Destined to Fail?

Groundwater Management in Canada

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TABLE OF CONTENTS

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EXECUTIVE SUMMARY

Canada's groundwater is critical to our well-being and prosperity. Fortunately, we have not yet encountered groundwater overuse and contamination on the same scale as many other countries. But, opportunities and pressures to provide an ever-increasing proportion of the world's food and energy supplies, combined with increasing urbanization, population growth, intensification of agriculture and energy production and climate change suggest we may be on the precipice of groundwater degradation on a scale that that could not have even been imagined even a decade or two ago.

An indicator of the pace of change is the fact that the year 2009 report by the Council of Canadian Academies Expert Panel on the Sustainable Management of Groundwater in Canada[1] did not even deal with shale gas fracking. The former Chairman of that Panel has indicated in a private communication that fracking would be high on their list of priorities if the same review were conducted today.[2]

The paper begins by describing existing and evolving groundwater management and regulatory regimes in Canada, and exploring the viability of these traditional approaches into the future. It notes that the 2009 report on groundwater by the Council of Canadian Academies concluded that while existing regulatory regimes for groundwater "... typically provide for extensive investigation, contravention and penalty provisions, in practice they are infrequently used." International research suggests that this is not unusual with traditional, permit-based regulatory schemes, partly because regulatory agencies regularly fall captive to the industries they regulate.

The paper suggests that even though the traditional approaches to protecting groundwater will continue to be necessary, they will not be sufficient to deal with future pressures on the resource. Some environmental destruction is inevitable. But, reversing the impacts of groundwater overuse and contamination is often difficult and sometimes impossible.

There are early indicators that insufficiencies in regulatory regimes, combined with weak communication of science are already resulting in intense public opposition to − and the loss of industrial and governmental "social license" for − certain types of resource development. This is most apparent with large-scale energy proposals, as witnessed by, for example conflicts around pipelines and shale gas fracking moratoria in New Brunswick, Quebec and Nova Scotia. Several other examples are also offered.

The case is made that everyone will be a loser if this emerging "stalemate" continues and intensifies. Future generations will lose the natural security which comes with the sustainable yield of good quality water from our freshwater aquifers. Current generations, including our Aboriginal populations, will experience unnecessary conflict, and significant damage to their health and wealth prospects. And even good development proposals will be delayed or completely stymied.

The paper goes on to explore options for avoiding those unpleasant outcomes, concluding that they cannot likely be overcome without achievement of a healthier form of environmental democracy. The three components of that healthier form of environmental democracy would include:

1) better and more accessible science;
2) more meaningful public participation in decision-making; and
3) citizen access to justice (the ability of citizens to seek a remedy for a violation of an environmental right).

The final section of the paper focuses on access to justice by exploring trends in other countries, and the merits and challenges surrounding enshrined environmental rights, and approaches founded on fiduciary duty such as public trust law, or something akin to it; and concludes that there are fundamental rights that can and often are abused in the short run, but which cannot be extinguished. Those fundamental rights must inevitably be satisfied to bring about a sustainable future.

Finally, recommendations are offered regarding further analysis, and if deemed appropriate following that analysis, the preparation of model legislation for the consideration of appropriate authorities.

1. GROUNDWATER IN CANADA – A VITAL RESOURCE

An adequate supply of good quality groundwater is critical to the health, well-being and prosperity of Canadians. About 10 million Canadians, or close to one in three depend on groundwater as their drinking water supply; and more than 80% of rural Canadians rely on groundwater for their entire water supply. The dependence of provincial populations on groundwater for domestic purposes varies from a high of 100% in Prince Edward Island to a low of 23% in Alberta.[3] In addition to domestic use, groundwater is also used in agriculture and by industries, including the energy sector. It also has an important ecological function, contributing as much as 50 percent of the stream flow in small and medium-sized streams, and feeding many wetlands and surface water bodies. [4]

Because most Canadians live and work on or close to surface water bodies, and because groundwater is not yet the primary source of water for irrigation here, groundwater use accounts for only about 5% of our total water use, compared to over 20% in the Unites States, although the proportion is gradually increasing in Canada as well. The type of use is also gradually shifting: the dominant groundwater users in British Columbia, Quebec and the Northwest Territories are now industrial as opposed to municipal or agricultural users. These trends, along with overall growth in population and level of economic activity, especially in the energy sector, point to ever-increasing pressures on our groundwater resources in the future.

Groundwater in its natural state is generally suitable for most human uses. But, when its quality is degraded, it becomes a much more serious problem than surface water degradation. Anthropogenic effects may appear slowly, and recovery may take a very long time even after the polluting source has been eliminated. This is because the turnover time of water in the groundwater regime may be several, or even hundreds of years. Although some artificial remediation of contaminated groundwater sites is possible, it is often insufficient and expensive. As a result, in some areas with intense development, for example in parts of southern Ontario, many communities are now abandoning groundwater in favour of piped water from relatively distant surface water sources.

In its 2009 review of groundwater in Canada, the Council of Canadian Academies Expert Panel concluded that "While there are no widespread cases as yet of 'water follies' such as the catastrophic over-pumping documented in the United States, individual cases of unsustainable groundwater management are on the rise across Canada."[5] And the pace of change is accelerating. An indicator of that pace of change is the fact that the year 2009 Council of Canadian Academies report on groundwater did not even deal with shale gas fracking. The former Chairman of that Panel has indicated in a private communication that fracking would be high on their list of priorities if the same review were conducted today.[6]

The groundwater situation is already becoming strained in many regions by urbanization, population growth, the intensification of agriculture and energy production, the proliferation of

exotic new contaminants, and global warming. These stresses are described in more detail in the section entitled *Storm Clouds on the Canadian Horizon* in Appendix A. To appreciate the nature of potential future stresses, it is also instructive to look at the much more dire conditions in a few more densely populated regions of the globe. For that purpose, a cursory assessment of the situations in China, India and the United States is also provided in Appendix A.

On a global scale, of the total volume of water on planet earth, about 97.5 % is saline, and about 1.5% is isolated in polar ice and glaciers. Groundwater makes up about 2/3 of that last 1%, and the remaining 1/3 is surface water.[7] As their surface waters have become depleted, many of the more populated regions of the world have been "mining" their groundwater, or in other words using it up and polluting it much faster than it can renew itself, with potentially disastrous long-range consequences.

The international situation is important for Canada, not only as an indicator of how bad things could get here, but also because, as the depletion of groundwater resources in more densely populated nations intensifies, Canada will face both enormous opportunities and enormous challenges to meet international demands for food, energy and other resources, with consequent implications from our own groundwater. That makes it doubly urgent to upgrade and solidify our groundwater knowledge and management regimes before the combination of domestic and international pressures become unmanageable.

2. EVOLVING MANAGEMENT REGIMES

The current legal regime in Canada

Canada's provinces have the primary powers to regulate groundwater use, due to their constitutional powers related to property, civil rights, local works and undertakings and natural resources. With respect to groundwater, British Columbia was the last province to legislate in this area when its *Water Sustainability Act* received Royal Assent on May 29, 2014. Details of the various provincial laws are available elsewhere, for example in an excellent publication by Linda Nowlan entitled "Out of Sight, Out of Mind? Taking Canada's Groundwater for Granted".[8]

Those details will not be repeated here, but I would just note that there are certain aspects of the regulation of groundwater use that are relatively consistent across Canada, and there are some significant differences. For example, in most cases, the licenses to pump groundwater specify the rate, the quantity, the duration and the time of use, and commonly state the purpose of the use. The differences include how regulators assess the environmental impact of withdrawals, and the degree to which public participation rights are specified under the laws.

In those provinces that require an environmental assessment for major withdrawals of groundwater, applicants for a license may need to submit a hydrogeologist's report detailing the probable impacts. In other cases, the consequences of the withdrawal may be dealt with through controls on wells or the establishment of conservation objectives. In the industrial heartland of Ontario, there are additional requirements in support of Source Water Protection Plans, and in support of the Great Lakes – St. Lawrence Sustainable Water Resources Agreement with neighbouring jurisdictions.

Groundwater quality is theoretically protected by provincial laws dealing with drinking water, environmental assessment, well-drilling and contaminated site remediation. Most environmental laws do not distinguish between surface and groundwater. Diverse, mainly agricultural sources of pollution are normally tackled through Best Management Practices and voluntary control measures. Innovative storm water controls show promise for groundwater recharge, but their impacts on groundwater quality are not well understood.

The deficiencies in our current legal groundwater regime, several of which are described in the 2009 CCA Expert Panel report are many and varied. For example, water use permitting seldom takes into account the impact of groundwater withdrawals on the environmental flows that the aquifers ultimately sustain. The permitting often reflects only a limited consideration of cumulative impacts and ecosystem perspectives. No matter how strong regulations regarding groundwater quality may or may not be, according to the CCA Expert Panel, they are infrequently enforced. And voluntary measures to address agricultural runoff, even when supported by incentives, have seldom been successful. Perhaps most importantly, permit-based

regulatory systems for groundwater, like those for most other aspects of environmental protection, often suffer from "agency capture", a subject that will be discussed in more detail later.

Regarding the right of citizens to be informed and to be involved in decision-making, one should not automatically assume that the public opportunity to speak during environmental assessment processes is equivalent to giving the public a say in the outcome. The outcome is controlled by government, and the criteria in the statutes are wide enough that the government can express whatever values it wants, and has complete discretion about the answer.[9] The public only has a say if it withholds or grants social licence through the electoral process or through social activism.

Relevant trends within and beyond the water sector

Within the water sector in Canada today, there are a lot of good things going on. Most Canadian water managers understand that:

- surface and groundwater resources must be managed as one system;
- water governance should take place primarily within the hydrologic parameters of significant watersheds;
- all stakeholders in a watershed must be brought to the table;
- basin agencies need clear consistent mandates and measurable objectives; and
- we must have good information on both water and economic resources within the watershed.[10]

And those water managers are working hard to implement those principles. For example, Ontario Conservation Authorities are working effectively with local stakeholders in assessing available water supplies, reducing pollution risks, developing and implementing source water protection plans, and influencing flood-plain management in positive ways. Watershed-based Councils in Alberta and Saskatchewan and Districts in Manitoba are bringing stakeholders together in constructive ways. And since 2002, under Quebec's Water Policy, work has been underway on some thirty river basin plans.

Canadian jurisdictions have also been making some good progress in interjurisdictional cooperation. Examples include the eight-state, two-province agreement dealing with Great Lakes diversions and consumptive use (the Great Lakes – St. Lawrence Sustainable Water Resources Agreement and Compact). Good progress is also being made in ongoing multilateral and bilateral negotiations of transboundary agreements in the Mackenzie Basin, where an Agreement between the Government of the Northwest Territories and Alberta was signed in

March of this year. Both of these basin-level and interjurisdictional arrangements include relatively sound groundwater management approaches.

But these positive developments within the water sector are being both undermined and overwhelmed by broader societal trends. The first important external trend during our age of "market triumphalism" has been widespread deregulation by stealth. On the regulatory front, we have gone through a lengthy succession of regulatory manoeuvres, with names like pollution prevention, self-regulation, regulatory harmonization, regulatory streamlining, smart regulation, and most recently "one for one" – the elimination of an existing regulation for each new one. In every case, the advertised purpose has been to increase regulatory efficiency. In each and every case, the outcome has been progressive deregulation, leading to further weakening of an already weak environmental protection regime.

A second troubling trend over the past quarter century has been the destruction of institutional capacity to carry out environmental research, monitoring, permitting, reviewing, enforcement and education. Cuts to environmental science within governments have been in the order of 40% over this period. Similar sized reductions have taken place in personnel previously assigned to implementing and enforcing environmental plans and laws. A fascinating statistic in that regard was offered recently by Ecojustice. Over a 20 year period, total fines levied under the Canadian *Environmental Protection Act* were less than the fines levied by the Toronto Public Library in a single year.[11]

Just as disconcerting as the declines in our capacity to understand and cope with disruptions to our ecological services has been an apparent attempt to keep knowledge out of the hands of the electorate. For example, since 2007 Environment Canada has not allowed its researchers to share their observations or analyses directly with the public through the media. Recently, when 4,000 federal government scientists were polled, 90% of them felt they were not being allowed to speak freely to the media. At the same time, we have shut down, defunded or shackled the majority of publically-funded environmental advisory groups.[12]

The net result of these actions is reflected in the Council of Canadian Academies 2009 report on groundwater which observed that "Although provincial [groundwater management regimes] typically provide for extensive investigation, inspection, contravention and penalty provisions, in practice they are infrequently used."[13]

Groundwater management in Canada: Destined to fail?

Close to half a century ago, Joe Sax, the father of what is now generally referred to as "public interest law" astutely observed that the institutional dynamic of "agency capture" made it unlikely that government agencies charged with protecting the environment would effectively and consistently do so over the long run. In his landmark book "Defending the Environment: A

Strategy for Citizen Action", he proposed that citizens should have the right to sue government agencies and private actors for harming environmental rights.[14]

Half a century later, in her book "Nature's Trust", another U.S. legal scholar, Mary Wood confirmed that Sax's forecast of "agency capture" has indeed become widespread.[15] Although she was describing the situation in the United States, it is the opinion of the author, based on 30 years' experience inside government and another 20 years observing it from the outside, that the phenomenon is just as prevalent, if not more so in Canada.

Wood asserts that "agency capture" takes place because agency discretion invites industries to lobby officials to bend the law in their favour, and that after years of such pressure agencies inevitably fall captive to the industry they regulate. Discretion then becomes a conduit through which the agency delivers public resources into corporate hands. She further contends that the wrongful transfer of public resources to private interests in response to political pressure takes place behind a veil of legitimization provided by environmental law. Citizens rarely discover the influence of politics, and if they do, the solid proof usually arrives years after the wrongdoing takes place and decisions become final.

Wood contends that "agency capture" takes place at all three stages of the regulatory process:

- At the rule-making stage, industry groups launch well-calculated (and often successful) power plays to advance their positions;

- At the technical decision stage, a host of technical presumptions flow into approval decisions, and agencies often invoke their vast discretion to choose assumptions that ease the burden on politically powerful permit applications; and

- At the enforcement stage, agencies enjoy tremendous discretion as to how they conduct inspections and whether to prosecute violators.

To the extent that governments fail to meet their fiduciary duty to preserve the essence of resources held in common, they are enabling the growth of moral hazard − inviting private industrial interests to reap profit while society bears the ecological cost of their activity. Some environmental destruction is reversible. But reversing the impacts of groundwater overuse and abuse is often difficult and sometimes impossible. Without a significant overhaul of our patchwork, incomplete approach to protecting groundwater, our groundwater management regimes in Canada are in fact destined to fail.

3. THE CASE FOR FUNDAMENTAL CHANGE

Is fundamental change inevitable?

A brief history of the changing groundwater management regimes is provided in Appendix B. If the past is any indicator of the future, fundamental change is in fact inevitable. Prior to about 1965, there was broad societal consensus in North America on the desirability of turning water resources into income and employment opportunities. By the mid-1960s, North Americans had concluded the pendulum had swung too far in the direction of unfettered development and initiated an era of environmental protection with the creation of environmental ministries and the passage of laws to protect water (and other) resources. By 1990, many had concluded it had swung too far in the direction of environmental protection, and began a search for a better balance under the label of sustainable development. Finding a balance between economic growth and environmental protection has proven to be very elusive and the pendulum has swung to yet another extreme, market fundamentalism, with a failure to appreciate that there are moral limits to markets.

Looking ahead, there is little doubt that conventional wisdom on governance will change again. We cannot survive without biodiversity, clean air, clean surface waters and groundwater, and healthy oceans. The laws of nature will eventually have to be re-elevated relative to the unnatural laws of economics. When and how this shift in conventional wisdom will take place, and its ultimate form are of course purely speculative. But, it is definitely not too early to begin the dialogue.

One extreme view, which is not yet shared by most analysts, is offered by authors like Naomi Klein, who suggest the need to "think big, go deep, and move the ideological pole far away from the stifling market fundamentalism that has become the greatest enemy to planet earth." She foresees a global, grass roots movement, a form of "blockadia" that will bring about "a deeper form of democracy, one that provides communities with real control over those resources that are most critical to collective survival – the health of the water, air, and soil".[16]

Still others, typically those in the environmental community, believe that the political calculus can be changed by reining in consumer-citizenship, imploring people to put the planet's well-being above the insatiable demand for consumer goods. But, as Susan Delacourt points out in her recent book "Shopping for Votes", this message will be a hard sell with "marketers, political and otherwise, who encourage people to think like consumers twenty-four hours a day, seven days a week".[17]

These are both useful contributions. For the purpose of this paper, I will assume that neither of these objectives will be met in the short run. The shift in conventional wisdom away from market primacy and towards a more constructive relationship with the natural environment will not

happen without a groundswell of popular support, support that does not yet exist. Instead, I will argue that it will take place more gradually as governments and industry lose the "social license" to continue along their current path. The outcome of this is unlikely to be an abrupt dismantling of the market economy, but rather a gradual shift to a healthier form of environmental democracy.

What is social license?

What makes a decline in social license an intriguing candidate for driving change is the fact that it is already happening, and that the trend may be accelerating.

Social license refers to community acceptance of a project or activity. It exists outside formal regulatory processes. Social license can be acquired through timely and effective communication, meaningful dialogue, and ethical and responsible behaviour. Most of the literature on this topic is from a business perspective. Proponents argue that corporations can increase long-term profits by operating from a perspective of corporate social responsibility.

But this paper explores social license from the opposite perspective. If social license can be acquired through effective and timely communication, meaningful dialogue, and ethical and responsible behaviour, does it not stand to reason that social licence can be diminished through poor communication, a lack of meaningful dialogue, or irresponsible behaviour – by either the regulating agencies and/or corporate interests?

If Joe Sax and Mary Wood's contention that "agency capture" is common − and if this is becoming increasingly apparent to citizens − governments and corporations may indeed be experiencing diminished social license in some situations. If so, one would expect this to lead to a form of environment-economy "stalemate", in which development is hamstrung by a lack of trust in government, and a lack of meaningful public participation in decision-making. It would be an overstatement to suggest that is the norm at this point in time. But, it would appear to be the case with at least some of the examples described in the next section.

4. DECLINING SOCIAL LICENSE

Perhaps the most obvious cases of loss of social license are those relating to proposals for massive energy projects and pipelines. This has occurred despite the best efforts of government and industry to earn social license for these developments. For example, diminishing social license is clearly contributing to the virtual stalemate in the Gateway Pipeline situation in British Columbia. But, there are many less well-known groundwater examples.

Groundwater quantity: the Nestlé example

In 2012, the Swiss food giant Nestlé applied to renew its licence for a well near Hillsburgh in Wellington County that served its water bottling plant. The Province of Ontario gave the company a new five-year licence, but added new conditions that meant the company would have to reduce its water taking during droughts. Nestlé appealed the conditions. Early in 2013, in what might be described as a classic case of "agency capture", Nestlé announced it had persuaded the Ministry of the Environment to remove the restrictions.

But the public fought back. Wellington Water Watchers, Ecojustice and the Council of Canadians intervened before the Environmental Review Tribunal of Ontario in support of the water restrictions, using public interest and public trust arguments. In August of 2013, the Tribunal ruled that the settlement agreement between Nestlé and the Province was not in the public interest.

Nestlé had a right to appeal the Tribunal decision, but in September 2013 it abandoned that right and announced it would accept the restrictions.[18]

Groundwater quality: the Alliston aquifer example

The Alliston Aquifer between Ontario's Lake Simcoe and Georgian Bay feeds numerous artesian wells in the area. An open aquifer replenished by precipitation, it contains some of the purest groundwater in the country. It is also highly vulnerable to contaminants that may be transported down from the surface.

In 2009, Ontario regulators issued a long-pending approval to build a landfill over the aquifer in Tiny Township. That aroused fierce local opposition. Bright blue-and white placards appeared in windows and were affixed to trees, fence posts and tractors, rallying passersby to "protect our water".[19]

For a decade and a half, developers had been planning the landfill. But as opposition grew and caught the attention of the national media, the social license to build the landfill withered away.

Under intense pressure, the local Simcoe Council suspended the construction permit in September 2009. Eight months later, the Province belatedly withdrew its approval.

Groundwater quantity and quality: The example of fracking in New Brunswick

Over 60% of New Brunswick residents get their drinking water from private wells. In 2008, energy companies began explorations for shale gas in the province, and shortly after some wells were brought into production. As noted in Appendix A to this paper, there are significant public concerns about potential impacts from shale gas production on both groundwater quality and quantity, and the data and science that might allay those fears are mostly non-existent. Therefore, it is hardly surprising that a powerful anti-fracking movement grew in the Province.

The key to uniting the anti-fracking movement was the ability to unite three peoples – Anglophone, Francophone and First Nations. By October of 2013, tensions between First Nations and allied groups on one side, and the fracking company and the RCMP on the other side led to a serious confrontation when the RCMP decided to break up a 17-day blockade of seismic testing equipment near the town of Rexton. That turned a local anti-fracking protest into a national story.[20]

The following year, the conflict became a major election issue. The Conservatives supported fracking, which forced the Liberals into calling for a moratorium. In the election the Liberals won a majority and a Green Party MLA was elected for the first time. On December 18, 2014 the incoming government announced a moratorium on fracking for shale gas. Declining social license had clearly played a role, and yet another environment-economy stalemate was the result. Social unrest has led to similar but somewhat less complete bans in both Quebec and Nova Scotia.

Legal challenges: An energy example

While this individual case may not, strictly speaking, be a typical social license example, it is nevertheless symptomatic of a broader decline in deference to authority as energy developments increasingly clash with the perceived rights of individuals and communities to protect the health of their groundwater and their environment more generally.

In 2007, Jessica Ernst, a private citizen near Rosebud, Alberta brought an action against EnCana Corporation for damage to her water well and the Rosebud aquifer allegedly caused by construction, drilling hydraulic fracturing and other activities in the area. She also brought actions against the Alberta government and its Energy Regulator for failing to protect her water

supply and breaching her Charter rights.[21] On the latter point she alleged that the Energy Resources Conservation Board (now replaced by the Alberta Energy Regulator) refused to accept further communications from her through the usual channels for public communication until she agreed to raise her concerns only with the Board and not publicly through the media or through communications with other citizens.

In 2013, the Alberta Court of Queen's Bench struck the Energy Resources Conservation Board from the case, ruling that it couldn't be sued or charged with breaching Canada's Charter of Rights because of an immunity clause in the *Energy Resources Conservation Act*.[22] Subsequently the Alberta government asked the court to strike it from the lawsuit, arguing that it doesn't have a private duty of care to individuals and is immune from prosecution under its environmental laws. In November 2014, Chief Justice Neil Wittmann of the Alberta Court of Queen's Bench dismissed the government's application, writing that there was a reasonable prospect that Ernst's claims would succeed and ordering the government to pay Ernst's costs at triple the regular rate.[23]

The author's understanding of the current situation at the time of writing is that Ms. Ernst has won the right to sue the Alberta Government, and is now appealing the Alberta Court of Appeal decision that excused the Alberta Energy Regulator from the proceedings on the grounds of immunity. At the time of writing, the Supreme Court of Canada had just agreed to hear the case.

The special case of First Nations

Since the beginning of the environmental era in the mid-1960s, there has been increased recognition of First Nations rights with respect to resource development. In 1984, the Supreme Court of Canada found that the federal Crown had breached a fiduciary duty when it acted on behalf of the Musqueam First Nation in 1958 to lease 170 hectares of prime Vancouver real estate belonging to the Musqueam for use as a golf course, without fully explaining the terms of the lease to the band.

More recent Supreme Court judgements have affirmed the significant leverage that Aboriginal peoples have on the environmental regulatory process. The Haida and Taku river cases in 2004 both arose in the context of forestry, mining and environmental assessment regulations. In their decisions, the Supreme Court ruled that the government has a duty to consult and accommodate Aboriginal interests before Aboriginal rights and title were finally determined.[24]

In an even more sweeping declaration in June of 2014, the Supreme Court granted declaration of aboriginal title to large swaths of unceded frontier territory in British Columbia to the Tsilhquot'in First Nation. It also confirmed that governments may not infringe on that title – for example, by allowing resource development – unless they can prove a "compelling and

substantive" public need, and that they are fulfilling the Crown's fiduciary duty to the First Nation in question.[25]

There are some significant uncertainties and contradictions contained within these Supreme Court decisions, and they clearly do not give Aboriginals a veto on resource development in their traditional territories. But they, along with experiences like the New Brunswick fracking controversy, do suggest that governments and industry will have to work much harder to gain social license from Aboriginals and all other Canadians to avoid an environment-economy stalemate that will benefit nobody.

In such a scenario, future generations would lose the natural security which comes with the sustainable yield of good quality water from our freshwater aquifers. Current generations, including our Aboriginal populations, would experience unnecessary conflict, and significant damage to their health and wealth prospects. And even good development proposals would be delayed or completely stymied.

5. TOWARDS CONSTRUCTIVE CHANGE

Breaking the logjam

Social license refers to the extent to which governments and private interest are constrained to meet societal expectations and avoid activities that societies (or at least influential elements within them) deem acceptable, whether or not those expectations are embodied in law. As we have seen in the New Brunswick fracking example, when societal expectations are not met, citizens will not grant "social license" for activities to take place, in this case leading to unnecessary violence, and eventually to a sort of stalemate, or logjam, in the form of a moratorium.

These kinds of situations can only be expected to multiply over time as Canada tries to meet more and more of the world's energy and food demands, and as groundwater is increasingly stressed by urbanization, population growth, intensification of agriculture and energy production, and climate change. Fracking – and other activities that threaten groundwater through overuse or contamination − may be both viable and safe in some locations and under some circumstances, and governments and industry may eventually gain social license to proceed in those cases. But that social license will have to be earned – it cannot be imposed.

We can reduce the threats to our groundwater and preserve related ecosystem services, and we can do so in ways that will increase our medium to long-term prosperity. But that will only happen if citizens, governments and industry enter into a more constructive partnership – a partnership based on a healthier form of environmental democracy.

Enriching environmental democracy

In a recent speech, Canada's Minister of Finance lamented that social license is being used to block resource projects, and proclaimed that "[The Government] won't go ahead with any project which isn't safe for Canadians and safe for the environment." The Minister went on to say that "…when we come to the conclusion that it is [safe], and the project is in the national interest, I think it's time to move ahead."[26] I suggest that this is wishful thinking, and a throwback to the 1970s when governments made decisions to impose projects such as landfills and dams on communities and then spent decades defending their decisions and trying to move projects forward.

The key to breaking the emerging economy-environment logjam will almost surely involve some healthier form of environmental democracy. It is clear that the alternative – deregulation, reducing oversight, withholding or manipulating information, and attempting to impose unpopular decisions – is not working.

The three components of environmental democracy are access to information, public participation in decision-making and access to justice. Access to justice refers to the ability of an individual or group of individuals to seek a remedy for a violation of an environmental right. The concept of "environmental rights" is central to the 1998 U.N. Aarhus Convention which declared that "Every person has the right to live in an environment adequate to his or her health and well-being, and the duty, both individually and in association with others, to protect and improve the environment for the benefit of present and future generations."[27] This apparently simple assertion is profound in its implications.

Citizens participate in environmental management in the political arena, through the public policy process, through their individual and collective marketplace decisions, and through their own actions. In doing so, they can only make informed choices if they are equipped with the necessary skills and information, provided with meaningful opportunities for participation and allowed access to justice.

Certain natural resources – especially air, oceans and freshwater, including groundwater – are central to our very existence. There can be no more important role for government than sustaining the essence of those resources for the long-term use and enjoyment of society. This does not mean that groundwater and other water resources cannot be exploited in a market economy. Governments can and should recognize and convey private proprietary interests in respect of common resources, but only provided that the public interest is not substantially impaired. Citizens must have appropriate access to justice to ensure those environmental rights are respected.

The topics of groundwater monitoring, information and science are discussed in the companion paper by David McLaughlin.[28] The remainder of this paper will focus on the broad topic of access to justice.

6. ACCESS TO JUSTICE

Water and environmental rights

In 2012, after years of lobbying by numerous social justice advocacy organizations, Canada formally recognized the human right to water and sanitation. This is certainly not insignificant, but there is little in the record of declaring "human rights" to support the expectation that merely extending them to water will accomplish much. To make the human right to water more than symbolic, it would have to be followed up by a concrete plan of action.[29] There is no indication that is likely to happen in Canada in the foreseeable future.

Another option to enhance access to justice in Canada could be to adopt and ratify the Aarhus Treaty, which has already been ratified by more than forty nations, mostly in Europe. The 1998 Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention) requires member states to implement routine and credible environmental reporting to their citizens, and an acknowledgement that every citizen has an interest in the environment that carries a presumed right to bring the state's performance of its stewardship before a court for review.[30]

It is not merely coincidental that in 2000, the European Union also adopted the European Water Framework, the world's most advanced regime for protection of water, aquatic ecosystems, and the terrestrial and groundwater features that connect them.

Yet another possibility for enhancing access to justice would be to enshrine the right to a healthy environment in our constitution. In that regard, Canadian environmental lawyer David Boyd examined the constitutions of 193 countries, and the laws and court decisions of more than 100 nations. He found that a constitutionally enshrined right to a healthy environment has been incorporated in law and is being enforced in many European, Latin American, Asian and African nations.[31] Boyd also concluded that nations with constitutional environmental protection "have stronger environmental laws, enhanced enforcement, greater governmental accountability, and better access to justice, information, and public participation in decision making than nations without such provisions. As a result, they also have smaller ecological footprints, rank higher on comprehensive indices of environmental performance, and have reduced pollution faster."

All of these notions are clearly worth pursuing, but none are on the immediate horizon in Canada. The Aarhus Convention was designed primarily for unitary as opposed to federated states, and significant constitutional change in Canada is unlikely in the foreseeable future. Another option which could be pursued by individual jurisdictions would be something akin to public trust law.

The public trust

The Western legal tradition permits and even encourages exploitation of natural resources, including groundwater, on the theory that natural resources can be essentially privatized, altered, destroyed, used and sold at the whim of the owner. When combined with the globalization of the economy, exponentially increasing resource demands and powerful new technologies, we have a recipe for the destruction of the very resources − air, oceans, and freshwater, including groundwater − that are critical to our survival. This notion must (and undoubtedly will eventually) be moderated to recognise the fiduciary duty of governments to sustain the essence of those resources for the use and enjoyment of the entire populace, now and into the future. This is the essence of the so-called "public trust doctrine".

Joseph Sax, in an important early article, put forth three ideas supporting the doctrine: first, "that certain interests are so intrinsically important to every citizen that their free availability tends to mark society as one of citizens rather than serfs", second, "that certain interests are so particularly the gift of nature's bounty that they ought to be reserved for the whole of the populace", and finally "that certain uses have a peculiarly public nature that makes their adaptation to private use inappropriate." The key elements of the public trust doctrine are preserving public access to important resources, and conserving those resources for the use of the public, now and into the future.[32]

Public trust law normally includes two common features: the duty to provide the public with enough timely information to judge whether the Crown is meeting its trust obligations, and a presumption of "right of standing" before the courts to litigate any failure of the Crown to meet those obligations. In the U.S., public trust law has gradually evolved from its initial emphasis on ensuring public access to water to an emphasis on resource conservation, and in some instances even to recognition of the intrinsic value of preservation.

For example, using the public trust doctrine, in 1983 the California Supreme Court concluded that diversions from Mono Lake violated the public trust, and ordered that they be reduced. In New Jersey, where power pants were killing fish, a court confirmed in 1975 that the state possessed a "right and fiduciary duty to seek damages for the destruction of wildlife which are part of the public trust."[33]

Although most of the literature on this topic is American, public trust concepts are now widely applied around the world. For example, the Indian Supreme Court declared in a 2010 Court decision that "The concept of people as a nation does not include just the living; it includes those who are unborn and waiting to be instantiated. Conservation of resources, especially scarce ones, is both a matter of efficient use to alleviate the suffering of the living and also of ensuring that such use does not lead to diminishment of the prospects of their use by future generations."[34]

In an often-quoted Philippines Supreme Court ruling, the Court characterised the clean-up of Manila Bay as "an issue of transcendental importance with intergenerational implications." The

Court went on to sharply criticize government agencies for their "cavalier attitude" towards environmental pollution, before positioning the clean-up of the Bay under its own continuing jurisdiction.[35]

Public trust and groundwater

In the United States, it has been found that the real power of the public trust doctrine lies not in the laws themselves, but in the creativity of the courts and those arguing cases before them. For example, in a case in Michigan (*Michigan Citizens for Water Conservation v. Nestlé Waters North America Inc.),* a very compelling argument was made that, under certain circumstances, the public trust should apply equally to surface and groundwater because "there is no logical difference between diverting tributary groundwater or stream water if the effect is the same."[36] In that case, the withdrawal of groundwater was reduced through an out-of-court settlement.

In New Hampshire, groundwater has been declared a public trust since 1998. In Hawaii, a coalition of concerned groups asserted public trust rights to water previously diverted to serve large sugar plantations. The Court judgement declared a public trust over all surface and groundwater in the state. The lawyers representing the coalition suggested that "The trust has given (the coalition) a cause with a powerful message: they are fighting not for 'their' water, but for water belonging to all, including generations unborn."[37]

A petition is currently before the Supreme Court of California which may decide whether the public trust doctrine will apply to groundwater in that state. A lower Court concluded last fall that the doctrine does apply to groundwater and since the State has a public trust duty to regulate groundwater, the County as a subdivision of the State has the same public trust duty. The Court concluded that the County, in issuing permits for new wells, is required to consider whether the new wells will affect public trust uses in surface waters.[38]

Public trust challenges in Canada

Despite its widespread acceptance in other countries, public trust law is notable in Canada mainly by its absence. There are a number of reasons for this. The Canadian economy is highly dependent on resource extractive industries and the public and their governments seem prepared to sacrifice some measure of ecological integrity for economic gain. However, the sacrifice of some measure of ecological integrity for economic gain is not necessarily inconsistent with the public trust as it has evolved south of the border. In the U.S., governments may "recognize and convey" proprietary interests in respect of common property, but only providing that the public interest is not "substantially impaired". Interestingly, in Canada, we have been prepared to

include phrases like "substantially unaltered" in legally-binding First Nations Land Claims Agreements.

Another fear in Canada has been that giving citizens "the right of standing" to litigate the failure of the Crown to meet its fiduciary duties might unleash a wave of nuisance lawsuits. That has not tended to be the case where public trust laws or something akin to them are in place. The courts are, by definition arenas for judgement and discretion. In more than a decade and a half since Michigan adopted very strong public trust provisions, the State has not been immobilized by frivolous suits.[39]

Canadian courts have been much less inclined than their American counterparts to assert fiduciary duties on governments. This is partially due to the fact that Canadian judges are unelected.[40] But, since adoption of the *Canadian Charter of Rights and Freedoms* in 1982*,* that is gradually changing. For example, the Courts now recognize the fiduciary duties of physicians and other professionals to their clients, and fiduciary duties owed by the federal government to Aboriginal peoples.

Another possible explanation for Canada's reluctance to embrace public trust principles can be found in the nature and scope of respective public property rights in the two countries. In the United States, since the 1892 *Illinois Central Railway v. Illinois* case, U.S. Courts have always held that the states hold title to the lands under navigable waters "in trust for the people of the State". By contrast, in Canada, it is important to recognize the role of the Crown as owners of all public lands.[41]

In analyzing the distinction between Canadian and U.S. situations, legal scholar John Maguire concluded that "the public trust doctrine is most likely not a classical trust nor should it be viewed as such." Nevertheless, he contended that the Crown-public relationship does raise a fiduciary duty on the part of the Crown to protect the public interest that could be equally effective in protecting and managing public resources and assist in achieving sustainable development. He went on to suggest that something akin to the public trust doctrine seems ideally suited to breathe life into Canada's stated commitments with respect to international environmental law.[42]

7. A MODEST PROPOSAL

We are already half way there

Fiduciary duty lies at the heart of legitimate democratic government. If democratic government does not exist to serve the public good, what is it for? Sovereign rule can be used for the benefit of a few or for the benefit of all. Public trust law or its equivalents, as it has developed in many democratic countries starts from the assumption that governments have a duty to preserve and protect the value of our water resources for the benefit of all, now and into the future. With groundwater, the "into the future" phrase takes on special meaning because if groundwater is not protected today, it will remain impaired for future generations of users, often for centuries.

Carrying this logic one step further, an approach founded on fiduciary duty would have certain characteristics as follows:

- It must apply at least to those resources that are essential to our long-term survival – air, oceans and freshwater, including groundwater.
- Property rights must explicitly recognize "common property rights" over and in relation to those resources.
- There must be a presumption against private ownership of such resources.
- The Crown must continuously assure the public's ability to use and enjoy such resources.
- The Crown can recognize and convey private proprietary interests in respect to these resources, provided that the public interest is not "substantially" impaired.
- The public must have a right to be informed about the state of these resources and to be involved in decisions that may impair their present or future uses.
- The public must have a right to hold the Crown legally responsible for meeting its fiduciary duties in these regards.

At a conceptual level, most Canadians would no doubt agree with most if not all of these propositions. In fact, at that conceptual level, most of these ideas are already reflected in federal and/or provincial legislation.[43] For example:

- Over a century ago, when we negotiated the *Boundary Waters Treaty* and enacted consequent domestic legislation, we gave domestic water use a higher priority than commercial uses.
- In 1987, the Brundtland Commission defined sustainable development as "ensuring it meets the needs of the present without compromising the needs of future generations to meet their needs". In recent decades, we have embedded the phrase "sustainable development" in numerous federal and provincial laws.

- In Canada, "ownership" of water in lakes, streams or in the ground is not allowed. Canadian water law recognizes water as a public resource, but allows the establishment of private proprietary rights to the use of water.
- Even where "riparian rights" link water to land ownership, the common good is theoretically prioritized by assuring that uses by adjacent land owners are not substantially impaired.
- The federal government has signed several land claims agreements with Aboriginal governments guaranteeing waters "substantially unaltered in quality, quantity and rate of flow."
- In 1993, Ontario enacted an *Environmental Bill of Rights* which acknowledges that Ontarians "have a right to a healthy environment" and to "the means that it is ensured."[44]

Our political leaders regularly speak in these terms, and have been quite prepared to include them in the preamble of laws. This gets us about half way to where we need to be. But to ensure the groundwater and other resources critical to our survival continue to meet the needs of future generations, we will have to go the other half of the way and begin operationalizing those concepts.

Operationalizing access to environmental justice

With respect to the environment, Canadian courts and legislatures have been very reluctant to impose fiduciary duties on the Crown. Former Supreme Court Justice Binnie, in a year 2004 opinion[45] seemed open to the notion, but noted that moving in the direction of public trust law would pose several novel policy questions, including:

1. The Crown's potential liability for inactivity in the face of threats to the environment;
2. The existence or non-existence of enforceable fiduciary duties owed to the public by the Crown in that regard;
3. The limits to the role and functions and remedies available to governments to take action on activity harmful to public enjoyment of public resources; and
4. The spectre of imposing on private interests an indeterminate liability for an indeterminate amount of money for ecological or environmental damage.

These are indeed daunting challenges. Nevertheless, they have not prevented most other industrialized nations from moving much further along this path than our legislators and courts have been prepared to do. In the United States, a wide variety of public trust laws have grown up, primarily through court judgements. For example, the following provisions have been on the state of Michigan's law books since 1995:[46]

(1) The Attorney General or any other person may maintain an action in the circuit court having jurisdiction where the alleged violation occurred or is likely to occur for

declaratory or equitable relief against any person for the protection of the air, water, and other natural resources and the public trust in these resources from pollution, impairment or, or destruction

(2) In granting relief provided by subsection (1), if there is a standard for pollution or for an antipollution device or procedure, fixed by rule or otherwise, by the state or an instrumentality, agency, or political subdivision of the state, the court may:
   a) Determine the validity, applicability and reasonableness of the standard.
   b) If the court finds the standard to be deficient, direct the adoption of a standard approved and specified by the court.

These are significant powers which have been applied in generally constructive ways. The courts are, by definition, arenas for judgement and discretion. As noted in section 6 of this paper, in two decades since Michigan adopted this legislation, the courts have not been immobilized by frivolous suits based on the presumed right of standing of citizens in public trust cases.

In Canada, there have been a few modest attempts to introduce similar legal instruments. For example, prior to devolution, both the Yukon and the Northwest Territories had passed environmental legislation based on public trust principles.[47] While both statutes vested legal rights in members of the public, neither was binding on the Crown. That could have only been accomplished by the federal government, which was at the time the only embodiment of the Crown in the Territories.

There have also been attempts by academics and others to get provinces to consider public trust-like principles when writing new laws. For example, academics in British Columbia recommended addition of the concept during preparation of the B.C.'s *Water Sustainability Act*. More recently, the author and a U.S. colleague made a submission to the Government of Ontario, suggesting specific wording for their emerging *Great Lakes Protection Act*.[48] The specific wording suggested was that the *Act* should contain:

1. A general recognition of the interconnected or single hydrological relationship of the waters of the Ontario portion of the Great Lakes Basin with other portions of the Basin waters, including tributary groundwater and surface waters.
2. A general recognition that these waters are held by the Crown in common and in public trust as recognized by decisions of the courts in Ontario and the Supreme Court of Canada.
3. A recognition that, along with First Nation interests, each citizen has a right as a member of the public to use and enjoy the waters and the bed of the Great Lakes and connecting and tributary navigable waters for boating, swimming, navigation and other water dependent public needs.
4. A provision that such public right to use and enjoy these waters shall not be subordinated to primary private purposes or otherwise materially interfered with or impaired.

5. A provision that any initiatives, decisions and instruments made or proposed under this Act shall conform to these public rights in navigable waters.

At the end of the next section, a specific recommendation is offered for moving this dialogue forward in an academic context.

8. CONCLUSIONS AND RECOMMENDATIONS

Canada has not yet encountered groundwater overuse and abuse on the same scale as many other counties. But that could change in the not-too-distant future as we address opportunities and challenges to provide an ever-increasing proportion of the world's food and energy supplies and the use of new technologies like shale gas fracking expands. In 2009, the Council of Canadian Academy's Expert Panel on Groundwater concluded that "actions to remedy contamination and prevent further degradation remain inadequate for sustainable groundwater management".[49]

International research suggests that "agency capture" has become the norm in regulated industries. Government agencies frequently fall captive to the industry they regulate, and this often takes place behind a veil of legitimization provided by environmental law. As agency capture becomes increasingly apparent to citizens, governments and corporations are losing "social license" in many cases, especially in circumstances related to pipelines, shale gas fracking and other large scale energy and resource extraction and transportation projects. First Nations rights are also being exerted more and more aggressively in frontier territories. This combination of factors threatens to lead Canada into a sort of environment-economy "stalemate" that will benefit nobody.

The key to breaking the emerging environment-economy logjam will almost surely involve some healthier form of environmental democracy, including improved access to information, fuller public participation in decision-making, and access to justice (the ability of an individual or group of individuals to seek a remedy for a violation of an environmental right). Most other industrialized nations have legislated access to environmental justice. This access sometimes takes the form of constitutionally enshrined rights, or rights enshrined in Treaties, or something akin to public trust law. Canada certainly falls well short of international best practices.

Even the Romans and the Greeks before them understood that certain natural resources – air, freshwater, the oceans and living things dependent on those resources – are central to our very existence. As Joseph Sax and others have pointed out, these are fundamental rights that can and

often are abused in the short run, but which cannot be extinguished. The good news is that Canada is in the very fortunate position of being able to proactively adopt policies and management practices to prevent or at least moderate the kinds of impacts on groundwater resources that have been experienced all too often in many other countries around the world.

It is recommended that the Program on Water Issues at the University of Toronto, or another interested institution, convene a small group of groundwater, water policy and legal specialists to explore prospects for ensuring that governments comply with their obligations regarding groundwater management, as reflected in approaches such as the public trust doctrine. It is recognized that any lessons learned with respect to groundwater may also prove useful in other areas of resource and environmental management.

It is further recommended that, if deemed appropriate, the group develop model legal provisions for the consideration of provincial governments as they evolve their groundwater management regimes.

APPENDIX A

A BRIEF INTERNATIONAL ASSESSMENT

Like all natural resources, groundwater must be protected through effective regulation, policies and practices that are based on solid science. What is the worst that can happen if we ignore this imperative? That is clearly impossible to answer. But one can get an indication by examining a few international examples of extreme overuse and contamination of groundwater.

Aquifer depletion and global food security

Overpumping of groundwater can lead to dropping aquifer levels, saltwater intrusion, land subsidence and reduced groundwater discharge to streams and wetlands. Numerous countries are now overpumping groundwater aquifers as they struggle to satisfy expanding food and water needs, including major grain producers like China, India and the United States.[50]

In the North China Plain, which produces over half of the country's wheat and a third of its corn, overpumping has largely depleted the shallow aquifer, forcing well-drillers to turn to the region's deep fossil aquifer, which is also rapidly depleting, and which is not replenishable. The World Bank has estimated that once the North Plains Aquifer is depleted, the grain harvest in the Hai Basin alone will drop by 40 million tons, which is more than Canada's total wheat harvest, and enough to feed 120 million Chinese. The Bank foresees "catastrophic consequences for future generations unless water use and supply can quickly be brought back into balance."

In India, it has been estimated that water tables are declining at over 20 million wells right across the nation. In North Gujarat, the water table is falling by 6 meters per year. In Tamil Nadu, a state with over 62 million people, 95% of the wells owned by small farmers have dried up, reducing the irrigated area by half. According to the head of the International Water Management Institute in Gujarat: "When the balloon bursts, untold anarchy will be the lot of rural India."[51]

In the United States, the situation is somewhat less dire, simply because irrigated land accounts for only about 20% of the U.S. grain harvest, compared with 60% in India and 80% in China. Nevertheless, the underground water table has dropped by over 30 meters in the Ogallala Aquifer under Texas, Oklahoma and Kansas, the three leading grain-producing states. As a result, wells have gone dry on thousands of farms in the southern Great Plains. In California, in 2014, against a dramatic backdrop of severe drought and huge cutbacks in surface water availability, the State for the first time enacted a law to comprehensively regulate groundwater extraction.

Even though total water use has levelled off in the U.S., groundwater use has continued to grow since 2000. It has been estimated that since 1900, American aquifers have lost the equivalent of two Lake Eries.[52] This situation will almost surely be exacerbated by climate change. The U.S. southwest and Central Pains regions are likely to be scorched by a decades-long "mega drought" in the second half of this century if climate change continues unabated, scientists from NASA and Cornell and Columbia Universities have warned.[53]

Many more specific groundwater quantity-related tragedies in the U.S. have been documented in Robert Glennon's 2002 book, *Water Follies*. A few examples include:

- Tucson's growth has dried up the Santa Cruz River;
- population growth in San Antonio and Sacramento has placed endangered species in jeopardy;
- Metropolitan Atlanta's water consumption threatens the way of life in Apalachicola, Florida;
- suburban development outside Boston supports a lifestyle of sprawling homes and lawns that sometimes dries up the Ipswich River; and
- in Florida, pumping by Tampa Bay Water has damaged houses and turned lakes into dry weed beds.[54]

Some will argue, correctly, that these international tragedies are being moderated by innovation. For example, North China's water shortages are at least partly being alleviated by massive diversions from the better-watered South China. India's overall food production is not yet declining due to other improvements in the agricultural sector. And since 2006 in Orange County, California, the worst impacts of salt water intrusion caused by aquifer depletion are being ameliorated by replenishing the aquifer with large quantities of desalinated water.[55] But these are all very expensive "fixes" and are very likely only temporary solutions.

Around the globe at least 15 countries with a total population of over 3 billion people are already significantly depleting the groundwater resources that are critical to their river systems, drinking water supplies and food production. As this is happening in all these countries simultaneously, over the long term this will create extremely challenging and perhaps unmanageable food scarcities. Some may see this as an opportunity for a food-exporting nation like Canada. But, even under the most optimistic scenarios, we will be able to contribute very little to the solutions, while at the same time witnessing extreme stresses and pressures on our own water resources.

Aquifer degradation and human health risks

We need to be concerned about not just the quantity of groundwater, but also its quality. In situ, groundwater in shallow aquifers is "clean", having percolated through soils and rock formations. But this groundwater can be contaminated through industrial, agricultural, mining, energy

development and municipal activities. Groundwater contamination is extremely difficult, and sometimes impossible to clean up. In some circumstances the residence time may be as long as 10,000 years, meaning most groundwater pollution is essentially permanent.

Groundwater overuse and abuse tend to go hand in hand. It should not be surprising that the countries with the most serious groundwater depletion problems are also those experiencing the worst groundwater contamination issues.

About 18% of China's water use comes from groundwater, and more than 400 cities in that country have no other source of drinking water. Much of the groundwater, especially on the over-committed North China Plain is contaminated by fertilizers, pesticide residues, waste water from irrigation, as well as pollutants from the mining and petrochemical industries. A 2012 report by the land ministry suggested that 41% of groundwater sites had poor water quality, and 17% had extremely poor quality with levels of iron, manganese, fluoride, nitrites, nitrates, ammonium and heavy metals exceeding safe drinking water limits.[56]

In India, a combination of groundwater depletion and pollution is leading to a silent, nationwide health crisis as aquifers are becoming unfit for drinking.[57] Nearly 80% of India's rural drinking water comes from underground sources, and even in a major city like Delhi, only about 65% of citizens are served by the municipal water system. The water resources ministry has reported that:

- groundwater pockets in 158 out of 639 districts have gone saline;
- pockets in 269 districts contain excess fluoride;
- pockets in 385 districts have nitrate levels beyond permissible levels;
- there are high lead levels in 270 districts; and
- in 63 districts, heavy metals like chromium and cadmium which pose a danger at any concentration are prevalent.

In parts of countries like China, India and others with very dense populations, certain health problems related to contaminated groundwater have become much more prevalent. These include: fluorosis, which damages teeth and bones where fluoride concentrations are high; reduced IQ levels in children and higher cancer rates in adults where chromium levels exceed standards; and so-called "blue baby disease" leading to respiratory and digestive problems in infants in the presence of high nitrate concentrations.

As lessons for Canada, the most instructive international examples, likely lie in the United States. Government reports in the United States, like those in Canada tend to downplay the health risks associated with groundwater contamination. But, a recent report by the Worldwatch Institute points to some troubling trends and statistics, many of which we will see repeated when we examine the situation in Canada in the next section of this Appendix, "Storm Clouds on the Canadian Horizon".[58]

In the United States, nitrate concentrations in groundwater have increased dramatically as fertilizer inputs have grown, and now exceed safe levels in about 15% of shallow wells below agricultural and urban areas. There are now over 100,000 sites in the United States in which the groundwater is contaminated with chlorinated solvents. About 60% of the nation's liquid hazardous wastes are directly injected into the ground. Although these effluents are injected below the deepest sources of drinking water, in parts of Florida, Texas, Ohio and Oklahoma some of these wastes are entering aquifers used for drinking water.

Other serious concerns for groundwater in the U.S. relate to:

- salt water intrusion as a result of depleted freshwater aquifers in coastal areas;
- many potentially carcinogenic pesticides, several of which do not even have drinking water standards, finding their way into aquifers in agricultural regions; and
- the extreme drawdown of some aquifers in the Great Lakes Region causing radium and other contaminant levels to rise above safe levels.

The great new imponderable: Shale gas fracking

A relatively new stress on groundwater resources is the rapid, recent and widespread use of hydraulic fracturing (fracking) to release oil and natural gas from shale deposits. Shale gas is natural gas that is tightly locked within low permeability sedimentary rock. Fracking involves injecting tonnes of sand, water and chemicals at high pressure to shatter the rock and release oil and natural gas contained within it. The extraction of shale gas can pose certain environmental risks including substantial water use, degradation of the quality of groundwater and surface water, and the risk of increased greenhouse gas emissions to the atmosphere.

Extensive shale gas deposits are found in North America, Australia, India, China, Argentina, South Africa and Europe. According to the International Energy Agency, recoverable shale gas reserves in the lower 48 U.S. states amount to 482 trillion cubic feet (Tcf), and worldwide, reserves amount to 250 years of supply at current rates of production.[59] The apparent economic potential is clearly enormous. However, the net economic benefit, factoring in the external environmental costs cannot be estimated at this time.

Because of the huge number of wells involved in fracking (tens of thousands across North America in recent decades), the environmental risks may be substantial. But we simply do not know how large or how small those risks are. With respect to groundwater, despite published claims that there are no verified impacts, a Canadian expert panel concluded in 2014 that despite a lack of rigorous scientific study, "There is reason to believe that shale gas development poses a risk to water resources" and that "the most important questions concerning groundwater contamination from shale gas development are not whether groundwater impacts have or will

occur, but where and when they will occur; if they will occur to an acceptable extent; and how long they will last."[60]

With shale gas fracking, we are in reality conducting a massive experiment in real time, with very little supporting data or science. Fracking in the United States has surged over the past two decades, with parts of western Canada moving ahead in lock step, but about a decade behind. This rapid proliferation of fracking has led to clashes between industry and government who wish to move as quickly as possible, and environmentalists and landowners who caution a "go slow" approach.

In light of the high potential risks of shale gas fracking, and the lack of scientific data and understanding, many jurisdictions around the world, with the notable exception of some U.S. states and some western Canadian provinces, are proceeding with extreme caution. For example, in 2011, the Government of France banned hydraulic fracturing for shale gas. There are effective moratoria in place in other European countries, and in Quebec, New Brunswick, Nova Scotia, as well as in some U.S. states pending further assessments and the allaying of public fears

STORM CLOUDS ON THE CANADIAN HORIZON

As noted earlier, nearly 30 percent of Canada's population depends on groundwater to supply its drinking water, and more than 80 percent of our rural population relies on groundwater for its entire water supply. Agriculture is by far the largest water consumer in Canada, and irrigation accounts for about 85 percent of that use, although there are no accurate estimates of the proportion of that use that comes from groundwater.

Canada has not yet entered the "big leagues" of groundwater overusers and abusers. But, we are overusers and abusers in many local situations and more broadly with respect to some issues. If, as is likely, we attempt to meet an ever-increasing proportion of the world's food and energy demands, and if our groundwater management regimes are not significantly upgraded, we will inevitably enter those "big leagues" within a few short decades, and as a result, our own natural security will be jeopardized accordingly

Many of the "storm clouds" on the Canadian horizon were documented in a comprehensive 2009 report entitled "The Sustainable Management of Groundwater in Canada".[61]

Troubling trends in groundwater quantity

Canada is not yet experiencing aquifer depletion to the same extent as more densely populated countries like China, India and the United States. But we do have localized aquifer depletion.

For example, about 75 percent of water users in the Regional Municipality of Waterloo depend on groundwater, and the region is experiencing water shortages in the dry summer months due to seasonal water level declines in wells. Similarly, in the Township of Langley, British Columbia, aquifer levels have been declining for over 40 years due to overuse. Such aquifer depletion is a result of increasing urbanization and population growth.

More serious groundwater quantity problems are expected to arise for different reasons. One may be an increasing global demand for Canadian-grown food as groundwater-based irrigation around the globe begins to falter. A second reason is climate change. It is virtually certain that reduced availability of surface water supplies due to climate change will result in a growing reliance on groundwater in some regions. One of those regions is the arid southern Prairies, where water supplies are already over-allocated.

Water demand is only one half of the supply-demand balance. The other half is aquifer recharge. Extensive artificial drainage of wetlands in the central and eastern Prairies has resulted in a dramatic reduction in wetland and pond coverage. Because many of these wetlands are the primary groundwater recharge zones for the Prairies, long-term negative effects on aquifers are inevitable.

Troubling trends in groundwater quality

One would naturally expect that, with our much smaller population, the Canadian situation with respect to contamination of groundwater would be much less dire that that of our southern neighbours. And it may be to some extent, but not nearly to the extent that Canadians have been led to believe. The reason for this is that Canada's regulatory regimes related to pollution in general are much less stringently applied than those in the United States. For example, Canadian industries emit about the same amount of toxic chemicals into the environment as their U.S. counterparts, despite the fact that we have only about a tenth of their population and an economy a tenth as large as the U.S.[62]

Groundwater quality issues tend to be similar in the two countries, in nature if not in magnitude. For example, in rural areas in Canada contamination originates from manure storage and application, septic systems, accidental spills and pesticide application. It has been estimated that 20 to 40 percent of all rural wells have nitrate concentrations or coliform bacteria occurrences in excess of drinking water guidelines.[63]

We saw earlier that the U.S. has over 100,000 sites in which the groundwater is contaminated with chlorinated solvents. Canadian estimates suggest there are over 30,000 such sites in this country.[64] Because of the relatively low solubility of many of these chemicals, pollutants can persist for very long periods of time, and relatively small discharges of pollutants can make very large volumes of water unfit for drinking. Although the incidence of new releases to

groundwater is declining, there continue to be some. Combined with the thousands of legacy sites, this will continue to be a significant issue for decades to come.

One issue that is particularly troubling in Canada is contamination from hundreds of abandoned mine sites. One of the most egregious examples is the former Giant Mine on the outskirts of Yellowknife in the Northwest Territories. Before the mine was abandoned by its previous owners, 270,000 tonnes of highly toxic arsenic trioxide had been stored in underground chambers. Taxpayers are now faced with having to pay enormous amounts to refrigerate those water-soluble poisons into perpetuity.[65]

There are several other groundwater contaminant issues which are not yet significant, but which are looming on the horizon with unknown magnitudes and impacts. One is the growing array of health-threatening, endocrine-disrupting chemicals that may enter groundwater through recharge from surface waters, artificial recharge or septic systems. Another is carbon capture and storage, which could result in the gradual migration of carbon dioxide into shallow aquifers. Yet another is the underground disposal of radioactive wastes.

And one cannot discuss any environmental issue in Canada these days without at least a brief mention of oil sands development. Without dwelling on the detail, suffice it to say that the CCA's Expert Panel on Groundwater concluded in studying the Athabasca oil sands that "in light of the sustainability criteria advanced in this report, the cost and success of a protracted regulatory regime are uncertain at best, and sustainable groundwater management is unachievable to date."[66]

Back to the great new imponderable: Shale gas fracking

Earlier we briefly visited the shale gas fracking issue from an international perspective. To date in Canada, shale gas production has been concentrated in Northern British Columbia and to a lesser extent in Alberta. Viable shale gas reserves are also known to exist in Quebec, New Brunswick and Nova Scotia, and are likely to be identified in other regions. Shale gas has been called a "game changer" because it is abundant, often close to major markets, and relatively inexpensive to produce. Its economic viability is generally accepted without question. But until all external costs, including environmental costs, can be quantified, this assumption needs to be treated with at least some scepticism.

The most authoritative Canadian scientific evaluation to date on this topic was conducted by the Expert Panel on Harnessing Science and Technology to Understand the Environmental Impacts of Shale Gas Extraction.[67] Three main messages come through loud and clear from the Panel's 2014 evaluation:

- "...impacts on water raise the greatest environmental concern [with respect to] shale gas development";
- "The greatest threat to groundwater is gas leakage from wells"; and
- "In most instances, shale gas development has proceeded without the collection of sufficient environmental baseline data".

The Expert Panel pointed out that mitigation measures with respect to cumulative impacts on land, fugitive GHG emissions and groundwater contamination are problematic at this time, because available mitigation technologies are untested and may not be sufficient. It also concluded that scientific understanding is incomplete and the design of an adequate regulatory framework is hampered by limited information. Despite the best efforts of governments and the industry to sooth public fears, there remains considerable scepticism about shale gas fracking, leading to high levels of conflict.

APPENDIX B

A BRIEF HISTORY OF GROUNDWATER MANAGEMENT REGIMES

Water and environmental management regimes, including those for groundwater cannot be understood in isolation from broader considerations of societal conventional wisdom. In this section, we look at how conventional wisdom about governance in general and groundwater management regimes in particular have evolved in parallel.

The water development period (pre 1965)

Prior to about 1965, there was a broad societal consensus in North America on the desirability of turning water resources into income and employment opportunities. Rivers were dammed to provide power, first for mills and later to produce electricity. Consumptive use of water grew exponentially as massive irrigation projects were initiated in both countries. The two countries were well on their way to fully allocating several main water sources, including the Colorado and South Saskatchewan Rivers. In the U.S., large-scale "mining" of groundwater under the Ogallala Aquifer under seven Great Plains states began, and continues to this day.[68]

Although regulators began allocating surface waters in the latter part of this period, for groundwater, the Rule of Absolute Capture (or the "law of the biggest pump") tended to dominate. In a landmark case in 1904, the Texas Supreme Court ruled that a landowner was not entitled to damages from a railway whose drilling of wells for steam locomotives had caused his well to go dry.

In both Canada and the U.S. early groundwater law was almost entirely permissive because little was known about the origin and movement of groundwater, and there was a belief that any attempt to apportion groundwater would discourage development. The characterization of groundwater as mysterious and unknowable, and the separate development of the law of groundwater and the law of surface water continued well into the second half of the twentieth century.[69]

The environmental era (1965 to 1990)

By the 1960s, the societal consensus on water had shifted. Citizens began to realize that completely unbridled development of water had negative repercussions on the environment, and

also on other water users. In 1970, Canada's First Ministers received advice from their Council of Resource Ministers to unify environmental responsibilities under single ministries. Shortly thereafter, environmental agencies were created at the federal level and in all provinces, backed up by a substantial suite of new environmental and water laws.

During the environmental era, most provinces put in place groundwater permitting systems to regulate large withdrawals. The two exceptions are Ontario, which had a permitting system in place in the early 1950s, and British Columbia, which only established its first groundwater permitting system in 2014. Water use licenses usually specify the purpose of withdrawal, and the rate, quantity, duration and time of use. Domestic private use is normally exempt from licensing, as are other uses below a specified threshold. Wells on private land are generally not regulated after they are commissioned. Small septic systems are regulated at the time of installation but are generally subject to only limited monitoring afterwards.[70]

During the environmental era, groundwater quality was theoretically protected through drinking water protection laws and environmental assessment processes at both federal and provincial levels, as well as through approvals for activities such as well-drilling, geothermal and energy development, and contaminated site remediation. Laws developed in this time period to regulate the management of chemicals generally did not distinguish between impacts on surface and groundwater. The chemical management laws passed in Canada and the United States tended to be relatively weak compared with those in Europe. And as for groundwater protection, according to the CCA's Expert Panel on Groundwater, "...actions to remedy contamination and prevent further degradation remain inadequate for sustainable groundwater management."

The age of market triumphalism (1990 to today)

As the period after about 1990 began, optimism was running high around the concept of sustainable development, which was anchored in 1987 report of the Bruntland Commission (the World Commission on Environment and Development).[71] As defined by the Commission, "sustainable development" was "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". However, sustainable development theory was quickly overtaken by a more powerful governance theory based on the primacy of markets.

Environmental progress began to slow in the mid-1990s when the Ronald Reagan and Margaret Thatcher proclaimed that markets, not governments held the key to prosperity and freedom. The same philosophy continued to hold sway through the 1990s with the market-friendly liberalism of Bill Clinton and Tony Blair.[72] And of course Canada followed suit, and continues to do so to this day.

Since the early 1990s, the underlying conventional wisdom driving western-style governance is the assumption that relatively unfettered markets, the encouragement of international trade and investment, and the promotion of democratic systems will lead to a virtuous cycle of wealth generation, social advancement and eventual ecological protection.

The latter part of that prediction is clearly breaking down, and if it continues to break down, the remaining components of the virtual cycle will inevitably break down as well, turning the virtuous cycle into a vicious cycle. The assumption about eventual ecological protection is breaking down because of a failure to recognize that there are moral limits to markets.[73] A few indicators of this breakdown include:

- a loss of stability of weather patterns as they respond to warming caused by human-produced carbon emissions that exceed the capacity of oceans and the biosphere to assimilate them;

- the addition of toxic, persistent, bioaccumulative, and endocrine disrupting chemicals to the global environment at a much faster rate than nature can break them down; and

- more specifically with respect to this paper, the overuse and abuse of groundwater aquifers that are critical to global food security and ecological integrity.

All three of these manifestations of global ecological decline will have enormous, mostly negative consequences for our future wealth, health and natural security.

Throughout this age of market triumphalism, groundwater laws have continued to evolve, usually as a reaction to a crisis or as a minimal response to a new situation or circumstance. For example, Ontario and some other provinces introduced source water protection initiatives in response to the 2000 Walkerton (Ontario) and 2001 North Battleford (Saskatchewan) drinking water tragedies. Ontario and Quebec have added water conservation conditions to their water use permitting processes to meet their obligations under a state-provincial agreement for the Great Lakes – St. Lawrence Basin. British Columbia, Alberta and New Brunswick have put in place some minimal requirements related to shale gas fracking, for example with respect to well integrity and setback requirements.

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