from the adjacent soil. It is especially important for understanding water used by irrigated crops, and is related to crop productivity. Sublimation is the process by which water changes from ice or snow (a solid)

> to water vapor (a gas), bypassing the liquid phase. This often happens in the Rocky Mountains as dry air (such as that caused by Chinook winds) hits the snow, bypassing the liquid phase and changing it directly into water vapor. Sublimation is a common way for snow to disappear quickly in arid climates.
>
> These fundamental mechanisms are a major part of the water cycle and have an important influence on water availability. Being able to quantify water lost or used through these processes can even have implications for administration of water rights and river basin compacts.[197]

Requiring a water right for activities that result in evaporative losses is not new. For example, the Nevada State Engineer's Office has required the acquisition of appropriate water permits to offset evaporative losses from pit lake evaporation associated with mining activities.[198] As well, the Alberta government has required a water licence for evaporative losses,[199] though it is not clear whether there is a government policy on this.

Land activities that reduce flow without a direct water diversion

Activities that do not directly involve an out of stream diversion can have the effect of reducing instream water and could require a water right. For example, *The National Water Act*[200]of South Africa "requires the licensing of stream flow reduction activities (SFRAs) as one of several forms of water use (section 36). A stream flow reduction activity SFRA is … any activity (including the cultivation of any particular crop or other vegetation) … [that] … is likely to reduce the availability of water in a watercourse to the Reserve, to meet international obligations, or to other water users significantly (NWA Section 36(2)). By implication, the definition of a SFRA is limited to land-based activities… ".[201]

Although the Alberta *Water Act* requires an approval for land-based activities that disturb river or lake beds or alter water flow,[202] nothing specific in the Act would require a water licence for instream losses owing to land-based activities. For example, nothing in the Act would require a water licence where a subdivision development will involve impermeable surfaces (roads, buildings) where there was a farmer's field, and the development will result in less water absorption into the soil, less groundwater recharge, and consequent instream losses.

Return flow and instream impacts

"Return flow" is the water that is returned to a water source after a diversion. For example, water used for hydro power may have a 100% return flow and municipal water use may have about an 80% return flow. Irrigation water use can have very little return flow as the water is used in food

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[197] USGS, *Evaporative Loss*, online: <https://water.usgs.gov/watercensus/evaporative-loss.html>.
[198] See the United States Department of Interior, Bureau of Land Management, *Cortez Hill Expansion Project*, Final Environmental Impact Assessment Statement, Vol. III, (2008), (Washington: US-DOI-BLM), at 66.
[199] Water Licence # 00267660 00 00 issued to Ducks Unlimited Canada, having a 1948 priority, to "operate a works and to divert up to 11,182,266 cubic metres of water annually via evaporative loss from the source of water for the purpose of lake stabilization and enhancement (wildfowl propagation)."
[200] *The National Water Act*, Statutes of South Africa, no 36, 1998.
[201] Department of Water Affairs and Forestry, Republic of South Africa, *Water-Use Licensing: The Policy and Procedure for Licensing Stream Flow Reduction Activities*, (1999) at 5, online: <https://www.dwa.gov.za/SFRA/Licensing/pdf/Policy%20&%20Procedure%20on%20Water-use%20Licensing.pdf>.
[202] *Water Act*, *supra* note 97, s 36, and definition of "activity," s 1(1)(b).

production, though this may vary. Especially in times of shortage, whether water allocations require water to be returned to source or not after being used for a given purpose will make a difference to water availability. A water management climate change adaption plan should take into account return flow requirements and expectations in developing and implementing adaptation measures.

Water laws and policies in North American jurisdictions differ as to return flow legal requirements. In Colorado, for example, "wastewater" – water that is left over after being used for the permitted purpose – must be returned to the watercourse for the use of other appropriators.[203]In Arizona, a water appropriator has the right to reuse wastewater as this constitutes an avoidance of wasting water.[204] Although some Alberta licences have return flow expectations/conditions in them, [205] it is not clear to what extent these are enforceable.

Rainwater harvesting, and rights to runoff or diffuse surface water

Rights to harvest rainwater and runoff or diffuse surface water also should be clarified. Elsewhere the author has discussed how jurisdictions differ with respect to their legal treatment of these water sources.[206] Some jurisdictions require a water right to collect water from such sources and others do not. For Alberta, although a licence may not be needed to harvest rainwater, (it depends on the circumstances), one is likely needed to collect diffuse surface water. As water supply becomes more scarce and unpredictable, it is important that government have clear and consistent water rights policies for all sources of water.

Re 5 Recommendations/Options:

- It is recommended that the province develop and implement a consistent policy with respect to licence requirements for evaporative losses, return flows, rainwater harvesting, collecting runoff or diffuse surface water, and carrying out land based activities that result in instream or groundwater losses, but do not involve a direct water withdrawal. In developing the policy, government should incorporate a climate change adaptation and resilience approach, including accounting for likely future IFN/EF needs, as well as other water users' needs.
- It is recommended that government amend laws and policies as appropriate to carry out the recommendations in the preceding bullet. This will include amendments to Alberta's water legislation to clarify water rights with respect to non-traditional sources of water, and water losses including evaporation, rainwater, runoff, and return flow. This will also include amendments to Alberta's water legislation to specify under what circumstances proponents

[203] *Pulaski Irrigation Ditch Co v. City of Trinidad*, 203 P 681 (Colo 1922).
[204] *Ariz Pub Ser Co.* 773 P.2d 996.
[205] As one of numerous examples, a licence first issued to the City of Calgary in 1899 from the Bow River system is for 114,000 acre feet annually, with a specified estimated consumptive use of 114,000 acre feet annually, and a specified estimated return flow of 92,300 acre feet to the Bow River system. *See* Alberta Environment water licence number 08834 to the City of Calgary, priority number 1895-08-01/1971- 11- 29.
[206] Arlene Kwasniak and Daniel Hursh, "Right to Rainwater - A Cloudy Issue" (2009) 26 Windsor Review of Law and Social Issues 105-128; Arlene Kwasniak, "Inflating and Deflating: Courts and State/Crown Ownership and Management of Water," (2012) 33 Public Land & Resources Law Review 95-142.

of land-based activities that do not involve a direct water withdrawal but result in groundwater or surface water losses, will require water rights.

Re 6 Discussion:

The Framework would provide for water reuse at domestic, commercial, and industrial levels. The Framework would also incorporate for use other appropriate alternate sources of water such as produced and desalinated water.

From the author's review, the water and climate change literature, academic and otherwise, overwhelmingly is in favour of water reuse to help combat the impacts of climate change.[207] There are two main issues with reuse water (sometimes called "reclaimed water' or "recycled water"), on which this Paper touches. One concerns the legal right to reuse water from a water rights perspective. For example, a brewery owner that holds a water licence to use water in its processing might want to upgrade and filter wastewater and "sell" [208] it to a local golf course for application on the grounds. Can the owner legally do this? The other issue deals with water quality standards for reuse, for example, what greywater quality standards are appropriate from a health and safety point of view for using household wastewater from washing machines, showers, and baths, to flush toilets or to water lawns?

Regarding the first issue, as mentioned in the discussion under recommendation for Re 5, the law is not clear in Alberta as to return flow requirements. Insofar as it might be uncertain whether a water licence holder must return to source water that is not used, it is uncertain whether that licensee may reuse water. A related water rights issue deals with *purposes* for an allocation. If a licence is issued for broad purposes, such as "municipal purposes," then the licence holder presumably can use and reuse the water for a variety of purposes, as long as they fall under the umbrella "municipal". However, if a licence is issued for a specific purpose, such as agricultural, then presumably the licensee could not use reclaimed water for leisure-business purposes, for example, to water a golf course.

With respect to the water quality and standards issue, the Alberta Municipal Affairs website states:

- While there is growing interest in Alberta about using reclaimed wastewater for domestic applications such as toilet and urinal flushing or landscape irrigation, there are health and

[207] A Google search of "climate change" & "recycled water" on March 8, 2017 resulted in about 193,000 hits. For a typical web article see International Water Association, *Water Reuse: A Critical Step on the Path to a Secure Water Future*, online: <http://www.iwa-network.org/water-reuse-a-critical-step-on-the-path-to-a-secure-water-future>

[208] The scare quotes around the word 'sell' are there because it is not clear in Alberta whether the property in the water itself passes to a user, and if the property does pass, when it passes. The Crown claims ownership of water in the *Water Act*, *supra* note 97, s 3, but the legislation does not indicate whether or how the property in the water transfers to a user. Does the claim of Crown ownership persist, for example, in a bottle of Alberta spring water produced in Alberta from Alberta river water and then exported to, say, England, consumed, and then passed as urine, treated by a municipal facility and returned as flow to the Thames River? And if underlying property in the bottled water does transfer from the Alberta Crown in this example, does it similarly transfer to a user who drinks a bottle of Alberta spring water in Alberta? Is there magic in the "export" to another basin? Although it is beyond the scope of this paper to explore this issue, it is noted that the matter may become critical to water management in the future as supplies becomes more scarce. John W. Johnson, notes that in some U.S. jurisdictions water may become personal property when captured. See John W. Johnson, *United States Water Law: An Introduction* 26 (CRC Press 2009). For further discussion of claims of Crown or State ownership of water see Arlene Kwasniak's "Inflating and Deflating: Courts and State/Crown Ownership and Management of Water," *supra* note 202.

environmental risks associated with using reclaimed wastewater, which is not of the same quality as the potable water commonly distributed through plumbing fixtures.

- Reclaimed wastewater may contain substances and microorganisms that pose a risk to public health and the environment. The risk to public health can result from direct contact with reclaimed wastewater or through contact with surfaces contaminated by reclaimed wastewater. Research shows that these risks also apply to "grey water," a term commonly used to describe household wastewater collected from sources like washing machines and bathtubs. "Grey water" does not include wastewater from toilets, urinals or kitchen sinks.
- Currently, there are no regulations or codes in place in Alberta to mitigate these risks and ensure that reclaimed wastewater is used safely for domestic applications. The government established the Reclaimed Water Working Group to develop appropriate regulations, and water quality and technical standards or guidelines to facilitate the safe use of reclaimed wastewater in Alberta. Until this framework is established, reclaimed wastewater from any source cannot be used inside buildings or for other domestic applications in Alberta.[209]

Although there are water quality and environmental concerns with respect to water reuse, many jurisdictions have successfully developed laws and policies to enable reuse. For example, as mentioned earlier (section 3.2.1.) Arizona is a world leader in greywater regulation. Arizona employs a three-tiered regulatory system where the lowest risk tier does not even require a permit. British Columbia has developed a water reuse legislative framework, joining the lead taken by a number of U.S. states and Australia states. As for Alberta, the Alberta Economic Development Authority's committee on Sustainable and Regional Development 2013 Report to the Alberta Premier says of the province, "Alberta appears to be lagging behind other jurisdictions in Canada and around the world in providing a legislative framework to support water reuse"[210]

As alluded to earlier, produced water, which is water resulting from the process of bringing oil or gas from its source to the surface, can be a source of water supplies. Quantities of produced water in Alberta are huge, for example, a 2007 report indicates an average of 720,000 cubic metres a day. [211] This amount represents both water with total dissolved solids (TDS) >4,000 mg/ litre (l), and water with TDS < 4,000 mg/1. Under the *Water Act* water with TDS >4,000 mg/ l is saline.[212] Accordingly, water with TDS < 4,000 mg/l is non-saline, but that does not mean it is "fresh" or "drinkable." For perspective, potable (drinking) water normally would have a TDS of ≤500 mg/L.[213]

Relatively speaking, the vast quantity of produced water is saline. To produce non-saline water an operator needs a licence under the *Water Act*, but the legislation exempts saline diversions

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[209] Alberta Municipal Affairs, *Reclaimed Water*, online: <http://www.municipalaffairs.gov.ab.ca/1176>.
[210] WaterSMART, *Water Reuse in Alberta: A Summary* Report (2013) at 9, online: < http://www.albertawatersmart.com/water-reuse.html> link to report.
[211] Petroleum Technology Alliance of Canada, *Produced Water Beneficial Re-Use, High TDS Study*, (2007) at 7, online: <http://eipa.alberta.ca/media/40911/fossil%20water%20ptac%20beneficial%20re-use%20high%20tds.pdf >.
[212] *Water Act (Ministerial) Regulation*, *supra* note 133, s 1(z).
[213] Government of Canada, *Guidelines for Canadian Drinking Water Quality*, online: < https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-total-dissolved-solids-tds.html>.

from the licensing requirement.[214] Current energy legislation requires produced saline water to be disposed of through deep well injection.[215] Is there an alternative to this? Can the water be put to some useful purpose? One alternative would involve desalination. Desalination is the removal of dissolved solids such as salts and minerals from water. Although desalination may more often be considered with respect to sea water, there is potential for desalinating produced water to put it to useful purposes.[216]

The literature is replete with studies on the potential to use produced water for beneficial purposes such as agricultural uses (irrigation, water for livestock), urban uses (landscaping, golf courses), contributing to wetland and wildlife needs, and industrial uses.[217] Studies, some that contain jurisdictional comparisons, set out the multitudinous issues concerning using produced water for such purposes, such as technical and economic matters regarding desalination and other upgrading techniques, determining appropriate water quality standards for a use, and legal and policy requirements to enable uses.[218]

Although it is clear that the Alberta government is aware of and is studying alternative uses for produced water, other than permitting or directing some reuse in oil and gas industrial operations,[219] research has not revealed a government policy regarding it other than the requirement for disposal.

Re 6 Recommendations/Options:

- It is recommended that the government develop and implement a water reuse strategy as part of a water management and climate change adaptation plan. Part of the reuse strategy should be the permitting of greywater reuse for residential, municipal, agricultural, and industrial purposes as appropriate.
- It is recommended that the government develop and implement policies for putting produced water to useful purposes as part of a water management climate change adaptation plan.

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[214] *Water Act (Ministerial) Regulation*, *supra* note 133, Schedule 3, s 1(e).
[215] Alberta Energy Regulator Directives 051 and 065.
[216] A webpage of Alberta Energy titled "talk about Water and the Oil Patch" (2011) notes "Desalination of oilfield produced water may be technically viable, however its economic advantages have not yet been proven." Online: <.http://www.energy.alberta.ca/Oil/pdfs/FactSheet_Oil_WaterOilpatch.pdf> .
[217] See, for example, Allan Ingelson, Arlene Kwasniak, Nickie Vlavianos, Tilly McRae, Gopal Achari, Bernard Mayer, Paul Reid and Cooper Langford, *Regulatory Challenges for Re-Using Produced Water* (2015) at 113-119, online: < http://auprf.ptac.org/water/identify-regulatory-challenges-for-re-using-produced-water-and-flowback-in-alberta/> link to 2015 Final Report.
[218] See, for example, Allan Ingelson et al, *Regulatory Challenges for Re-Using Produced Water, ibid*; Arlene Kwasniak, "Waste Not, Want Not A Comparative Analysis and Critique of Legal Rights to Use and Re-Use Produced Water—Lessons for Alberta," *supra* note 35; Petroleum Technology Alliance of Canada, *Produced Water Beneficial Re-Use, High TDS Study*, *supra* note 211; and Sander Duncanson, *Managing Produced Water from Coalbed Methane Operations: A Critical Examination of Alberta's Regulatory Framework*, (2011) (prepared for a Canadian Bar Association Banff , Alberta Conference), online: <http://www.cba.org/cba/cle/PDF/ENV11_Duncanson_Paper.pdf>.
[219] See discussion in Allen Ingelson et al, *Regulatory Challenges for Re-Using Produced Water*; *supra* note 217, at 4 and 10.

- It is recommended that the government develop the appropriate health, safety and environmental laws, and appropriate building and plumbing codes (insofar as these are within provincial authority) to implement the above two recommendations.

Re 7 Discussion:

The Framework would provide for and require, as appropriate, water conservation methods and approaches.

There is legislative power for the government to compel water conservation. Under the *Water Act*, if a "Director is of the opinion that water is not being conserved or that a person has wasted any water that is diverted pursuant to an approval, licence, registration or this Act and the wastage is contrary to a water conservation guideline respecting wastage of water, the Director may issue to any person a water management order for conservation purposes."[220] A water management order may require the "person to whom it is directed to take any measures that the Director considers necessary" including "to stop wasting water and comply with the water guideline regarding wastage of water."[221] This is a powerful tool in the government legislative toolbox that it could use in a water management climate change adaptation plan. However, to date, no water guideline on wastage of water exists.[222]

At a policy level, the government has been more active on the water conservation front. The 2003 *Water for Life: A Strategy for Sustainability* includes "conservation, efficiency, and productivity outcomes and actions specific to sector planning." It requires that "all water sectors," identified as municipalities, irrigation, oil and gas, forestry, power generation, and chemical, to "prepare water conservation and productivity plans" and by 2015, to improve the "overall efficiency and productivity of water use in Alberta … 30% from 2005 levels."[223]

In the writer's experience, an often misunderstood aspect of this conservation, efficiency, and productivity (CEP) sector strategy concerns what happens with the conserved water? Does it stay instream? Are water rights reduced?[224] The answer to the second question is "no." Sector water right holders still have the right to the allocations under their licences notwithstanding the reduction of their water demand owing to conservation measures. The answer to the first question depends on whether the sector uses the conserved water or not. Alternatively, it may be possible for the water rights holder to transfer the conserved allocation in accordance with the *Water Act*

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[220] *Water Act*, *supra* note 97, s 97(2).
[221] *Ibid*, s 99(1)(a) (ix).
[222] This is based on a search of Alberta Environment and Parks website page. Water, Legislation/Guidelines, on February 6, 2017, online: < http://aep.alberta.ca/water/legislation-guidelines/default.aspx>. There is a *Water Conservation and Allocation Policy for Oilfield Injection*, (2006), online: < http://aep.alberta.ca/water/programs-and-services/groundwater/regulation-and-policy/documents/WaterConservationOilfieldInjectionPolicy.pdf> , that strives to limit the use of fresh water for oilfield injection, but this document does not appear to have the status of a *Water Act* water guideline.
[223] Alberta Environment and Parks, *Water Conservation, Efficiency and Productivity (CEP)*, online: <http://aep.alberta.ca/water/programs-and-services/water-for-life/water-conservation/efficiency-and-productivity.aspx>, and Government of Alberta, *Water for Life: A Strategy for Sustainability*, (2003), online: < http://aep.alberta.ca/water/programs-and-services/water-for-life/strategy/documents/WaterForLife-Strategy-Nov2003.pdf >.
[224] Also see Julia Ko for *Water Matters*, "What Happens to Conserved Water?" (2011), online: < http://www.water-matters.org/story/431>.

transfer provisions, or to apply for a licence amendment to add to purposes for use, if this would benefit the user. In these cases, conserved water will like?ly be diverted out of stream.

So how did the CEP sectors fare? Did they reach the 30% improvements through conservation, efficiency, and productivity measures by 2015?

Reports by the seven sectors were due in 2015 to the Alberta Water Council. The Alberta Water Council (AWC) is a 24 member multi-stakeholder partnership not-for- profit society established pursuant to the *Water for Life Policy.*[225] The AWC posted the seven reports on its website.[226] However, it is not clear how to assess the progress of the sectors so as to answer the question "how did the sectors fare?" This lack of clarity is reflected in a statement by the AWC made in connection with a multi-stakeholder project it commenced in 2015, based on the

> … recently released Water Conversation Action Plan [that] commits the Government of Alberta to ensuring major water-using sectors make *concrete, measurable and demonstrative improvements in water CEP*. [Emphasis added]. This will be accomplished by continuing to support the voluntary approach to CEP planning by working with the AWC to examine implementation progress and evaluate the extent to which the CEP process was successful.

The purpose of this project is two-fold:

1) Evaluate and report on the contributions of the water-using sectors' implemented CEP opportunities to achieving the three WFL [*Water for Life*] goals, the specific WFL outcome of a 30% improvement in overall efficiency and productivity from 2005 levels by 2015, and the AWC-approved CEP desired outcomes; and

2) Evaluate the process undertaken by the AWC to achieve CEP objectives and make recommendations for potential future enhancements to sector planning, implementation and reporting, if needed.

This Project team's work report is due March 2017.[227]

Re 7 Recommendations/Options:

- It is recommended that the government devise and promulgate a water conservation guideline under the *Water Act* that requires holders of water rights under approval, licence, or registration to be conserved. The guideline should contain provisions relevant to climate change adaptation, and be incorporated into a water management climate change adaptation plan.
- It is recommended that the government's Conservation, Efficiency, and Productivity (CEP) program be made mandatory, e.g. through a *Water Act* water conservation guideline.
- It is recommended that the government develop regulatory mechanisms and tools, and more fully use existing mechanisms and tools, including market-based instruments (e.g.

[225] See the webpage for the Alberta Water Council at: <http://www.albertawatercouncil.ca/>.
[226] Alberta Water Council, *Water Conservation, Efficiency, and Productivity*, online: http://awchome.ca/Projects/CEP/tabid/209/Default.aspx>.
[227] Alberta Water Council, *Evaluating Water Conservation, Efficiency and Productivity Project Team Terms of Reference*, online: <http://awchome.ca/LinkClick.aspx?fileticket=urzzvrwLvJw%3d&tabid=209>>

water transfers, incentives), so that conserved water can without difficulty be protected instream.

Re 8 Discussion:

The Framework would require municipalities, of all kinds - rural to cities - to engage in climate change adaptation planning in respect of all aspects of municipal authority, in particular, authority that relates to stormwater management. Municipal climate change adaptation plans would contain a number of elements including climate change risk assessments, planning for more frequent floods, setting out an implementation plan of adaptation measures which address stormwater infrastructure improvements, separating combined sewer systems, embracing low impact development, conducting wetland inventories and developing and implementing wetland policies.

How does the current Alberta law and policy framework fare as compared with the ideal framework summarized in 8 above, and set out in detail earlier? It will not be possible to address all of the elements involved in 8, and so this Paper will focus on the current Alberta law and policy framework and how it relates to the following key elements: municipal climate change adaptation plans; combined sewer systems; low impact development; and wetlands, climate change, and municipalities.

Municipal climate change adaptation plans

The Alberta government does not require municipalities to engage in climate change adaptation plans in respect of matters within municipal authority. However, there are various sources of provincial legislative authority under which the province could require such plans. Here are some of them:

- The MGA confers the authority to municipalities to engage in such planning. Part 17 of the MGA deals with land use planning, subdivision, and development. Provisions in that Part prescribe that all municipalities of 3500 persons or more develop and adopt a municipal development plan (MDP), and permits smaller municipalities to do so.[228] The Act requires that an MDP must address certain matters, which matters could support climate change and adaptation considerations.[229] As well, municipalities may develop non-statutory plans (plans not specifically mentioned in the MGA) provided the matters within the plan are in municipal jurisdiction. Municipal plans could require that potential climate change impacts and adaptation actions be taken into consideration in relevant municipal decisions. Plans also could set out adaptation measures and provide a roadmap for when and how climate change and adaptation considerations will drive decision-making in particular cases. For example, under a municipal plan climate change and adaptation considerations could

[228] MGA, *supra* note 102, s 632.

[229] E.g., MGA, *ibid*, ss 632(3)(a)(i), (ii), (iii): "(i) the future land use within the municipality, (ii) the manner of and the proposals for future development in the municipality, (iii)the co‑ordination of land use, future growth patterns and other infrastructure with adjacent municipalities if there is no intermunicipal development plan with respect to those matters in those municipalities, (iv) the provision of the required transportation systems either generally or specifically within the municipality and in relation to adjacent municipalities, and (v) the provision of municipal services and facilities either generally or specifically."

require that low impact development techniques be used in order to be granted subdivision approval. Climate change adaptation provisions could be reflected in a municipality's land use bylaw, which regulates permitted and discretionary uses in a land district.[230]

- The province could use its powers over municipalities to compel them to develop climate change adaptation plans, including with respect to stormwater management. For example, the province could require municipalities to develop and implement climate change adaptation plans through a Land Use Policy or through the *Alberta Land Stewardship Act* (ALSA) regional planning authorities. Section 622 of the MGA authorizes Cabinet to establish land use policies and, when one is established, "Every statutory plan, land use bylaw and action undertaken pursuant to this Part by a municipality, municipal planning commission, subdivision authority, development authority or subdivision and development appeal board or the Municipal Government Board must be consistent with the land use policies."[231] Although a land use policy does not apply to an area covered by an ALSA regional plan, an ALSA regional plan could impose comparable requirements.[232]
- Under the *Alberta Environmental Protection and* Enhancement *Act*, storm drains are to be *designed* to meet at minimum, the applicable standards set out in the *Standards and* Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems,[233] published by the government and other standards directed by the Director.[234] Accordingly, there is potential to require climate change planning and adaptation considerations and action plans in stormwater management, at least at the design stage. The mentioned *Standards*, according to Alberta Environment and Parks, have been "decoupled into five functionally-associated sections." The section relevant to storm water are the 2013 *Alberta Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*.[235] The 2013 *Standards and Guidelines* do not mention climate change, though they do mention watershed analyses. They provide that for "detention facilities for wet ponds, dry ponds, and wetlands", "watershed / subwatershed analyses should be performed to coordinate subcatchment / pond release rates for regional flood control."[236] These provisions provide a basis, although limited, for watershed based stormwater management. However, these *Standards and Guidelines* are not mandatory. As stated in the Forward pages, "They [are] intended to provide general guidance on storm drainage management.

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[230] MGA, *supra* note 102, Part 17, Division 5.
[231] MGA, *supra* note 102, s 622(3).
[232] See discussion of the ALSA in section 4.4.
[233] The Alberta Environment and Parks website, *Water, Standards and Guidelines*, online: <http://aep.alberta.ca/water/programs-and-services/drinking-water/legislation/standards-and-guidelines.aspx>.
[234] *Wastewater and Storm Drainage Regulation*, Alta Reg 119/1993, s 5(1).
[235] The Alberta Environment and Parks website, *Water, Standards and Guidelines*, reports that the "2006 version of the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems has now been decoupled into five functionally-associated sections." The section relevant to stormwater is the 2013 *Alberta Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*. See online: <http://aep.alberta.ca/water/programs-and-services/drinking-water/legislation/standards-and-guidelines.aspx>.
[236] *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*, *ibid* at 5-15, 5-18, and 5-20.

Good engineering and best management practices are included in this Part. These are not mandatory requirements but they establish the minimum expectation when the system owner / utility applies for registration."[237]

- Developing municipal stormwater schemes and facilities normally require both a statutory authorization under the *Environmental Protection and Enhancement Act* and under the *Water Act*. There are opportunities for the province at each of these levels to impose climate change adaptation requirements with respect to stormwater management through specific approval requirements, or general regulatory or code of practice requirements. The author could not locate any specific provincial requirements regarding stormwater management and climate change adaptation.
- The *Stormwater Management Guidelines for the Province of Alberta* [238](1999) contains detailed information and best management practices for stormwater management but they are not, by themselves, regulatory in the sense that non-compliance could result in an enforcement action. The *Guidelines* overall appear favorable to watershed management, and ecological approaches to stormwater management, though they do not mention "climate change" or "climate change adaptation." These *Guidelines* could be updated to incorporate municipal climate change adaptation measures.
- Some may argue that it might not be feasible or desirable for every municipality in Alberta to develop a climate change adaptation plan. For example, a small rural municipality with a low climate change impact risk might not have a budget for, or require a full-blown plan. However, such a municipality could join with other municipalities within a region or watershed to develop an intermunicipal climate change adaptation plan. The MGA provides for intermunicipal plans,[239] and Bill 21, the *Modernized Municipal Government Act*, encourages intermunicipal cooperation and permits intermunicipal sharing of services,[240] which may come in handy in climate change adaptation situations.
- The province has taken steps towards funding local government and community climate change adaptation initiatives. For example, in late 2016 the Alberta government introduced the *Alberta Community Resilience Program*, "a multi-year provincial grant program supporting the development of long-term resilience to flood and drought events." Eligible projects include structural measures such as, "berms, dykes, flood walls, bank protection and stabilization works, retention ponds and diversion structures to protect critical

[237] *Ibid* at V.
[238] Government of Alberta, Municipal Planning and Development Branch, Environmental Service, *Stormwater Management Guidelines for the Province of Alberta* (1999), online: < http://aep.alberta.ca/water/programs-and-services/municipal-wastewater-and-storm-water-management-program/documents/StormwaterManagementGuidelines-1999.pdf>.
[239] MGA, *supra* note 102, s 631.
[240] Bill 21, *Modernized Municipal Government Act*, *supra* note 103. The new MGA Preamble includes the following statement: "WHEREAS the Government of Alberta recognizes the importance of working together with Alberta's municipalities in a spirit of partnership to co-operatively and collaboratively advance the interests of Albertans generally." It also includes a new section 54 which states that a "municipality may provide outside its municipal boundaries any service or thing that it provides within its municipal boundaries …" including in other municipalities, with their agreement.

> infrastructure and ensure public safety;" property purchase, flood proofing with respect to "critical infrastructure (water, wastewater, stormwater works, and infrastructure to access those services)", bio-retention infrastructure to reduce drought impacts, including new stormwater management facilities, low impact development projects, and incorporation of wetland features.[241] As well, the government has recently (February 6th, 2017) introduced that it has set aside $600,000 for grants to the non-profit, community and indigenous organizations to fund climate change educational projects.[242]

Although the government does not require municipalities to engage in climate change risk assessments and climate adaptation plans for stormwater management infrastructure, and flood management, Alberta municipalities have taken steps in that direction nevertheless. For example, Leduc, Alberta's 2014 *Weather and Climate Change Readiness Plan*, includes action plans for enhancing stormwater and sewage systems in view of changing precipitation patterns, and to "improve understanding of future overland flooding risks to inform …actions to reduce the risk of flooding in existing developments and … the design of new developments to minimize flooding risk.".[243] In developing its Plan, Leduc worked with the not-for-profit, charitable organization, All One Sky Foundation, whose objective is to help vulnerable populations, including municipalities, learn about and deal with climate change.[244] The influence of Leduc being a leader in climate change readiness is reflected in this statement of Leduc's Environmental Sustainability Coordinator:

> All One Sky Foundation worked with the City of Leduc to develop our first ever Weather and Climate Readiness Plan. Council approved the plan at the end of 2014. This has resulted in several requests from other municipalities and provincial organizations for information on our process and on our commitment to this type of proactive planning. We are pleased to be champions for building resilience to weather and climate effects and have dedicated resources this year for the implementation of initial actions.[245]

The City of Red Deer is another municipal climate change adaptation leader with its *Climate Change Adaptation Plan*. Part One of the Plan, approved in 2014, contains overall goals set out under themes, and Part Two, currently under development, will set out "detailed actions under each major theme."[246] Major themes and actions from Part One include "building or upgrading

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[241] Government of Alberta, *Alberta Community Resilience Program* (2016), online: <http://aep.alberta.ca/water/programs-and-services/alberta-community-resilience-program/default.aspx>.
[242]Government of Alberta, *Community Environmental Action Grant*, online: < https://www.alberta.ca/alberta-community-environment-action-grant.aspx>.
[243] City of Leduc, *Weather and Climate Change Readiness Plan* (2014), at 27- 28, online: <https://www.leduc.ca/sites/default/files/Weather%20and%20Climate%20Readiness%20Plan.pdf>.
[244] All One Sky Foundation, About Us, online: < http://allonesky.ca/about-us/>. The Foundation's website links to a number of educational materials, including *Climate Change Adaptation for Municipalities, A* Primer, online :< http://allonesky.ca/wp-content/uploads/2015/12/C-145-Muni-WCRP-in-Alberta-Primer-AUMABrandedShortRB.pdf>.
[245] Kerra Chomlak, Environmental Sustainability Coordinator, City of Leduc, All One Sky Foundation, About Us, *ibid.*
[246] City of Red Deer, *Climate Change Adaptation Plan*, online: < http://www.reddeer.ca/city-government/plans-and-projects/corporate-projects/climate-change-adaptation-plan >.

infrastructure to be ready for anticipated impacts, examples from other municipalities include stormwater collection system improvements or seawall reinforcement" and risk assessment.[247]

Other Alberta municipalities are in the process of developing climate change adaptation plans and strategies.[248] Although these initiatives are welcome and necessary, what appears to be missing is a strong and consistent provincial role. As mentioned earlier, the province has adopted a *Climate Change Adaptation Framework*, produced the *Adaptation Framework Manual*, and is in the process of developing a provincial adaptation strategy to help ensure the province and organizations, including local governments, are better prepared for, and more resilient to a changing climate.[249] It is hoped that this process will result in the province taking a strong leadership, guidance, regulatory, and funding role so that local governments can plan to address climate change impacts through adaptation.

Prohibiting future combined sewer systems and plans to upgrade existing ones

Alberta is fortunate in that only one municipality, Edmonton, has combined sewer systems.[250] Yet there still is a need for proactive measures at the provincial level in view of climate change in respect of combined sewage systems. The government has a policy on combined systems and combined sewage overflows (CSOs), including that no new combined systems be developed in the province, that no new CSOs be permitted, and that existing combined systems be separated where possible. The policy recognizes that many decades might be required to achieve separation. In the meantime, the policy requires CSO strategies be developed.[251] In light of climate change and more frequent severe weather events that could result in CSOs, the province should re-examine this policy to ensure that it is adequate and precautionary. Moreover, as policy is not legally binding, the province should develop enforceable combined systems regulations.[252]

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[247] City of Red Deer, *Climate Change Adaptation Plan, Part One*, at 11-12, online: < http://www.reddeer.ca/media/reddeerca/city-services/environment-and-conservation/our-corporate-initiatives/Council-Climate-Change-Adaptation-Plan-March-4-2014.pdf>.

[248] For example, Calgary's *Climate Program*, in preparation for the 2019-22 budget years, online: < http://www.calgary.ca/citycouncil/Pages/Council%20News/Utilities-Corporate-Services-2017-02-22.aspx> and Edmonton's *Climate Change Adaptation and Resilience Strategy*, to be brought to City Council in 2018, online: < https://www.edmonton.ca/city_government/city_vision_and_strategic_plan/climate-change-adaptation-strategy.aspx>.

[249] See discussion in section 5.3 Re 1.

[250] Environmental Service, Environmental Services Division, Municipal Program Development Branch, Alberta Environment, *Municipal Policies and Procedures Manual*, 2001, at 3-2, online: <http://aep.alberta.ca/water/programs-and-services/municipal-wastewater-and-storm-water-management-program/documents/MunicipalPoliciesProceduresManual-2001.pdf>.

[251] *Ibid* at p 3-3 and 3-4.

[252] Although this Paper does not focus on federal jurisdiction, in this context it should be mentioned that in 2012 the federal government promulgated the *Wastewater Systems Effluent Regulations* (*Wastewater Systems Effluent Regulations*, SOR/2012-139) *under* the *Fisheries Act*, *supra* note 80. These regulations set effluent standards for wastewater treatment plans that had to be met (unless an extension was granted) by January 1, 2015. However, if a wastewater system had CSOs then the standards do not have to be complied with until 2041. As Ecojustice Canada points out "The intent is to allow the municipality time to focus on the CSO problem by delaying treatment plant upgrades. However, the regulations do not set any reduction targets or standards for CSOs. The concern is that this will allow cities to delay much-needed treatment plant upgrades while not resulting in any tangible progress on CSOs." As recommended by Ecojustice, the federal regulation should be changed to require tangible progress on CSOs, including standards and enforceable targets. As well, Ecojustice recommends that the federal government provide affected municipalities with funds to implement CSO strategies and conversions to separate systems. See

Low impact development

There is no provincial program or directive that the author's research revealed that requires or encourages low impact development where it would assist in climate change adaptation. As with other climate change adaptation approaches the government could accomplish this through a Provincial Land Use Policy, or through the use of ALSA tools.

On the municipal side, a number of Alberta municipalities (Lethbridge, Edmonton, Rockyview, Airdrie, and Strathcona) are members of the Alberta Low Impact Development Partnership (ALIDP). [253] The ALIDP promotes low impact development such as green infrastructure, sustainable urban drainage systems, and water-sensitive urban design.

Wetland inventories, wetland policies, and wetland protection

The Alberta government has conducted or gathered wetland inventories, and geo-spatial information regarding them is available online.[254] The inventories work hand in hand with the 2013 Alberta *Wetland Policy*[255] (*Wetland Policy*). The *Wetland Policy* replaced the 1993 *Wetland Management in the Settled Area of Alberta*.[256]

This Paper focusses on the *Wetland Policy* in relation to adaptation to climate change, and in particular, in relation to stormwater management.[257] This Paper has discussed the importance of preserving and restoring wetlands as an adaptation measure because of wetlands' role in dealing with climate change impacts including drought, storms, and floods. It also has stressed the importance for municipalities to be proactive in adaptation measures including taking advantage of wetlands and their values in stormwater management. Accordingly, this section focusses on how the government has fared with respect to wetlands in their relation to climate change adaptation and to stormwater management.

To pursue climate change adaptation wetland drainage must be aggressively controlled and mitigated. Wetland policies or legislation should be at minimum no-net- loss so that, after taking into account mitigation measures (such as wetland restoration elsewhere) wetland drainage does not result in a reduction of wetland values. As well, to feature in climate change adaptation, wetland policies or legislation must incorporate consideration of wetlands' role in ameliorating climate change impacts, such as their role in stormwater management. In addition, wetland policies or legislation must take into account the critical role of municipalities as the primary on-the-ground stormwater managers, and the primary regulators of subdivision and development.

Ecojustice Canada, The Great Lakes Sewage Report Card, 2013, online: <https://www.ecojustice.ca/wp-content/uploads/2014/08/FINAL-The-Great-Lakes-Sewage-Report-Card-2013.pdf>.

[253] Alberta Low Impact Development Partnership website, *Partners*, online: <https://alidp.org/partners>.

[254] Alberta Government, *Geo-Discover Alberta*, *Wetland Information*, online: <http://geodiscover.alberta.ca/Viewer/?Viewer=GDA&Project=798a76b5-17a7-4ea2-85f4-8bd1ae3e6df6>>

[255] See Government of Alberta, Environment and Parks, Alberta *Wetland Policy* (2013), online: <http://www.waterforlife.alberta.ca/01533.html> (*Alberta Wetland Policy*).

[256] Alberta Water Resources Commission, *Wetland Management in the Settled Area of Alberta, An Interim Policy* (1993), online: < http://aep.alberta.ca/water/education-guidelines/documents/WetlandManagementSettled-InterimPolicy.pdf>.

[257] For legal and policy information on wetlands in Alberta, see Arlene Kwasniak, *Alberta Wetlands: A Law and Policy Guide*, 2nd edition, (Calgary, Canadian Institute of Resources Law and the North American Waterfowl Management Plan Partnership, 2016).

So how does Alberta fare with respect to directing the use of wetland values to assist in climate change adaptation? It is impossible in this Paper to comprehensively answer this question, but here are some remarks:

- The Alberta *Wetland Policy* is not a no-net-loss policy, though its application would permit no-net loss on a regional basis.[258]
- The Alberta *Wetland Policy* is designed to protect wetlands of the "highest value" in relation to "relative wetland value", as determined by the *Wetland Policy* and *Wetland Policy* implementation tools. The words "climate change" or "adaptation" are not mentioned in the *Policy* though the ingredients that render wetland value are relevant to climate change impacts and adaptation. These are biodiversity, water quality improvement, flood reduction, and human value.[259] However, the *Wetland Policy* states that the relative value of a wetland can be affected by its abundance on the *current* landscape.[260] This, on its face, does not account for adaptation with respect to future landscapes impacted by climate change. In other words, wetlands that are abundant now, may not be taking into account climate change projections, and they will be needed intact to adapt to a climate-changed landscape.
- The government does not require municipalities to inventory wetlands within their borders and to protect them from development. This departs from the practice of other jurisdictions, for example, Manitoba.[261]

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[258] See Arlene Kwasniak, *Alberta Wetlands: A Law and Policy Guide*, Second Edition, *supra* note 257, especially chapter 6, at 163-180.

[259] Alberta *Wetland Policy*, *supra* note 255, at 13.

[260] Alberta *Wetland Policy*, *ibid* especially at 13.

[261] Manitoba Reg 81/201, *Provincial Planning Regulation*, under *The Planning* Act, CCSM, c 80, provides (with emphasis added):

5.1 Protecting Water Goals

To ensure the protection of Manitoba's water and to ensure that the quality and quantity of our water and aquatic ecosystems are healthy and sustainable for future generations.

Policies

5.1.1 Water bodies, groundwater and riparian areas must be identified and protected from the risks associated with development. In particular, land uses, activities and developments that have a high risk of causing pollution, such as disposal fields, fuel tanks, waste disposal grounds, lagoons and chemical and fertilizer storage facilities, must be considered and prevented or suitably mitigated.

5.1.2 In order to ensure water quality is protected, development in or near water bodies or riparian areas must not be permitted if the development may result in

a) the contribution of nutrients, deleterious chemicals or materials to water bodies or a riparian area;

b) an acceleration of erosion or bank instability;

c) the removal of natural vegetative cover; or

d) an impact on any in-stream flows needed to maintain a healthy aquatic ecosystem.

5.1.3 To ensure the protection, retention and, where required, rehabilitation of riparian areas, the following setbacks must be applied in respect of development:

a) a minimum setback of 15 metres upslope from the normal high water mark of

i) first and second order drains, and

ii) artificially created retention ponds;

b) a minimum setback of 30-metres upslope from the normal high water mark for all natural water bodies and waterways, including ephemeral streams;

- The Alberta *Wetland Policy* does not on its face embrace the important role of municipalities in wetland protection and management, including with respect to climate change adaptation by, for example, encouraging or requiring municipal wetland policies.[262]

Re 8 Recommendations/Options:

- It is recommended that the government require municipalities to develop climate change adaptation plans in respect of all relevant aspects of municipal authority, including stormwater management. Stormwater management plans should incorporate integrated flood management (IFM) approaches. The government could do this through its MGA Land Use Policy powers, powers set out in the ALSA, or other legislative powers.
- It is recommended that the government set standards and guidelines for municipal climate change adaptation plans, for example, that they be regional and watershed based. The government could make accommodation for smaller, low climate change impact risk municipalities by permitting them to adopt larger regional or watershed-based climate change adaptation plans.
- It is recommended that the government provide appropriate funding so that municipalities and others who are affected can comply with provincial legislation and policies relating to municipal climate change adaptation plans.
- It is recommended that the government take leadership in promoting and requiring as appropriate, low impact development to better assure that municipalities can be adaptive to climate change.
- It is recommended that the government develop enforceable and precautionary combined sewage regulations.
- It is recommended that the government use its pertinent powers under the *Environmental Protection and Enhancement Act* and the *Water Act* to better ensure that local stormwater infrastructure and facilities and stormwater management, better assure municipal resilience from climate change impacts.
- It is recommended that the government revisit and revise the Alberta *Wetland Policy* and implementation tools to better ensure that it is appropriate, not only for current wetland landscapes, but also for future landscapes altered by climate change and for future climate-changed conditions.

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c) a minimum setback greater than 30 metres upslope from water bodies and waterways that
i) are designated under an enactment,
ii) are socially, historically or culturally important, or
iii) contain unique aquatic assemblages and species.
The natural vegetative cover must be retained or rehabilitated within the above setbacks.
[*Author's note:* The regulation continues with exceptions.]

[262] For a discussion of municipal roles and arguments and observations as to why the province should partner with municipalities in wetland protection and management, see Arlene Kwasniak, *Alberta Wetlands: A Law and Policy Guide*, Second Edition, *supra* note 258, at 225-228.

- It is recommended that the government better recognize and promote municipal wetland policies within the overall provincial wetland policy framework.

Summary of Recommendations/Options

- It is recommended that the province develop and implement a comprehensive climate change adaptation plan. A water management and climate change adaptation plan should be part of a larger climate change adaptation plan.
- The provincial climate change adaptation plan should be based on science and other reliable sources of knowledge including Aboriginal traditional knowledge and community knowledge. In addition to being a climate change adaptation for all Alberta, its sectors, and communities, the plan would recognize the unique adaptation needs of some sectors and communities, for example, Aboriginal communities. The plan would demonstrate the province's commitment to UNDRIP.[263] The plan would also recognize and incorporate legal and international obligations owed when devising and implementing a climate change adaptation plan. As well, the plan would be adaptive to respond to changing circumstance and knowledge development.
- Recognizing that water management is a public/private responsibility, included within the plan should be the establishment of an Alberta climate change adaptation fund, to help fund groups, individuals, municipalities, industries, businesses, landowners, and universities to develop and implement climate change adaptation tools, and to become more climate change resilient.
- It is recommended that *Water for Life* be revised and renewed to more fundamentally incorporate climate change adaptation measures. Legislators should consider the Battle River Watershed Alliance's work in setting out concrete climate change adaptation measures.
- It is recommended that the comprehensive climate change adaptation plan and any sub-plans and implementation actions be incorporated not only into government policies, but also into legislation.
- It is recommended that the province amend the *Water Act* and regulations to ensure fairness, as characterized in this Paper, as a climate change adaptation measure. The province should keep an open mind about retaining or abandoning FITFIR. The Act could retain FITFIR as long as the Act provided sufficient discretion and authority for the appointed officials to implement adaptation provisions, such as re-ordering priorities as necessary, or issuing share the shortage directives, well before there is dire need to do so.
- It is recommended that the province amend the *Water Act* and regulations to incorporate flexibility and adaptive management, as characterized in this Paper. This will require the authority to adjust issued licences and other authorizations as required to implement climate change adaptation measures.

[263] See section 5.3 Re1 Discussion.

- It is recommended that *Water for Life* and other water management policies be revised and renewed to more fulsomely incorporate fairness, flexibility and adaptive management as climate change adaptation measures.
- It is recommended that the government vigorously pursue IFN/EF determinations for all of Alberta. The government should continue its use of desktop methods as appropriate where full-blown IFN/EF determinations have not yet been achieved.
- It is recommended that the government develop and implement a comprehensive IFN/EF program that incorporates climate change adaptation and resilience. The program should also include an action plan setting out how and when government will meet restoration and protection objectives.
- It is recommended that the government revisit and rework the *Water Act* so that it clearly possesses a broad range of tools to restore and protect IFN/EF. The Act should recognize that such restoration and protection is a shared public/private endeavour and accordingly the Act should specifically permit privately held instream flow licences for authorized purposes. Privately held instream flow licences should be permitted both on an original application for a licence, or following a transfer of an allocation.
- It is recommended that the government, in revisiting and reworking the *Water Act,* pursue greater cancellation and amendment in the public interest powers, including new powers to modify issued water rights, including deemed licences, to implement climate change adaptation.
- It is recommended that the government in revisiting and reworking the *Water Act* remove the uncertain and potentially unwieldy special status for deemed licences so that it can straightforwardly and forthrightly develop and implement a water management climate change adaptation plan.
- It is recommended that government use its current powers to their fullest to restore and protect IFN/EF including reservations and Crown instream flow licenses to implement water conservation objectives.
- It is recommended that government continue, and complete its studies relating to conjunctive water management. It is further recommended that it include conjunctive water management in a water management and climate change adaptation plan. If implementing conjunctive water management requires more flexible water allocation rights, government should explore how to effect this without, as much as possible, injuring privately held allocation rights. This may require amendments to the *Water Act.* Logically, if implementing conjunctive water management improves rights by making it more likely that allocations will be met in times of shortage, there would be no injury or negative impacts on them.
- It is recommended that government finally regulate water quality together with water quantity, acknowledging that completing such an endeavor may take time. In the meantime, regulatory and policy frameworks can continue to integrate quality and quantity legislation and policy, including in connection with water management and climate change adaptation.

- It is recommended that government continue its water management planning processes, in particular, Cabinet approved water management plans, for the major river basins and key sub-basins in the province. Climate change adaptation measures should be included in these plans. As well, current plans should be reviewed and updated to ensure that climate change adaptation scenarios and implementation are incorporated.
- It is recommended that government continue its development of ALSA regional plans and include climate change adaptation provisions. It should also ensure that its current ALSA regional plans incorporate climate change scenarios and adaptation measures. As well, it should continue its development of ALSA regional plans in this manner.
- It is recommended that government continue its support for the work involved in the SSRBAP and the Bow River Basin Project. However, it is recommended that the government do its own review and work on integrated water management for the SSRB and sub-basins and specifically build in climate change adaptation considerations. As well, it is recommended that in developing and implementing its own integrated water management scenarios for the Bow River Basin and other sub-basins in the SSRB, the government widely consult with interested persons and organizations whether or not they hold a water right to the sub-basin being studies. It is also recommended that the province carry out its Constitutional obligations to Aboriginal persons both in respect of consultation and accommodation, and to gather and use traditional knowledge in respect of the SSRB and sub-basins.
- To follow on the last point, it is recommended that the government conduct detailed legal and policy research into proposed integrated water management scenarios for the SSRB sub-basins that it develops, including regarding any legal obligation to pay compensation for alteration of water related activities.
- It is recommended that government review its policies with respect to WPACs to best ensure their full effectiveness. Government should support and fund WPAC initiatives to develop water related climate change adaptation plans, and government should adopt, as appropriate, WPAC recommendations into provincial laws and policies.
- It is recommended that the province develop and implement a consistent policy with respect to licence requirements for evaporative losses, return flows, rainwater harvesting, collecting runoff or diffuse surface water, and carrying out land based activities that result in instream or groundwater losses, but do not involve a direct water withdrawal. In developing the policy, government should incorporate a climate change adaptation and resilience approach, including accounting for likely future IFN/EF needs, as well as other water users' needs.
- It is recommended that government amend laws and policies as appropriate to carry out the recommendations in the preceding bullet. This will include amendments to Alberta's water legislation to clarify water rights with respect to water losses and non-traditional sources of water including evaporation, rainwater, runoff, and return flow. This will also include amendments to Alberta's water legislation to specify under what circumstances proponents

of land based activities that do not involve a direct water withdrawal but result in groundwater or surface water losses, will require a water rights.

- It is recommended that the government develop and implement a water reuse strategy as part of a water management and climate change adaptation plan. Part of the reuse strategy should be the permitting of greywater reuse for residential, municipal, agricultural, and industrial purposes as appropriate.
- It is recommended that the government develop and implement policies for putting produced water to useful purposes as part of a water management climate change adaptation plan.
- It is recommended that the government develop the appropriate health, safety and environmental laws, and appropriate building and plumbing codes (insofar as these are within provincial authority) to implement the recommendations in the above two bullets.
- It is recommended that the government devise and promulgate a water conservation guideline under the *Water Act* that requires holders of water rights under approval, licence, or registration to be conserved. The guideline should contain provisions relevant to climate change adaptation, and be incorporated into a water management climate change adaptation plan.
- It is recommended that the government's Conservation, Efficiency, and Productivity (CEP) program be made mandatory, e.g. through a *Water Act* water conservation guideline.
- It is recommended that the government develop regulatory mechanisms and tools, and more fully use existing mechanisms and tools, including market-based instruments (e.g. water transfers, incentives), so that conserved water can without difficulty be protected instream.
- It is recommended that the government require municipalities to develop climate change adaptation plans in respect of all relevant aspects of municipal authority, including stormwater management. Stormwater management plans should incorporate integrated flood management (IFM) approaches. The government could do this through its MGA Land Use Policy powers, powers set out in the ALSA, or other legislative powers.
- It is recommended that the government set standards and guidelines for municipal climate change adaptation plans, for example, that they be regional and watershed-based. The government could make accommodation for smaller, low climate change impact risk municipalities by permitting them to adopt larger regional or watershed-based climate change adaptation plans.
- It is recommended that the government provide appropriate funding so that municipalities and others who are affected can comply with provincial legislation and policy relating to municipal climate change adaptation plans.
- It is recommended that the government take leadership in promoting and requiring as appropriate, low-impact development to better assure that municipalities can be adaptive to climate change.

- It is recommended that the government develop enforceable and precautionary combined sewage regulations.
- It is recommended that the government use its pertinent powers under the *Environmental Protection and Enhancement Act* and the *Water Act* to so that local stormwater infrastructure and facilities, and stormwater management, better assure municipal resilience from climate change impacts.
- It is recommended that the government revisit and revise the Alberta *Wetland Policy* and implementation tools to better ensure that they are appropriate not only for current wetland landscapes but also for future landscapes altered by climate change and for future climate-changed conditions.
- It is recommended that the government better recognize and promote municipal wetland policies within the overall provincial wetland policy framework.