RESILIENT SYSTEMS

RESILIENT COMMUNITIES

INTERSECTIONS OF SUSTAINABILITY

Jordan B. Kinder and
Makere Stewart-Harawira

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Contents

Introduction

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Resilient Systems, Resilient Communities emerges from a transdisciplinary research network focused on water governance, climate change, and the futures of communities. The aim of the research network is to bring a whole-system approach to developing critical, solutions-driven research in partnership with government agencies, academic partners, civic organizations, policy makers, industry actors and non-government organizations. This collection of essays from some members of the network extends these aims by providing a compendium of work that engages resilience thinking, a concept that continues to play a central role in academic and policy-making circles.

Against the background of anthropogenic change, rapidly rising global temperatures and extremes of crisis across multiple spheres, the real possibility of synchronous inter-systemic failure at a level involving multiple cascading system failures (Homer-Dixon et.al. 2015) demands urgent responses. From this perspective, the need for an integrated, whole-system approach to understanding and fostering radical social and ecological transformation has never been starker. The impact of rapid and irreversible biospheric changes calls for an urgent re-thinking of the role of resilience in understanding the ability of both human and non-human communities to adapt to a vastly different environment with enormous social and economic as well as

biological implications. In this context, resilience thinking and resilience theory have become major tools for understanding social and ecological change across multiple disciplinary fields.

This small contribution attempts to clarify the usefulness of resilience as a framework for understanding and supporting the adaptability of social and ecological systems by centring recent work by scholars in the Intersections of Sustainability research network within current resilience thinking and theory. After noting some key critiques of resilience theory approaches, this brief introduction begins with some conceptualizations of resilience in the environmental literature, follows with a note of some applications of social or community resilience and concludes with the major tool as well as challenge to establishing social and ecosystem resilience, that of management and governance.

Since the mid-1990s in particular, a growing body of resilience scholarship has examined transformation toward improving ecosystems and sustainability globally (Olsson, Galaz and Boonstra, 2014). However, as Welsh (2013) notes, theoretical frameworks that promise a means of capturing the complexity of an interconnected world of "complexity and contingency, of risk, relationality, flows and mutability" are seductive. Resilience thinking and theory has thus become the subject of important critiques regarding its applicability and efficacy. Some of these criticisms are concerned with the analytical ability of resilience thinking to study sustainability transformations, particularly shifts in social systems (*cf.* Pelling and Manuel-Nararrete, 2011, as cited in Olsson et.al.). Another important and in our view, well-supported criticism of resilience approaches is the underplaying of the role of power.

Defining Resilience

The history of resilience thinking is generally traced in two key disciplinary areas; one focusing on the ability of ecosystems to absorb, adapt to or recover from shock—whether environmen-

tal, geophysical or technological in origin, and the other in the psycho-social literature with a focus on trauma in individuals and/or communities. Emerging in the psychological literature in the 1960s and the environment literature in the 1970s, resilience thinking has become a ubiquitous concept that permeates law, governance, biological sciences, geography, public health, social sciences, finance, planning and policy. In the sustainability literature, resilience is frequently promoted as "a boundary concept by which social and natural dimensions of sustainability can be integrated" (Berkes and Ross, 2003; 2013). Despite challenges to the idea of resilience as a unifying concept able to bridge social and natural sciences, recent resilience thinking places considerable emphasis on the interrelationship between social and environmental dimensions of sustainability. Here we turn again to Folke, who suggests that "[r]esilience thinking emphasizes that social-ecological systems, from the individual, to community, to society as a whole, are embedded in the biosphere. The biosphere connection is an essential observation if sustainability is to be taken seriously" (2016, p.1). This is not to preclude pluralist thinking, which is well emphasized in recent resilience scholarship. It does, however, align with land and place-based ontological positionings, including those found in Indigenous scholarship. More particularly, it calls attention to the urgency of reconnection, of healing what is referred to in Marxist criticism as the 'metabolic rift' between humans and their environment (Foster, 1999).

Ecological Resilience and Sustainability

An early and influential thinker in resilience theory and environmental change is Hollings, whose work focused on understanding ecological systems, stability and equilibrium. A primary feature of his work has been to clarify the distinction between ecological and engineering resilience (Cretney, 2014) and to challenge the notion of static equilibrium as the ideal

state, a concept primary to mathematics and physics-centered empirical ecology approaches. In contrast to the engineering concept of resilience that focuses on the ability to bounce back to a steady-state point of equilibrium (Hollings, 1973; 1996), Hollings' major contribution was his re-envisioning of ecosystems as having a zone of stability that allows for the reorganisation of a system to continually exist and function even in the face of disturbance and change. Following Hollings, resilience becomes broadly defined in both sustainable ecosystems and governance literature, as "the capacity of a complex system to remain within a regime in the face of external perturbations and/or internal change" (Hollings, 1973, as paraphrased in Garmestani & Benson, 2013). Walker clarifies this, "Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker et.al., as cited in Berkes & Ross, 2013). From this standpoint, adaptability and understanding adaptive cycles is critical to achieving and maintaining ecosystem resilience.

Drawing on work by Gunderson and Holling (2002), Garmestani and Benson (2013) explain that an adaptive cycle "describes the processes of development and decay in a system, and captures the dynamic character of structures and processes in complex systems." In place of hierarchies of cycles of development and decay are nested sets of adaptive cycles, or panarchy. Panarchy differs from hierarchy in that conditions can arise that trigger "bottom-up," i.e., cross-scale cascading, change in the system (Garmestani & Hollings, 2002; Garmestani, Adam & Gunderson, 2009). Adaptive cycles operate over specific ranges of scale and are interconnected to other adaptive cycles in the panarchy. This allows for understanding that a system's resilience is dependent upon the interactions between structure and dynamics at multiple scales (Garmestani & Benson, 2013).

A significant body of resilience literature focuses on the distinctions between adaptability, transformability and resilience. A useful and concise distinction offered by Walter et al. (2004) applies resilience to the management of social structures as well as ecosystems:

> Resilience and adaptability have to do with the dynamics of a particular system, or a closely related set of systems. Adaptability is defined as the capacity of actors in a system to influence or manage resilience while transformability is defined as the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable.

Adaptability: Managing and Governing for Resilience

Adaptive management and adaptive governance have been described as vehicles for putting resilience theory into practice (Gunderson & Holling, 2002). Because the stability landscape is constantly changing, the 'adaptive' part of both governance and management is required in all phases of the adaptive cycle.

Adaptive governance as a concept has been widely theorized in resilience approaches to understand and manage change in SES, including catchments and irrigation systems (Walker et al. 2004; Folke et al. 2005; Olsson et al. 2006; Smit and Wandel 2006; Pahl-Wostl 2007a, b, 2009) and its importance to policy relevance examined (Nelson et al., 2008; Nettle & Paine 2009, Daniell, 2013). "Defined broadly as governance approaches that are collaborative, flexible, and learning-based and rely on networks of people and organizations at multiple levels" (Resilience Alliance, 2010), the goal of adaptive governance is to manage change in complex SES so as to maintain the resilience (or enable transformation) of communities, their places, and institutions (Lebel et al, 2006). Adaptive governance thus goes beyond formal legal frameworks and institutions.

A key component of adaptive governance is polycentric systems. These are complex adaptive systems without a central authority controlling the processes and structures of the systems (Anderson & Ostrom, 2008). Polycentric systems are characterized by multiple governance units at multiple scales, with each unit having some capacity to govern at its scale (Ostrom, 2010). This allows for local knowledge of ecological and social conditions to shape governance (Janssen et al., 2007; Ostrom, 2010). Given that adaptive governance of social-ecological resilience also requires capacity to deal with the broader environment and preparation for uncertainty and surprise (*cf.* Folke et.al.180), allowing for local SES knowledge to shape governance is critical. Adaptive governance is thus dependent upon adaptive management and incorporates formal institutions, informal groups/networks, digital content/connectivity, and individuals at multiple scales for purposes of collaborative environmental management (Folke, 2005). It requires collaboration and cooperation across different levels of government, as well as nongovernmental and individual action (Cosens et al., 2017; Huitema et.al, 2009).

As an "environmental management strategy that attempts to reduce the inherent uncertainty in ecosystems" (Green & Garmestani, 2012), a central tenet of adaptive management is that "management involves a continual learning process that cannot conveniently be separated into functions like 'research' and ongoing 'regulatory activities,' and probably never converges to a state of blissful equilibrium involving full knowledge and optimum productivity" (Walters 1986; Walters & C. Holling, 1990). Green and Garmestani describe adaptive management as operating in an iterative manner rather than providing discrete conclusions based on science, acknowledging that our understanding of natural systems is constantly evolving. This aligns with Walters (1986, pp. 8-9) who declared a central tenet of adaptive management to be

that "management involves a continual learning process that cannot conveniently be separated into functions like 'research' and ongoing 'regulatory activities,' and probably never converges to a state of blissful equilibrium involving full knowledge and optimum productivity."

While adaptive management has been widely promoted as a necessary basis for sustainable development, its ability to effect change is frequently hampered by existing governance structures have not allowed it to function effectively. Increasingly, scholars describe an outstanding need to operationalize (Bahadur et al., 2010; Wardekker, 2010; Rickards & Howden, 2012; Davidson, 2013) or enact (Wagenaar & Wilkinson, 2015) resilience approaches to design and implement practical interventions for improving SES governance (Miller, 2010; Ison, 2011; Davidson, 2013; Sinclair 2014). Emphasizing the need for law reform in order to adequately account for socio-ecological dynamics, Garmestani and Benson (2013) compare management and adaptive governance in legal systems as a framework for resilience-based governance of social ecological systems.

Resilience Law and Reflexive Governance

Resilience law "addresses the nature in which substantive law imposes specific societal values and substantive social aims through enforceable frameworks" (Capps & Olssen 2002, cited in Olssen et. al., 2015). As a concept, resilience law arises from the systems theory of Niklas Luhmann and discourse theory of Jürgen Habermas (Olssen et.al., 2015). Important work in the area of environmental governance draws on both resilience science[1] and reflexive law, the premise being that resilience science can be integrated into environmental governance with concepts from reflexive law. Cosens et.al (2017)

1 Panarchy, adaptive management, and adaptive governance, etc. (Cosens 2017).

use reflexive law as a framework for examining the ability of law to achieve water governance that is capable of facilitating management, adaptation, and transformation in the face of climate change, i.e., "law that is itself adaptive". They explain,

> Law dictates the structure, boundaries, rules, and processes within which governmental action takes place, and in doing so becomes one of the focal points for analysis of barriers to adaptation as the effects of climate change are felt. Adaptive governance must therefore contemplate a level of flexibility and evolution in governmental action beyond that currently found in the heavily administrative governments of many democracies.

Their interdisciplinary project which assessed the resilience of six North American water basins included three crucial questions for the role of law[2]: What is the role of law in: (1) creating either a disturbance or window of opportunity in which adaptive processes may emerge, (2) eliminating barriers and facilitating adaptive processes, and (3) ensuring legitimacy in more adaptive governmental process? From this project they drew recommendations for resilience-based governance. In their concluding statements, they emphasize,

> ...if adaptation is necessary for society to navigate the changes and transitions that will accompany climate change, and law dictates the structure, capacity, and process through which government acts, then analysis of the role of law in adaptive governance when faced with environmental conflict and the implementation of any necessary reform becomes imperative.

2 Those assessments are available in the first Natural Resources and Environmental Law Edition of the Idaho Law Review 51(1), http://www.uidaho.edu/law/law-review/articles; Gunderson et al. 2017).

Yet critical questions remain about the efficacy of resilience theory as a theory of change. Young (2017) highlights the difficulties that accrue when systems reach tipping points, particularly when complex and human-dominated systems reach bifurcation rather than oscillation. Arguing that even in crisis, critical needs for learning and adjustment or adaptation can remain unfulfilled, Young references the European political system on the eve of World War I in 1914 and the global economy on the eve of the Great Depression (p.10). Given that neither learning nor adaptation occurred in these critical instances, he sees no basis for assuming, as Dryzek (2014) proposes, that learning and adaptation in time to prevent catastrophe will occur.

It could be argued that the current pervasive political malaise regarding the urgency of transitioning from fossil fuel-based systems and of immediately reducing carbon and methane emissions supports Young's claim. At the end of the day, as Davidson (2013, p. 21) remarks, "The question remains, however, whether our scholarly efforts to conceptualize these system dynamics and offer useful guidance for social organizations are as effective as they could be." If resilience theory and thinking are to fulfill their promise as effective agents for promoting and enabling change, then much remains yet to be done.

Resilience Thinking and Communities

Despite the difficulties of unifying discrete disciplinary areas, many scholars in the environmental sciences see considerable potential in the application of resilience theory and resilience thinking in addressing social as well as environmental transitions, particularly in political and practical discourses of grassroots societal change (Folke et. al., 2005). In support of the idea of resilience as a unifying concept, Berkes and Ross (2003; 2013) describe community-level resilience as overlap-

ping and complementing the two key strands of resilience literature, thus providing opportunities of mutual enrichment. Hence they see it as important to develop an integrated concept of community resilience. As examples, they offer two definitions, one by Magis (2010, p. 401), where community resilience is the "existence, development and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability and surprise." Another is from the Canadian Centre for Community Renewal (2000, p. 1–5), which defines a resilient community as "one that takes intentional action to enhance the personal and collective capacity of its citizens and institutions to respond to and influence the course of social and economic change." Panarchy plays an important role in more recent analyses of community-based resilience by Berke and Ross (2016), who used the concept to explore the connections of the community to other levels by drawing attention to cross-scale relationships. One example of community-level resilience research is the Arctic Resilience Case studies (Arctic Council, 2016). In their findings, loss of resilience (LoR) is identified as those cases in which there has been a loss of livelihoods, identity, function and structure. Conversely, cases in which people have acted to purposefully modify the system's identity, function and structure to better suit their needs exhibit transformation (T).

Yet research into community-level resilience research can be deeply problematic, particularly when driven by neoliberal agendas. An example is the Arctic Resilience Assessment studies, a two-year study of the impact on large and rapid changes occurring in the Artic, the findings of which were published in the Arctic Resilience Report (Arctic Council 2016). Here resilience is predicated on and characterized by adaptability. Groups that are seen to have acted purposefully by modifying the system's identity, function, and structure

to better suit their needs, exhibit transformation. Conversely, cases in which there has been a loss of livelihoods, identity, function and structure have failed at resilience. In a salutary warning about confronting the claims of Indigenous resilience and its disciplinary role in creating neoliberal subjects, Reid (2017) points out that there is no accounting here for power, no accounting for the colonial relations of exploitation that are a hallmark of neoliberal governance.

Conceptually connected to community resilience is disaster literature, the origins of which is generally ascribed to Timmerman (as cited by Klein in Mayunga, 2007), who defined the term resilience as the measure of a system's or part of the system's capacity to absorb and recover from hazardous event. Again, definitions of resilience in the hazard and disaster literature are diverse, with McEntire et al. (2002) arguing that a major limitation to reaching a common definition is the fact that "individuals, groups, and communities may each possess different degrees of resilience which vary significantly over time. Hence, finding consensus or common ground on the definition of resilience concept is difficult" (as cited in Mayunga, 2007). Seeking a more comprehensive approach, Mayunga draws on capital, identifying the five major forms of capital; *Social, Economic, Physical, Human*, and Natural. Here the notion of capital aligned with the concept of sustainability is necessary for development of a sustainable community economy and therefore linked to the concept of disaster resilience.

Relevant research examines resilience in Indigenous communities in relation to traumatic events such as forest fires and earthquakes. Lambert (2012; 2015) examined the resilience of Māori communities in Aotearoa New Zealand when dealing with traumatic shock events, particularly major earthquake events. His findings underscore the particular vulnerability of Indigenous communities to loss of resilience due to economic marginalisation. As Davidson (2013, p. 22) argues

in her response to Berkes and Ross, "Dealing with resource scarcity and the ethical implications this imposes needs to be front and centre in any treatment of community resilience," who also highlights the absence of an accounting for power in resilience discourses.

Focusing more on transformability than resilience, Welsch (2013) points to community transition movements, e.g. to a low carbon economy, as an example of community resilience. In particular, he directs attention to the Transition Town movement, summarized in Hopkins (2008): *The transition handbook: from oil dependency to local resilience* as one well-known attempt to utilize resilience as an organizing principle and a basis for achieving 'regime shift'.[3] While many emphasize the importance of resilience in urban systems, others point out that resilience can affect cities in adverse ways. Puppim de Oliveira (2017) argues,

> Weak governance in cities in developing countries has detrimental outcomes, which are reinforced by the strong resilience of the urban system. Thus, breaking the resilience of urban systems in the first place is necessary to advance the agenda of sustainability avoiding the return to the initial (unsustainable) state.

Under-acknowledged and certainly under-theorised in the resilience literature are issues of power, a lack that resilience scholars are increasingly coming to recognize (*cf.* Olsson et al, 2014). Another is the positioning of the human-nature relationship. The recent emphasis on positioning the biosphere at the centre, which has come to signify resilience thinking in the 21st century, goes a long way to the reparation of the

3 For further references on the Transition Town movement and resilience, see Bristow (2010), Mason and Whitehead (2012), Bailey et al. (2010) and Wilson (2012), all of whom are drawn on by Welch.

"metabolic rift" between humans and their environment that Marx, following the Austrian chemist Leibniz, viewed as responsible for the ruptures within society (Foster, 1999). Other worldviews position humans as an integral part of nature. Here people are "deeply entangled in a multitude of relationships with all its elements and processes" (Raygorodetsky, 2017). This view of human-nature relationships sits at the heart of Indigenous concepts of resilience. In some Indigenous communities, the loss of resilience that accrues from the disruption of this relationship is mitigated by ceremonies that maintain their relationship within this web. Thus the role and function of ceremony and spirituality is strongly linked to resilience in Indigenous communities (Stewart-Harawira, 2015).

The Collection

Resilience thinking, the literature review above demonstrates, is a multi-faceted concept that, as a result, demands multi-disciplinary attention. The eight essays that comprise this collection provide a survey of contemporary work on socio-ecological resilience in Canada, representing a number of diverse fields, including business, law, and watershed science. The aim of this collection is, then, twofold. First, it aims to provide a snapshot of significant work on resilience in Canada. Second, it aims through this snapshot to foster the development of productive dissonances and resonances in each contribution's engagement with resilience. The collection is structured by pairing essays according to disciplinary focus—from watershed science, law, Indigenous studies, to business and philosophy. Such a structure moves from scientific approaches to resilience (Gan, 2018; Bryant and Davies, 2018) on the one hand, to social science-based approaches (Gehman et al., 2018; Welchman, 2018) on the other. In organizing the essays this way, *Resilient Systems, Resilient Communities* reveals

the important space that resilience as a concept occupies in inter-disciplinary discussions of our current socio-ecological moment—one marred by both intensifying inequality and uncertainty—and the possibilities for establishing a more socially and ecologically just future.

The first piece in the collection, Thian Yew Gan's updating of his 2000 article "Enhancing the Resiliency of Canadian Prairies Against Future droughts Under Possible Impact of Climate Warming," discusses drought in Alberta, Manitoba, and Saskatchewan in relation to climate change. Citing the Intergovernmental Panel on Climate Change (IPCC, 2007, 2013), Gan (2018) suggests that global warming will contribute to increasingly severe and frequent flood and droughts. Canada's Prairie Provinces, Gan demonstrates, will likely be affected most prominently in the agricultural sector, which is a major consumer of water in the region. Water management practices are a key site to focus on .when considering these impacts of droughts. Using resilience as a metric through which to develop and evaluate those practices proves useful. "Resiliency," Gan explains, "is the magnitude of disturbance that a system can handle before experiencing stress and moving into a different state or category" (p. 47). Following this, Gan asks if "current water management practices in the [Canadian Prairie Provinces] [can] be robust enough to cope with impacts of climate change on water, or can past hydrological experience provide a good guide to future conditions" (p. 47)? In turning to past experiences alongside current practices, Gan while providing recommendations to increase resiliency in the Canadian Prairie Provinces.

In "Living With Rivers," Seth P. Bryant and Evan G. R. Davies (2018) continue the focus on resilience and water management practices, providing an overview of a larger project of the same name. This project examines adaptation-resilience in relation to Southern Alberta's catastrophic flooding in 2013.

This flooding caused five deaths, resulted in over $5 billion in damages. "Living With Rivers" makes four major moves to provide a map of the flooding and its consequences. The paper begins with a discussion of the most comprehensive direct damage lower-bound estimate of the 2013 Flood to date. Then, Bryant and Davies (2018) discuss flood management on First Nation (FN) reserves and the experiences of FN communities impacted by the 2013 Flood—particularly the Stoney and Siksika Nations. Bryant and Davies (2018) then analyze public attention around the 2013 Flood more generally and, finally, relay the results from their survey of fifteen municipal flood managers, which they conducted in an effort "to understand the real on-the-ground challenges to flood risk reduction in Alberta" (p. 63). One alarming finding was that "the survey responses suggest that the policy course set post-2013 may not bring about any risk reduction for some communities" (p. 75). What these avenues that make up Bryant and Davies' piece offer us is insight into the complexities and tensions of the flood management landscape in Alberta while providing examples of Alberta's adaptation-resilience and its capacities for developing further resilience.

Prompted by the argument that "[t]he reality of climate change requires that our law of water allocation must allow for resilience in water use," David Percy's (2018) contribution "Climate Change and Water Allocation in Alberta" addresses issues with Alberta's water policies in light of the effects of climate change from a legal vantage-point. It focuses on three defects of these water policies initially highlighted by other scholars. These defects stem from those related to property rights that have been granted in perpetuity; to the inability to provide environmental protection due to the prior allocation principle; and, finally, to the non-existent distinction between surface and groundwater. In confronting these defects, Percy argues for amendments particularly to the prior allocation

principle. Using the Bow River Project (2013), which adds "the goal of protecting the health of the river throughout the basin" (p. 101) to existing water sharing agreements, Percy underscores the possibilities of strengthening Alberta's socio-ecological resilience in the context of water use through revising legislation.

In "Environmental Law, Socio-Ecological Resilience, and Climate Change," Cameron Jefferies (2018) examines how litigation can serve as a process for the strengthening of socio-ecological resilience. Extracted from a larger article of the same name, the selection revised and re-printed in this collection begins by asking if "the legal system, which is designed to foster stability and certainty for its subject," can "be utilized to respond, adapt, and/or promote resilience in view of unprecedented and uncertain change" (p. 110)? To answer this question, Jefferies "considers the limited role that litigation has played in influencing the trajectory of Canada's legal approach to climate change mitigation to date and considers the likelihood that it might occupy a more significant role moving forward" (p. 111). Like Percy, Jefferies sees in the legal apparatus a means through which to develop and implement policies that establish the groundwork for socio-ecological resilience in Canada and, indeed, elsewhere.

When considering resilience in the way that this collection does, it is important to note the intersections between both the social and ecological dynamics of resilience. Lewis Williams' (2018) "Empowerment and Social-ecological Resilience in the Anthropocene" examines the relationship between the public health sector and broader socio-ecological health through ecological determinants of health. Williams calls for an expanded understanding of human-ecological well-being that moves beyond 'upstream' determinants of this well-being embodied in concepts and practices of community action or 'empowerment', which, as Williams points out, are histor-

ically rooted in Western positivist epistemologies. Williams thus views the inability for public health to address environmental issues as endemic to this attachment to Western epistemologies. "Health promotion's impotency in tackling environmental issues", she writes, "undoubtedly in part lies in the epistemic rift between Western and Indigenous approaches" (p. 136) and one way Williams addresses this is by developing an alternative understanding of empowerment grounded in Indigenous and Participatory paradigms. Resilience also plays an important role here as Williams suggests that socio-ecological resilience can operate "as an organizing concept for working across diverse cultural collectives in addressing issues of human-environmental well-being" (p. 137). And in looking to Indigenous and Participatory paradigms, Williams finds at their core a framing "within a reciprocal participatory exchange which situates human rights and well-being within the earth's carrying capacity" that recognizes "the mutual flourishing of all life forms" (p. 148).

Makere Stewart-Harawira (2018) focuses on renewed global Indigenous environmental activism and resistance in her contribution, "Indigenous Resilience and Pedagogies of Resistance: Responding to the Crisis of our Age." Stewart-Harawira locates this renewed resistance in what has come to be known as the "triple crisis" of sustainability, that is, the interrelationship of financial, environmental and food security crises that define the contemporary moment. As she puts it, "the global and local space within which Indigenous rights to cultural heritage and their traditional relationships with land and territory are mediated and negotiated is directly connected to this 'triple crisis of sustainability' through being subsumed within a form of globalization best described as a new form of imperialism" (p. 161). States, Stewart-Harawira suggests, are perpetuate this form of neoliberal imperialism. Discussing the ratification of the UN Declaration on

the Rights of Indigenous Peoples in 2007, Stewart-Harawira (2018) points out that "of the 159 states represented at the General Assembly at the time of the vote, the only four states to vote against the adoption of the Declaration, i.e. Australia, Canada, the United States, and New Zealand, are former British colonies, each with sizable Indigenous peoples living within their nation-state borders" (p. 163). And while these four states eventually adopted the Declaration, its widespread adoption can be largely attributed to its non-binding status; such an episode proves instructive in highlighting the struggles faced by Indigenous peoples in the twenty-first century as colonial relations persist under novel guises. In this resurgence of Indigenous resistance, Stewart-Harawira sees a desire to restore "the relationship between human beings and the lifeworld, to a profound recognition of our deep interconnectedness across all species and a return to the recognition of the sacred in all things" (p. 176) and, indeed, we can see in this desire a path towards socio-ecological resilience.

Joel Gehman's contribution shifts the focus of the collection to the role of big-picture thinking in addressing the collective problems we are faced with today. "Robust Action Strategies for Tackling the World's Grand Challenges," co-authored with Fabrizio Ferraro and Dror Etzion (2018), propose three robust action strategies to address grand challenges. Grand challenges, they write, are major and unresolved problems, including poverty alleviation, climate change, or exploitative labour. Gehman et al. identify three overarching characteristics of grand challenges: first, they are complex; second, they are uncertain; and third, they are evaluative. To address these three facets, Gehman et al. use the concept of robust action as their critical foundation. "In robust action," they write, "leaders embrace ambiguity, rather than striving for clarity; focus on short-term accomplishments, rather than long-term goals; and are satisfied with oblique movement, rather than linear

progress" (p. 183). They argue that one strategy for achieving this is *participatory architecture*, or "a structure and rules of engagement that enable diverse and heterogeneous actors to interact constructively over prolonged timespans" (p. 187). Another robust action strategy is *multivocal inscription*, "defined as discursive and material activity that sustains different interpretations among various audiences with different evaluative criteria, in a manner that promotes coordination without requiring explicit consensus" (p. 189). Their final strategy is *distributed experimentation*, what Gehman et al. understand as "iterative action that generates small wins, promotes evolutionary learning and increases engagement, while allowing unsuccessful efforts to be abandoned" (p. 192) The notion of grand challenges resonate strongly with the concept of socio-ecological resilience, particularly in relation to global anthropogenic climate change. Gehman et al.'s contribution sensitizes us to the ways in which addressing such challenges will likely require disrupting business-as-usual.

Jennifer Welchman (2018) continues this big-picture thinking in "Can Environmental Ethics Embrace Socio-Ecological Resilience?" where she questions the ways in which environmental ethics engages socio-ecological resilience. Focusing on a number of key strands of philosophical ecological thought, including Biocentrism, Ecocentrism, Weak Anthropocentrism, and Environmental Pragmatism, Welchman examines how each of these tenets understand socio-ecological resilience. Environmental Pragmatism, for instance, "sees socio-ecological concepts of resilience that do not incorporate some strong preservationist commitments will be ethically problematic goals for social policy-making and planning on (weak) anthropocentric grounds" (p. 213). This argument is the result of Environmental Pragmatists' view that "the persistence of certain natural entities and environs are *irreplaceable*" (p. 213) in terms of providing humans with a constituent

component of human flourishing, that is, "self-comprehension" (here Welchman cites O'Neill, Holland & Light, 2008). Welchman complicates this preservationist understanding of socio-ecological resilience by arguing that nature and environs are not irreplaceable in this way and that these arguments conflate two narratives, the historical and the heritage. The historical reflects a past reality whereas the heritage need not be grounded in any historical or material past and as such do not serve to justify socio-ecological resilience. "Heritage narratives aren't embodied in things," Welchman writes, "but words," (p. 221) and the preservationist impulse in Environmental Pragmatist arguments such as those from O'Neill, Holland and Light. Socio-ecological resilience, in Welchman's view, remains a significant concept, and Environmental Pragmatist arguments are important in the ways that they move beyond the purely economistic instrumental views of nature, but socio-ecological resilience is ultimately hampered by strong preservationism.

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Enhancing the Resiliency of Canadian Prairies Against Future droughts Under Possible Impact of Climate Warming

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ABSTRACT

According to the Clausius–Clapeyron relationship, the water holding capacity of the atmosphere will increase with global warming, giving rise to increased evaporation, moisture, moist static energy, and storms are expected to be more intensive. Because increase in evaporation is constrained by the availability of surface moisture and energy budget, warming could also increase the frequency of dry days and exacerbate droughts. As the hydrologic cycle accelerates, occurrences of hydrologic extremes will increase, which can reduce the reliability of Canadian Prairies (CP)'s water resources. Past and present studies show that CP have become warmer and drier since the mid-Twentieth Century. However, long-term climate projections involve many uncertainties: climate, economy, population growth, social changes and water demand that complicate our effort to prepare against future droughts. With uncertainties on the potential impact of climatic change

and other uncertainties, several strategies are proposed to increase the resiliency of the Prairies against future droughts, where surface water is the primary water supply and agriculture is the major water user: (1) Continue implementing small-scale water resources projects and increase water storage through snow management, (2) increase integration between existing water resources systems, and (3) promote water conservation measures in agriculture practice, water pricing and water metering.

Introduction

For the three Prairie Provinces of Canada, Manitoba, Saskatchewan and Alberta, hydrologic extremes such as droughts probably has the most significant impact on the Prairies' water resources, which are very sensitive to climate variations because of their semi-arid climate (Gan, 2000). For example, Schaake (1990) found a higher runoff elasticity for drier climates, which means a higher percent change in runoff resulting from a 1% change in precipitation and temperature. However, the Marmot Creek Research Basin of the Prairies under intensive observation since 1962 has displayed remarkable resilience, or a low runoff elasticity to changing climate and extreme weather probably because it is located in the Canadian Rocky (Harder et al., 2015). Therefore, albeit arid and semi-arid regions could be more prone to potential climate impacts, the predictions of extreme droughts and/or floods induced by warmer conditions involve many uncertainties.

According to projections of global climate models (GCMs) of Inter-governmental Panel of Climate Change (IPCC, 2007, 2013), increasing greenhouse gas concentrations in the atmosphere could lead to a warmer climate in the future, and the frequency and severity of floods and droughts is expected to get worse in coming decades because of global warming impact. From the Clausius–Clapeyron relationship, the water holding

capacity of the atmosphere will increase by about 7%/oK rise in temperature, and warming will give rise to increased evaporation, moisture, moist static energy and storms are expected to be more intensive. As the Earth warms, higher temperatures likely mean that more precipitation will fall over shorter time intervals, thus increasing the frequency and severity of extreme storm events. Droughts can be caused by a persistence of high pressure over the drought area, changes in the track of extratropical cyclones during climate anomalies such as El Niño-Southern Oscillation (ENSO) or climate anomalies. Examples of severe heat and droughts that affected many regions across the world in the first decade of the 21st century are such as the 2004-2005 severe droughts in western USA that lead to record wild fire in 2006; the 2007-08 drought in south-eastern parts of South America was its worst drought since 1900; the 2005 drought of Greater Horn Africa seriously affected over 15 million people; the 2002 drought in central Russia had the lowest summer precipitation ever recorded; the 2006 and 2009 droughts of China damaged millions of hectares of crops; 2001-2010 had been the worst decade of drought in Australia, and the coast to coast drought of Canada in 2001/02.

Climate, Water Resources, and Agriculture of the Canadian Prairies

According to the Clausius–Clapeyron relationship, the water holding capacity of the atmosphere will increase with global warming, giving rise to increased evaporation, moisture, moist static energy, and storms are expected to be more intensive. Because increase in evaporation is constrained by the availability of surface moisture and energy budget, warming could also increase the frequency of dry days and exacerbate droughts. As the hydrologic cycle accelerates, occurrences of hydrologic extremes will increase, which can reduce the reliability of Canadian Prairies (CP)'s water resources. Past and present

studies show that CP have become warmer and drier since the mid-Twentieth Century. However, long-term climate projections involve many uncertainties: climate, economy, population growth, social changes and water demand that complicate our effort to prepare against future droughts. With uncertainties on the potential impact of climatic change and other uncertainties, several strategies are proposed to increase the resiliency of the Prairies against future droughts, where surface water is the primary water supply and agriculture is the major water user: (1) Continue implementing small-scale water resources projects and increase water storage through snow management, (2) increase integration between existing water resources systems, and (3) promote water conservation measures in agriculture practice, water pricing and water metering.

The Prairies consist of sun-drenched grain fields, undulated grasslands, countless small ponds and few low hills scattered across on the land surface and generally get less than 500 mm of precipitation because cyclonic precipitation rarely reaches these places from the west and east coasts, and partly because of the dry Arctic air blowing south. Pacific air streams that manage to reach the Prairies shielded by the Western Cordillera are relatively warm and humid compared to the Arctic air streams, bringing a considerable fraction of the water vapour and heat. Maximum precipitation usually occurs in late spring or in the summer when a thermal low is often present, e.g., the 'Alberta clippers'. Given about 30% of the Prairies' precipitation comes as snow, spring snowmelt plays a major role in its water supply. Of about 770 reservoirs in the Prairies, most reservoirs are filled in the spring, and supply irrigation demand during the summer.

Alberta is dominated by the north (122,800 km^2) and south Saskatchewan (146,000 km^2), Athabasca (155,000 km^2) and Peace River basins (293,000 km^2) while Saskatchewan and Manitoba are dominated by the Saskatchewan–Nelson

River Basin, which consists of the Saskatchewan River system (336,700 km^2), the Red and Assiniboine rivers system (290,808 km^2), and the Winnipeg River (139,565 km^2) (Figure 1). The annual runoff in the Prairies varies from virtually none to over 500 mm in the mountains, or an annual runoff precipitation ratio of almost zero to over 90%, exhibiting a wide range of spatial, hydrologic variability. The mean annual runoff is generally less than 150mm because of its semi-arid climate. In some southern basins, such as the Bow river basin, the demand for water often has exceeded the firm supply.

Given a large portion of the total annual water withdrawal in the Prairies goes to the agriculture sector, it is obvious that adapting the water resources of the Prairies to future droughts should be closely linked to its agriculture, which is the key sector with respect to current water consumption. On a whole, the water intake for Prairie agriculture represents about 75% of the nation's total for agriculture and almost 50% of the Prairies' total water intake.

Using the 50km resolution dataset from CANGRD (Canadian Grid Climate Data), Jiang et al. (2013) show that Alberta has become warmer (1–5°C) and somewhat drier for the past 112 years (1900–2011), especially in central and southern Alberta. Much of the warming occurred since 1970. In general, northern Alberta and areas along the Canadian Rocky show positive precipitation trends while central Alberta shows negative trends for all seasons. Mekis and Vincent (2011), however, found that from 1900 to 2009, a mixture of non-significant positive and negative trends are detected in the seasonal precipitation of CP. Peak water demand occurs in the summer (May–August) when irrigation and municipal use are the maximum. Total annual stream flows have generally declined in Canada during the 20th century, especially summer flows (up to 80%) albeit there is considerable regional and temporal variability. Multiple impoundments of streamflow by reser-

voirs have caused increased evaporation loss, which with a general decline in winter snowpacks and human water withdrawals have significantly contributed to declines in streamflow in the CP, especially in the South Saskatchewan River. Even the Athabasca River with no dam or large water withdrawals, its summer flows in lower reaches have declined by about 30% since 1970s, despite increased flows from glaciers caused by warming (Schindler & Donohue, 2006).

All major rivers in the CP originate in the Rocky Mountains. Deep snowpacks and melting glaciers contribute to the streamflow of these rivers in spring and summer. With declining snowpacks and significant glacier mass losses by about 25% or higher since the Twentieth Century (Watson & Luckman, 2004), these mountain water supplies are diminishing. All across the world, glaciers have receded rapidly in the 20th century with predominantly negative mass balance since the 1960s (Barry & Gan, 2011). The front of Athabasca glaciers are now over one km or more upslope of their previous positions in the early Twentieth century. In snow-dominated watersheds of CP, warmer temperatures had led to receding glaciers, reduced snow accumulation and early melt runoff, resulting in less water available in the summer.

With a rapidly growing population, agriculture that consumes enormous amount of water to support various irrigation projects and intensive livestock operations with millions of cattle and hogs relying on feeds grown in irrigated land, and Alberta`s oil-sands development in Fort McMurray that consume three to six barrels of water per barrel of oil produced, the CP is subjected to ever growing water stress problems (Schindler & Donohue, 2006). Over 75% of the water withdrawn for irrigation will not return to the water course but 'consumed' through soil infiltration and evaporation loss. There are a number of large irrigation districts in the Prairies, particularly in southern Alberta where about 2.5×10^9 m^3 of

water per year is used to irrigate about one million acres of land. The major irrigation districts in southern Alberta are the St. Mary River Irrigation District, the Lethbridge Northern Irrigation District (LNID), the Eastern and Western Irrigation districts, the Taber Irrigation District, the Canada Land Project; and in Saskatchewan we have the Riverhurst East Irrigation Project and the South Saskatchewan River Irrigation District #1. Some of these irrigation districts, such as LNID, have limited reservoir storage and depend largely on the day-to-day streamflow near Brocket.

Observed and Projected Climatic Changes in the Prairies and Canada

Gizaw and Gan (2015), using six extreme precipitation indices for the rainy period of May-August (MJJA), and 9-km resolution, Special Report on Emission Scenarios (SRES) A2 and A1B climate scenarios of four CMIP3 GCMs dynamically downscaled by a regional climate model, MM5 (Hanrahan et.al, 2014), found a projected increase in precipitation volume of very wet and extremely wet days in 2050s (2041-2070) and 2080s (2071-2100) over southern Alberta. This means that southern Alberta will be expected to experience more frequent and severe intensive storm events in the MJJA season that could potentially increase the risk of flooding in this region. By forcing MM5 set up in a one-way, three-domain nested framework with climate data of four GCMs for the baseline 1971–2000 and 2011–2100 based on the SRES Emissions Scenarios A2, A1B, and B1 of IPCC (2007), grid-based intensity-duration-frequency (IDF) curves were projected for central Alberta (Kuo et al., 2015), which show a wide range of increased intensities especially for storms of short durations (≤1-h). Conversely, future IDF curves of Alberta are expected to shift upward because of increased air temperature and precipitable water which are projected to be about 2.9 °C and 29

% in average by 2071–2100, respectively, implying that the impact of climate change could increase the future risk of flooding in central Alberta.

However, Gobena and Gan (2013), using the self-calibrating Palmer Drought Severity Index (sc-PDSI) with the potential evapo-transpiration parameterized by the Penman–Monteith method to study the summer moisture anomalies in western Canada, found a significant downward trend in the historical moisture availability in the CP since 1950s. From simulating the scPDSI of western Canada for the 2050s using the SRES climate change scenarios of IPCC (2007), the summer moisture deficit of CP relative to 1961–90 is projected to increase by 2050s. By forcing a land surface scheme called MISBA (Modified Interaction Soil Biosphere Atmosphere) of Kerkhoven and Gan (2006) with climate change scenarios of seven GCMs for central Alberta, Kerkhoven and Gan (2011a) shows that an increase in air temperature of 1fflC will result in approximately 8% decrease in the annual runoff of the Athabasca river basin (ARB) of Alberta. All GCMs and emission combinations predict large declines by the end of the 21st century with an average change in the annual runoff, mean maximum annual flow and mean minimum annual flow of ARB by –21%, –4.4%, and –41%, respectively.

As expected, the moisture of CP is teleconnected to large scale climate patterns (Jiang et al., 2015), e.g., droughts over western North America (NA) have been attributed to the decadal climate variability over the North Pacific Ocean and North America. Latif and Barnett (1994) attributed about 1/3 of the low frequency climate variability in North America to a cycle involving unstable air-sea interactions between the subtropical gyre circulation in the North Pacific and the Aleutian low-pressure system. By wavelet, scaling and multifractal analysis on historical data, Gan et al. (2007) shows that various climate anomalies such as ENSO and Pacific

Decadal Oscillation (PDO) had exerted a strong influence on the winter precipitation data of SW Canada, e.g., active El Niño (La Niña) leads to a lower (higher) mean winter precipitation of the CP, even though other climate anomalies also have their shares in forcing the precipitation over the CP. The detected teleconnections could occur at interannual (ENSO) or interdecadal (PDO) scales. From analyzing large-scale relationships between summer Palmer Drought Severity Index (PDSI) patterns in Canada and previous winter global sea surface temperature (SST) patterns using singular value decomposition analysis, Shabbar and Skinner (2004) showed that the interrelationship between ENSO and PDO play a significant role in the summer moisture availability in Canada. They also found that the warm ENSO (El Niño) events lead to a summer moisture deficit in the western two-thirds of Canada while the cold ENSO (La Niña) events produce abundant summer moisture in western Canada and in the southeastern portions of CP.

Islam and Gan (2015) assessed the future streamflow of the South Saskatchewan River Basin (SSRB) of Alberta under the combined impacts of climate change and ENSO. Using the 1961-1990 re-analysis data of the European Centre for Mid-range Weather Forecasts (ERA-40), potential impacts of climate change on the streamflows of 29 sub-basins of the SSRB for the 2020s, 2050s and 2080s were simulated by MISBA with the climate scenarios projected by four GCMs forced by three SRES emission Scenarios (A1FI, A21, B21) of IPCC (2007). Next, the combined effect of climate change and ENSO were simulated by driving MISBA with the re-sampled ERA-40 dataset for active El Niño and La Niña episodes adjusted for the climate projections of 2050s. Under the SRES climate projections alone, MISBA simulated an overall decrease in streamflow for sub-basins of SSRB in 2020s, 2050s, and 2080s. While under a combined impact

of climate change and ENSO, a further decrease (increase) in the streamflow of SSRB by 2050s was simulated if the climate anomaly considered was El Niño (La Niña).

Islam and Gan (2014) used the MISBA model, the Water Resources Management Model (WRMM) of Alberta Environment and the Irrigation District Model (IDM) of Alberta Agriculture Food and Rural Development to assess the future water resources management strategy of the SSRB of Alberta subjected to the potential impact of climate change in a multi-criteria decision support approach. With reference to the base data of SSRB of 1928-1995, the potential effects of climate change on SSRB for the 2020s, 2050s and 2080s are simulated by these models on the basis of changes projected by the SRES climate scenarios of IPCC (2007). Under these climate projections, MISBA simulated a significant decrease in the annual mean and maximum streamflows over selected nodes within SSRB, while the irrigation water demand projected by IDM is expected to increase progressively over the 21st century; and according to the simulations of WRMM to specific water sectors of SSRB, overall the senior non-district irrigation users will only be marginally affected in 2050s and 2080s. In contrast, junior and future non-district irrigation blocks are projected to be progressively affected by climate change. For non-irrigation consumptive uses, however, all senior, junior and future licenses could be significantly affected by climate change.

By assuming climate variability and climatic change follows the long-term Budyko framework, Tan and Gan (2015) assessed the hydrologic influence of human and climate change to observed changes in the mean annual streamflow (MAS) of 96 Canadian watersheds. To separate the influence of human and climate change, they used the elasticity of streamflow in relation to precipitation, potential evaporation and human impacts such as land cover change analytically derived from the Budyko Framework. They found that climate

change generally caused an increase in MAS, while human impacts generally a decrease in MAS. Higher proportions of human contribution, compared to that of climate change contribution, resulted in generally decreased streamflow of Canada observed in recent decades. Without contributions from retreating glaciers, human impact would have led to a more severe decrease in Canadian streamflow.

Even though we expect droughts to continue to occur in the CP, we do not know how severe and frequent will be future Prairie droughts, even though obvious warming trends have emerged, and hydrologic extremes are more likely to occur more frequently and in greater severity. Furthermore, there are different types of droughts. Meteorological drought refers to prolonged low precipitation, hydrological drought to prolonged low streamflow and groundwater levels, and agricultural drought to prolonged low soil moisture level. From the perspective of the hydrologic cycle, precipitation is the forerunner of the drought signal, while streamflow is the end result of drought.

Measures to Enhance Resiliency against Droughts in the Prairies

As expected, long-term climate projections involve many uncertainties (e.g., Kerkhoven and Gan, 2011b). Besides climatic uncertainties, there are many other uncertainties such as economy, population growth, social changes and water demand that complicate our effort to prepare against future droughts. Even though past studies have shown that existing water supply systems in water-scarce regions can be sensitive to climate change, climate is only one of many factors that affect our water supply and demand, and the function and operation of existing water infrastructure such as hydropower, structural flood defense, drainage and irrigation systems, and water management practices.

Gan (2000) listed factors contributing to uncertainties in water resources planning and management in the Prairies: (1) Changes over a lengthy horizon in water demand, social values, technological progress, resource depletion, economy, population growth, and their interactions that are far too complicated to forecast. (2) Optimal system operations derived from historical data are 'thrown' off by changing hydroclimatic conditions, and (3) uncertainties in any long term climate forecast. All these reasons point to the potential pitfalls of a rigid implementation of water resources planning and management policies based on projected water demand and long-term climate forecast.

What are possible adaptive measures to enhance the resiliency of water resources systems and to reduce the vulnerability of CP against future droughts? Resiliency is the magnitude of disturbance that a system can handle before experiencing stress and moving into a different state or category. Can current water management practices in the CP be robust enough to cope with impacts of climate change on water, or can past hydrological experience provide a good guide to future conditions? Several ideas are discussed below:

(1) A cautionary, not proposing any major change strategy. This 'what if' or 'wait and see' approach has been suggested because of enormous uncertainties. However, this passive approach will not be helpful to enhance the resiliency of CP against future droughts projected to be more severe and to occur more frequently. Therefore this option is not discussed further;

(2) A flexible strategy to adjust the capacity of existing facilities, but at the same time being prepared to implement major supply expansions (reservoir constructions) because fine-tuning existing operations and adjusting water use patterns have limitations (Wolman and Wolman, 1986);

(3) Adopt short-term planning in the future and continue to upgrade relatively short-term decisions as the impact of climate change unfolds over time.

Possible measures to enhance the resiliency of the CP related to options 2 and 3 are:

4.1 Structural Solutions

On the basis of past studies and discussions between various stakeholders and policy makers, structural measures that can enhance the resiliency of existing systems are such as implementing small scale water storage ponds, reservoirs, or water pipelines to the CP.

(a) Small-Scale Water Resources Projects

Since the Prairie Farm Rehabilitation Administration (PFRA) was established in 1935, thousands of small-scale water resource projects have been constructed. Between 1935 and 1985, PFRA had provided financial assistance for the construction of 110,114 farm dugouts, 11,801 stock-water dams, 381 larger community reservoirs and 7,433 irrigation projects in the CP (Caligiuri and Nemanishen, 1986). Since 1973, PFRA has provided assistance for the construction of 62,341 wells, and water pipelines for farmers to distribute water to their farms or to fill dugouts, which have thus become important water sources in rural areas. As a result, a majority of the Prairie farms now rely on one or more of these dugouts or stock-water dams. These small-scale projects, together with improved soil management techniques, and financial assistance provided to farmers under several drought assistance agreements or crop insurance programs, have made the Prairies less vulnerable to drought and soil erosion problems. In theory these small-scale projects can provide water for

up to two years, which means that the farmers can survive one drought year with little or no water supply. Unfortunately, PFRA was terminated by the Federal government of Canada in 2012 and the impact was likely the strongest in the irrigation districts of the CP.

(b) Integration of Water Resources Systems

In terms of adaptation, one possibility is to increase the robustness of the Prairies' water resources by providing more integration between their existing reservoir systems, and/or the development of regional water distribution systems. Unlike the reservoir systems in California or other parts of the U.S., the majority of the major reservoirs in the Prairies is 'isolated' and so is more susceptible to local water shortage problems. This is especially so when the Prairies' streamflow is highly variable geographically and temporally.

It will be beneficial to better integrate the major reservoirs of Alberta, such as Oldman River, St. Mary and Dickson dams. This means that a fairly comprehensive network of pipelines/water canals and computerized gate controls have to be built. However, the Master Agreement signed in 1969 between Canada and the Prairies that defines the amount of water for each province, and new inter-provincial agreements on water rights and allocation policies would have to be re-formulated if the integration goes beyond individual provinces. Until now, integration of water resources systems is still lacking in the CP.

4.2 Non-structural Solutions

The Prairie should continue implementing non-structural solutions or adaptation strategies, which include better management of existing water resources systems and water conservation.

(a) Increase Water Storage

There is a potential to increase water yield through watershed management. Swanson and Bernier (1986) showed that using a forest clear-cut size of one hectare or less for the Saskatchewan River Basin would increase the water yield of the basin. Their idea is theoretically sound but costly to implement because smaller clear-cut sizes require greater road density to extract the timber.

Snow trapping is likely to be more feasible to increase water storage than the above mentioned strategy. Since snow constitutes about 30% of the amount of precipitation on the CP, the principle is to trap snow and hold it on the field until crop is grown. To increase the trapping of snow by stubble, stubble should be cut at the highest possible height, and at alternate heights. Nicholaichuk and Gray (1986) found two cutting patterns increased the amount of snow trapped by 1.6 cm and 4 cm of snow water equivalent respectively. Other than stubble height, stand thickness and density also determine the snow trapping potential of a stubble field (Fowler, 1998). For example, canola stubble, being thinner than cereal stubble, has to be cut higher to compensate for poorer snow trapping capabilities. The trapping of snow by stubble management should be encouraged even though the effort may not always result in good returns because of the high spatial variability of snow.

(b) Water Conservation in Agriculture

Since a warmer climate could mean an increased demand for water in all sectors, yet droughts could be more widespread and happen more frequently, a wise strategy is to promote water conservation. Even though water conservation is essential during severe droughts, users of all water sectors should be educated to conserve water as a way

of life. Unfortunately, partly because of a lack of public awareness, when droughts arrive, most water conservation programs have to be enforced through water rationing regulations and water-use bylaws. Because agriculture is a major water user in the Prairies (close to 50%) and the use is mostly consumptive (> 70%), to reduce the sensitivity of Prairie agriculture to droughts, dryland management, diversify agriculture to specialty crops and selecting crop cultivars of drought tolerance should be encouraged.

(c) Domestic Water Conservation

Markets and prices have not been the principal means of allocating water. However, water conservation can be promoted through proper water pricing and water metering. According to Environment Canada (EC) (1993), an average un-metered household in Calgary uses about 50% more water than metered households in Calgary and in Edmonton. The recent metering improvement programs implemented in four cities in Ontario have reduced the water consumption by 15 to 27% on a long-term basis. Further, the average municipal water price of Canada of about $1.6 per 1000 liters in 2004 is the lowest among the developed countries while its average daily household water use of 340 liters per capita per day is the second highest. Also, irrigation water charges only recover about 10% of the actual costs of the service. Even by implementing water prices that reflect not the full but higher costs of water services, the average water usage should reduce among domestic users, and farmers will use more efficient irrigation technologies as listed above. The EC report also claims that over half of the average Canadian household's water use of 500,000 liters per year is wasteful and unnecessary.

Lastly, integrated watershed planning and management, promote coordinated effort between various water alliances,

such as North Saskatchewan Watershed, Red Deer River Water and Battle River Water alliances, sustainable water strategies for the major river watersheds such as maintaining ecological instream flow, conservation of freshwaters, maximize efficient use of increasingly scarce freshwaters, etc., will enhance the resiliency of CP against the impacts of future water crisis under the impending threat of global warming and rapidly increasing human activities.

Summary and Conclusions

According to the Clausius–Clapeyron relationship, the water holding capacity of the atmosphere will increase with global warming, giving rise to increased evaporation, moisture, moist static energy and storms are expected to be more intensive. Because increase in evaporation is constrained by the availability of surface moisture and energy budget, warming could increase the frequency of dry days and exacerbate droughts. As the hydrologic cycle accelerates, occurrences of hydrologic extremes will increase, which can reduce the reliability of CP's water resources. Past and the present studies show that CP have become warmer and drier since the mid-Twentieth Century. However, long-term climate projections involve many uncertainties: climate, economy, population growth, social changes and water demand that complicate our effort to prepare against future droughts. With uncertainties on the potential impact of climatic change and other uncertainties, several strategies are proposed to enhance the resiliency of the Prairies to future droughts, where surface water is the primary water supply and agriculture is the major water user: (1) Continue implementing small-scale water resources projects and increase water storage through snow management, (2) increase integration between existing water resources systems, and (3) promote water conservation measures in agriculture practice, water pricing and water metering.

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Living with Rivers

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ABSTRACT

Socio-Ecological Systems (SES) behave in complex and unexpected ways—especially when shocked by disaster. For example, a fire that burns one city may reduce the damage experienced by another in a future flood— as occurred in Alberta when disaster response systems were overhauled following the 2011 Slave Lake Fire—likely reducing the damages of the 2013 Southern Alberta Flood ("2013 Flood") (MNP LLP 2015). Disaster Risk Reduction research has spawned a panoply of views on how best to frame and understand the complexity of SES behaviours when faced with disaster. We adopt the framing espoused by Birkmann et al. (2013), namely that resilience, coping, and exposure are all components or drivers of vulnerability. Further, Birkmann et al. (2017) describe the two-faced nature of resilience: 1) the traditional engineering view of a system's ability to bounce

1 The authors are profoundly thankful to the municipal flood managers who participated in our survey. Additionally, we would like to thank the Municipal, Provincial, FN, and Federal staff who were kind enough to entertain our endless inquiries (esp. Sandra Davis, Peter Yackulic, and Peter Brundin) and the Kule Institute for Advanced Studies for their generous support. Finally, we'd like to thank the friends and family who tolerated many flood management rants and provided invaluable feedback (esp. Alexandra Witkin).

back to normal, or *system-resilience*; and 2) an expression of adaptation or a community's ability to learn and reduce vulnerability following a disaster, or *adaptation-resilience*.

Through this lens, the following article presents a summary of the *Living with Rivers* project, whose goal was to improve understanding of flood management in Alberta. To accomplish this, the project reviewed academic and grey literature, held conversations with federal and provincial flood managers, and surveyed 14 municipal flood managers. From this source material, a picture of the Alberta flood risk SES emerged that shows promising signs of resilience, commitment, and expertise—as well as more worrying indications of political fatigue, data scarcity, and a lack of sensitivity for First Nations (FN).

Mapping Birkmann et al. (2017)'s two-faced resilience concept onto the Alberta flood risk SES opens two windows: 1) a greater understanding of flood risk and response to-date; and 2) identification of opportunities to reduce disaster harm. The project provides positive historical examples of Alberta's adaptation-resilience, such as the flood risk management improvements following the 2013 Flood; as well as some negative examples, such as the continued failure to enforce risk-limiting land-use policies. The research identified system-resilience in the public's and media's return to a non-disaster focus shortly after the 2013 Flood; however, this likely hindered flood risk reduction. In peering through the second window for additional flood risk reduction, the project identified private overland flood insurance as a potential avenue for risk reduction. As Canada is the only G8 country without flood insurance, such a risk transfer scheme for homeowners could improve system-resilience through incentivizing floodproofing and providing more comprehensive post-disaster support—but only if implemented carefully and correctly.

It is crucial that we take a more robust and comprehensive approach to counteract the forces elevating flood risk in

Alberta, such as the rising population, increasing urbanisation, and changing climate (Buttle et al. 2016). The legacy of flood policy recommendations reviewed below support the conclusion that this more comprehensive approach must tackle the risk from both ends, by combining traditional efforts to shield people from harm, with vulnerability reducing measures that enhance the resilience of Alberta and its communities.

Introduction

The motivation for this work lies in three observations in Alberta: 1) floods continue to damage society and property; 2) government resources are focused on recovery rather than prevention; and 3) annual flood damage is rising and will likely continue to do so without additional policy intervention. Furthermore, presently there is a unique opportunity for policy change as the political climate in Alberta has become very disaster-sensitive after the triple pain of $1.0, $5.1, and $8.8 billion disasters over five years—or roughly 6% of the total annual provincial budget.[2] Most notably, on June 18, 2013, a low-pressure system stalled in the headwaters above Southern Alberta, triggering widespread flooding and devastating many communities, including the largest city: Calgary. The significance of the 2013 Flood on flood management in Alberta, and across Canada, cannot be understated.

Understanding the importance of flood management requires a comprehensive view of flood damage over time. However, flood damage data is generally inconsistent and unclear across events and sources because of: 1) a lack of standards for measuring damage; 2) composite natural disasters (e.g.

2 Estimates for the 2011 Slave Lake Fire (KPMG 2012), the 2013 Southern Alberta Flood, and a preliminary estimate for the 2016 Fort McMurray Fire (Alam and Islam 2017) adjusted to 2016 CAD with Consumer Price Index (Statistics Canada 2017c). These damage estimates are combined and compared with the 2016 provincial budget of 51$BN (Alberta Government 2016d) .

hurricanes with flooding); and 3) a lack of clear jurisdictional responsibilities (National Weather Service 2015; Guha-Sapir et al. 2015). While these challenges make any temporal or spatial comparisons difficult, the available data shows that tangible flood damage is climbing in Alberta (Figure 1).

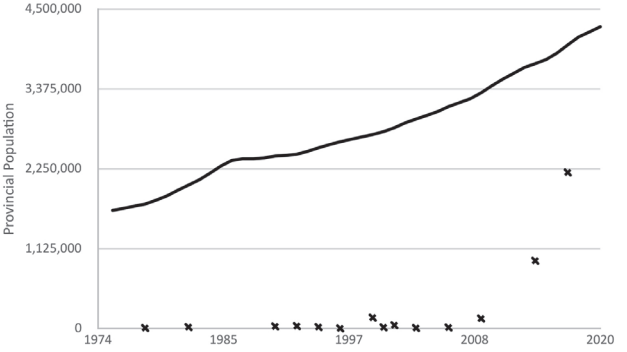

Figure 1. Flood damage trends in Alberta. 'X' denotes annualized damage estimates in thousands of CAD for flood events from the Canadian Disaster Database (CDD) (17 of 37 events have no available damage estimate) (Public Safety Canada 2017) and the solid line shows the population estimate for Alberta over time (Statistics Canada 2017b).

Analyzing government spending on flood management, response, and recovery is complicated by: 1) obscurity and coarseness in financial reporting; 2) frequent restructuring of ministries; and 3) payment transfers. Furthermore, separating mitigation from recovery spending is subjective even with the most transparent accounting. Despite these challenges, it appears that recovery spending in Alberta has been much greater than mitigation spending, with substantial mitigation spending coming only after the 2013 Flood (Figure 2). Additionally,

federal disaster recovery spending, of which flooding in Alberta is the largest recipient, is projected to rise 18-fold from 1970 levels (Frechette 2016).

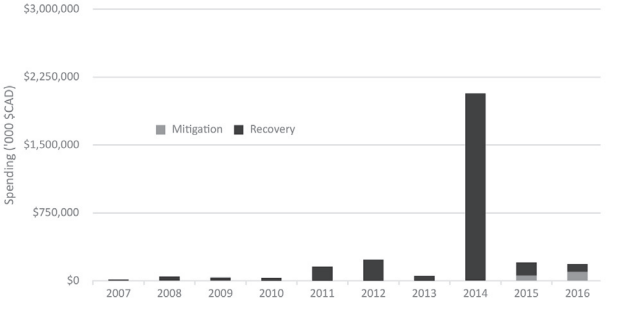

Figure 2. Alberta Government 10 years of spending on flood mitigation and recovery. Compiled from annual financial reports for Alberta Environment and Parks (AEP) (Alberta Government 2016c), Municipal Affairs (MA) (Alberta Government 2016d) and Indigenous Relations (IR) (Alberta Government 2016a). Recovery costs include spending on all disaster types and emergency response. All MA and IR spending tabulated as recovery. All AEP spending with the heading 'recovery' tabulated as recovery. Recovery amount reflects the latest 2013 DRP estimate (recorded in fiscal year 2014).

Finally, trends in both human development and the environmental response will continue to increase flood risk: climate change is projected to increase rainfall intensity (Burn and Whitfield 2016), population is expected to rise and urbanization to continue in Canada (UNDESA 2015), and the subsequent land development may continue to affect catchment and channel properties (Buttle et al. 2016). All these factors contribute to creating a moving target for flood managers.

Because of this uncertainty, society will need to implement flexible, resilient, and comprehensive strategies to achieve sustained flood risk reduction.

With this context, we present four topics that both describe flood management in Alberta and present avenues for improvement: 1) the most comprehensive direct damage lower-bound estimate of the 2013 Flood to date; 2) the first Alberta specific overview of flood management on First Nations (FN) reserves and their experience under the 2013 Flood; 3) an analysis of public attention around the 2013 Flood; and 4) results from our survey of fifteen municipal flood managers to understand the real on-the-ground challenges to flood risk reduction in Alberta. These four pieces form a picture of Alberta's transformation following the 2013 Flood, but more importantly underline the institutional challenges that must be overcome to avoid a similar disaster.

The 2013 Flood: How Bad Was It?

The 2013 Flood had a profound impact on flood management in Alberta—and for the loved ones of the five people who lost their lives the harm is indescribable. A full accounting of the damages is important in making governments more accountable for their efforts to reduce flood risk, providing insight on preparation for similar events, and guiding allocation of scarce public funds towards mitigation. However, despite this usefulness, our research did not find any final damage estimates for the 2013 Flood, official or otherwise.

Preliminary[3] estimates for the economic damage vary widely by amount, credibility, and completeness. Five of the 13 estimates we identified cite Wood (2013), a news article of a press conference with the then-GOA-Finance Minister Doug

3 Most damage estimates self-describe as "preliminary." This is likely a result of ongoing recovery and acknowledgement of the limited scope of each estimate.

Horner. To put this estimate into perspective, Minister Horner was asked if the estimate was final, to which he replied, "Oh, hell no" (Wood 2013). However, the figures quoted in Wood (2013) of "over $5 billion" to "approximately $6 billion" seem to have stuck, as no alternate figures exist.[4]

While a final estimate accounting for all sources of monetary and non-monetary damage may not be achievable due to challenges in monetization and scant observations, a lower bound of the direct-monetary[5] damage is calculable. The Canadian Disaster Database (CDD) reports a lower bound estimate of $2.2 billion 2013CAD[6] for the 2013 Flood. However, the CDD's estimate lacks key damage sources (Provincial DFAA Payments, Provincial Department Costs, Municipal Costs, etc.). Searching through publicly available reports to fill in these gaps, we develop a lower limit estimate on recovery spending to date as a proxy for damage (Table 1). While this estimate is still incomplete and approximate, it still provides a more credible benchmark from which to understand the need for future mitigation. However, this lens fails to convey the severity of flood risk in Alberta's most vulnerable communities.

4 See the full report, *Living with Rivers: Flood Management in Alberta* for a complete list of reviewed estimates. A full reference is provided at the end of the chapter.

5 Those damages easily quantifiable monetarily which result from direct contact with flood waters and debris.

6 As of February 2017.

Table 1. 2013 lower limit final recovery spending estimates.

Recovery (2013CAD)	Expense Location (description)[1]	Source
1,220,826,000	Alberta Government (non DRP)	(Alberta Government 2016e)
1,595,174,000	Alberta Government (DRP estimate)[2]	(Alberta Government 2016d)
1,700,000,000	Insurance Payments	(Public Safety Canada 2017)
285,848,000	Calgary Estimate (non-DRP)	(City of Calgary 2016)
45,000,000	Canadian Red Cross	(Canadian Red Cross 2017)
693,000	High River Disaster Relief Fund	(Bev Warner 2014)
1,400,000	United Way	(United Way Calgary 2017)
1,900,000	Salvation army	(Schmidt 2014)
4,200,000	Samaritans Purse	(Schmidt 2014)
20,000,000	Parks Canada	(Derworiz 2014)
4,875,041,000	SUM	

1. Source of the recovery value. These expenses cover a range of recovery activities. Values are reported in such a way as to avoid double counting.
2. The CDD reports a federal share of $1.015 billion.

First Nations

Renzetti and Dupont (2017) provide an overview of the evolution of FN/settler relations in Canada, and the resulting context for modern water policy. Relevant generalizations to flood management are: 1) FN tradition views the people "as part of, and not apart from or having dominion over, nature"; 2) FN

seek to reclaim autonomy; and 3) FN have unique and heterogeneous cultural and governance values. Following the signing of treaty six, seven, and eight in the late 1800's, the tribes in Alberta were compensated in part through confinement to reserves (Renzetti and Dupont 2017). Today, Alberta contains roughly 45 FN on 140 reserves (Government of Canada 2010), many incorporating some (mostly unmapped) floodplain.

What Flood Management Policy Looks Like on the Reserve

Land-use on reserves is governed by the Indian Act of 1876 and any treaties the individual FN signed with the GOC (Government of Canada 2012b). Under this complex legal structure, modern land-use policy on FN reserves is generally a mix of GOC and FN initiatives, which denies the province any jurisdictional authority. In Alberta specifically, the Municipal Government Act—which legislates most provincial land-use policy—does not apply on reserves (Alberta Government 2016f), and thus neither does the recent legislation to limit floodplain encroachment: Bill 27. In summary, historical land-use policy has been applied largely on a case-by-case basis to each reserve (Government of Canada 2012b), without much consideration of flood risk.

Historically, flood hazard mapping on reserves was conducted under the Federal Damage Reduction Program (FDRP) by the provinces and a 1985 MOU declaring that flood hazard areas would only be mapped on reserves when requested by the community (Beasley 2010). In Alberta, this policy was further entrenched in 1989 under the FDRP's provincial wing, which explicitly excluded mapping on reserve lands (Government of Canada and Alberta Government 1989). As a result, many reserves, including the Stoney, Tsuut'ina, and Siksika, had no hazard mapping and extensive floodplain development prior to the 2013 Flood (see Figure 3 for an example). Following the 2013 Flood, the Flood Hazard Identification Program (FHIP)

is now mapping the Bow and Elbow Rivers through the Stoney and Tsuut'ina reserves respectively (Onyshko 2015). How these maps will be used is less certain.

As part of the treaties from the late 1800's, the GOC took on the responsibility to provide on-reserve housing for FN. Meanwhile, most provinces have distanced themselves from housing policies on reserves within their borders. Belanger (2016) discusses such complexities of FN housing at length, and attributes the continued lack of adequate housing on reserves to the policy paradigm adopted by the GOC, the lack of consultation with FN, and the lack of participation by the provinces. Such systemic problems have led to appalling conditions on many reserves (Moe 2011), and for many to use the label "housing crisis." Such labels become painfully salient when these sub-standard homes are damaged by flooding. For example, in Manitoba, Thompson et al. (2014) documents the Provincial decision in 2011 to divert flood waters onto the Lake St. Martin FN in order to reduce damage to non-FN communities. Despite this, the Government of Manitoba continued its policy of deferring FN housing to the GOC, resulting in over 1900 members still homeless six years after the flood (Indigenous and Northern Affairs Canada 2017b). Likely in reaction to the negative portrayal in the media of the Lake St. Martin (and the Attawapiskat First Nation in Ontario) disaster, the GOA "bucked the trend" and took responsibility for disaster recovery on two of the 2013 Flood affected FN reserves, Stoney and Siksika (Belanger 2016).

The People Not in Calgary: FN Under the 2013 Flood

Stoney, Siksika, Piikani, and Tsuu T'ina were the FN communities directly affected by the 2013 Flood. Although no official damage reports are available, Stoney and Siksika seem to have been particularly hard hit, with an estimated 900 of 3494 and 700 of 2972 people affected, respectively (Alberta

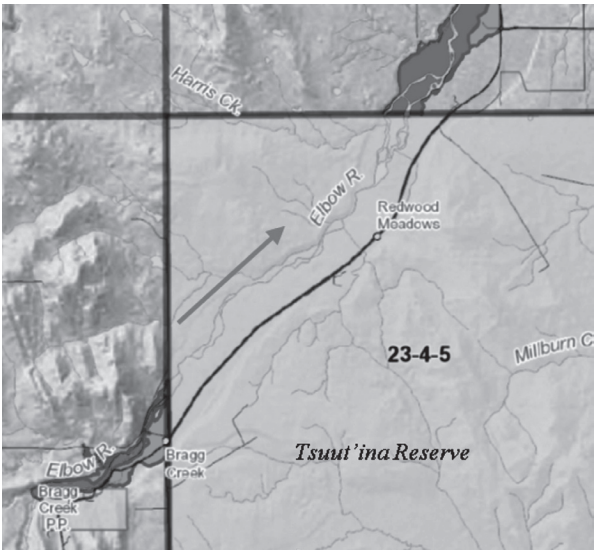

Figure 3. Extract of the 1992 flood hazard map across the Tsuut'ina reserve just west (upstream) of Calgary, which suffered flooding in 2013. Areas in red are floodway and flood fringe. Blue Arrow is direction of flow along the Elbow River (UMA Engineering Ltd 1992).

Government 2014c; Statistics Canada 2012). The situation was likely worsened by the delay and ineffectiveness of flood warnings. MNP LLP (2015) reported that some reserves did not receive warnings in time, while others ignored them. This example demonstrates both a lack of infrastructure on the reserves, and challenges in applying systems designed for off-reserve communities to on-reserve communities.

As mentioned, in an unprecedented and highly-praised policy shift, the GOA decided to take responsibility for the 2013 Flood recovery on FN reserves, rather than wait for the often slow GOC programs to kick in (Belanger 2016). In the weeks following the 2013 Flood, provincial DRP agents were

deployed to assess the damages; they found that 136 and 548 homes needed reconstruction on Siksika and Stoney reserves, respectively (Alberta Government 2016a). To accomplish this reconstruction, the GOA signed a memoranda of understanding (MOU) with each FN in November and December of 2013 (Alberta Government 2014b) and committed $345 million over five years for FN recovery (Alberta Government 2014f). The MOUs established the Province as the project administrator and financier while the FN were responsible for the housing plans and community relations (Alberta Government and Stoney Nakoda Nation 2013; Alberta Government and Siksika Nation 2013).

However, the recovery program was not without its challenges. A 2014 internal audit found a lack of preparedness, experience, and systems in the GOA's approach to the reserve rebuilds (Auditor General of Alberta 2014). Fifteen months after the flood, the province transferred administration of the rebuild project on the Siksika reserve to the Siksika Nation (Jarvie 2016), which continued to develop the replacement neighbourhoods through the Siksika Rebuild Team (SRT). To meet provincial requirements and economic constraints, the nine Siksika replacement neighbourhood plans were significantly denser than the pre-flood housing (Siksika Rebuild Team 2017). Thirteen months after the SRT took over management, tribal members blockaded one of the neighbourhoods, protesting the lack of transparency, accountability, and consultation (Zig Zag 2016). As a result of the forced delay, the Siksika Nation is now exposed to contract disputes, the majority of the displaced remain in temporary housing, and community cohesion has suffered (Zig Zag 2016). The Alberta experience provides evidence that provincial involvement is a necessary, yet insufficient condition, to making progress on the FN housing crises and disaster recovery.

Public Interest

As photos and reports of the devastation spread, the 2013 Flood quickly became the focus of the nation—Prince William even wrote a letter of support on day six (Calgary Sun 2013). Once flood response efforts shifted to recovery, community action groups formed to pressure governments further. However, it is widely understood that as memories of a disaster fade, so too does the public's interest (Simonovic 2014), closing the window of opportunity for systemic improvement. Writing four years after the disaster, the falling trend of newspaper articles published related to flooding demonstrates the media is losing interest (Figure 4). This lack of media attention is reflected in the public's interest in flooding, as shown by the falling trend of related Google searches (Figure 5). This dual drop in interest has not gone un-noticed by law-makers and seems to be reflected in the GOA's spending plans as well (Figure 6).

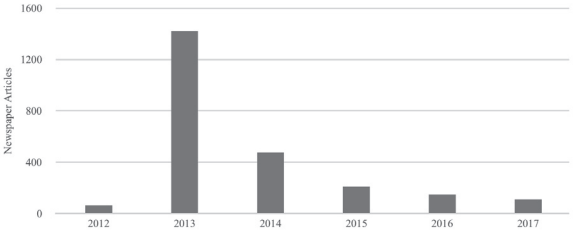

Figure 4. Number of newspaper articles published in Canada related to "flood" and "Alberta". Values obtained from ProQuest (2017) with search boolean "all(alberta) AND all(flood)".

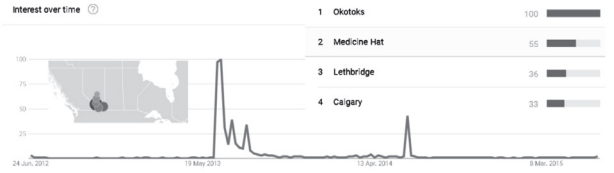

Figure 5. Google Trend's search interest for 'Alberta Flood' in Alberta for the year before the 2013 Flood to two years following. "Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular." (Google 2017)

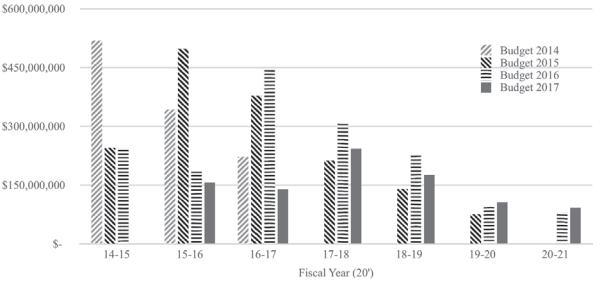

Figure 6. Four recent Alberta Government 5yr Fiscal Plans for flood recovery and mitigation related expenses (Alberta Government 2016d, 2015a, 2014c, 2017a).

What the Managers Say

As we have seen, the Alberta flood policy landscape is diverse and dynamic. The opt-in nature of provincial programs and the diversity of resources and risks in each community lead to differing implementation and levels of effectiveness of flood policy. To better understand the results of cultural, temporal, and spatial heterogeneities on the expression of such flood

policy, we surveyed fifteen municipal flood managers. Specifically, we asked the people charged with flood management how paper policies translate down to real flood risk reduction.

Survey Method

Municipal departments for the major at-risk communities across the province were solicited through their websites for participation in our online survey *Floods in Alberta: Management's Perspective*. The survey was conducted from April-May 2017. Ninety-three questions were asked. Participants were instructed to skip a question if they felt uncomfortable answering or the answer too time consuming.[7] If a participant provided the same answer for all questions in a single category, the responses are excluded from the below results.

Survey Results

Fifteen self-identified flood managers from nine municipalities participated on a condition of anonymity (both in name and jurisdiction). These municipalities collectively represent one third of Alberta's population. Experience in flood management (in their jurisdiction) ranged from 1.5 to 28 years with an average of 11.9 years. Eight (8) of 15 identify as professional engineers and 5 of 15 identify as having a Master's degree in a related field.

Risk Awareness

Understanding a manager's perceived level of risk for their jurisdiction can serve as a proxy measure to track the effectiveness, and to identify space for improvement, of flood management measures at reducing flood risk. Participants were asked to qualitatively rate their perception of flood risk before and after the 2013 Flood. Survey results showed 6 of 14 feel

7 88% of questions had a participation rate 12 of 15 or better.

there has been no flood risk reduction since 2013. However, if participants with less than 10 years of experience are excluded, this changes to 2 of 8 (who feel there has been no reduction). Finally, 10 of 14 participants stated the near-future flood risk is moderate to high.

Table 2. Participants' views on post-2013 flood policy

Responses	Risk Reduction[1]
4	Significant
4	Moderate
6	None

1. Level of flood risk reduction (because of policy intervention) from pre-2013 to now

Commenting on the current level of flood risk, one participant highlighted the gap in flood policy concerning basement damage:

> *Even if buildings are flood-proofed above ground, basements are not usually regulated, so there is still (or could be) considerable damage to parts of the building that are below the design flood elevation. To some who chose to live in these areas, this risk may be acceptable, but it may not be for others. It still does not reduce risk/potential damages enough in my opinion, and in some cases the government will still be expected to compensate the owners when these buildings' basements flood.*

Policy Improvements Since 2013

Following the 2013 Floods, the GOA, in partnership with municipalities/FN, overhauled its approach to flood risk mitigation with two new grant programs,[8] an infrastructure program for those basins affected by the 2013 Flood, renewed

8 See main report Living with Rivers: Flood Management in Alberta for a complete list of programs and their acronyms.

flood hazard mapping efforts (FHIP), and improved flood forecasting. To gauge Alberta's progress on these fixes, participants were asked to rate the implementation level (Figure 7) and effectiveness (not shown) of the following flood policy recommendations found in the literature:

1. map unmapped flood hazard areas;
2. include climate change in flood mapping;
3. increase return period for design storm;
4. use risk analysis (flood damage assessments) in planning;
5. prohibit new development in the floodway;
6. buy-out existing high-risk developments;
7. create incentive programs for floodproofing; and
8. improve public flood risk communication.

While answers varied both across and within municipalities, a relative consensus emerged on the responses to two policy improvements: 1) 11 of 12 participants stated no action has been taken to include climate change in flood maps [#2]; and 2) 0 of 12 participants say that an incentive program has been introduced for floodproofing [#7].

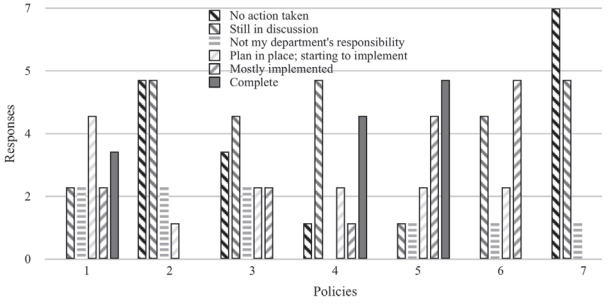

Figure 7. Implementation of recommended flood policies since 2013. Some response/policy sets are omitted for clarity. See list (this section) for policy descriptions.

Of those policies that participants identified as implemented or installed, prohibiting new development in the floodway [#5] was viewed as the most effective policy towards reducing flood risk among the set, while improving public flood risk communication [#8] was seen as the least effective. One participant elaborated on the effectiveness and challenges of flood risk communication:

> *Overall, heightened personal awareness and experience has increased resiliency to flooding. After 2013 there was a lot of effort put into this, but we know there is still a large portion of the public unaware of their flood risk or emergency response. Due to funding, a lessened perceived sense of urgency as the time lapsed [sic] since the last flood increases, and corporate mechanisms, flood communication is decreasing with time, reducing the effectiveness of this measure.*

Survey Analysis

The above survey results demonstrate some of the challenges to flood risk reduction and provide hints at progress. These results also suggest flood risk will remain moderate to high after flood control projects currently in development are complete. This is not surprising considering lawmakers exempted Fort McMurray and Drumheller from recent floodplain management legislation (Bill 27) regulations because of "significant existing development in a floodway" (Alberta Government 2015c). In summary, there remains a significant need for further flood mitigation in Alberta.

More alarming, the survey responses suggest that the policy course set post-2013 may not bring about *any* risk reduction for some communities. Many participants (6 of 14) stated no flood risk reduction has occurred in their municipalities, despite the $163 million spent to-date on flood mitigation by the GOA (see Figure 2). However, these responses were correlated with experience: the more

experienced participants stated more risk reduction had occurred since 2013 than the less-experienced. This could be due to the difference in observation periods between the more- and less-experienced groups, with the less-experienced lacking the pre-2013 exposure necessary to gauge the risk at that time. Regardless, this suggests that we need to revisit the post-2013 approach to flood management in Alberta. However, such a rethinking is unlikely considering fading public pressure and law-maker interest (see section 4); or as one participant put it:

> *What is it going to take to see strict policy for development in flood hazard areas?*
> *Answer—very strong leadership, but most likely 1–2 more disasters.*

The participants did however shed light on a potential path forward for flood risk reduction. In terms of the broad approach to flood risk reduction, participants feel the GOA should take primary responsibility away from municipalities; while both the GOC and GOA should increase their roles (in most areas surveyed)—especially in funding. This desire for more involvement from higher levels of government could be connected to the major limiting factors participants identified in their flood risk reduction work:

- *Funding:* The broader tax base of the GOC and GOA can provide more reliable funding.
- *Staffing:* Participants indicated the GOA (specifically the AEP) has excellent staff and expertise.
- *Legislation Uncertainty:* Considering the most relevant legislation is developed by the GOA and potentially the GOC (insurance regulations), more direct involvement from these actors can reduce the uncertainty at the municipal level.

Beyond these broader concerns of how to structure flood management and policy execution, the survey results also provide insight on specific policy actions. Participants stated that prohibiting new development in the floodway has been the most effective while flood risk communication has been the least effective measure. Furthermore, participants stated that no action has been taken to account for climate change or to incentivize property owners to floodproof. Therefore, preparing for climate change, launching an incentive program for at risk property owners to undertake floodproofing, or re-visiting efforts to educate the public about flood risks could be low-hanging risk reduction fruit for policy makers.

Conclusion

Following the 2013 Flood, Federal, Provincial, and some Municipal governments invested heavily in flood risk reduction. These efforts must continue, but they must also display more resilience by adapting to, and learning from, shortcomings encountered in the post-2013 policy landscape. Specific challenges for Alberta include: 1) a lack of flood damage data; 2) sub-optimal Provincial-Municipal relationships; and 3) an incoherent approach to flood management on FN reserves. To address the first challenge, we recommend that policy makers: 1) incorporate more complete damage assessment data collection into DRP assessments; 2) conduct follow up assessments to collect intangible and indirect loss data (these could also be used to provide additional recovery services); 3) find a solution to the privacy requirements that prevent data from being shared openly without excessive aggregation; and 4) provide efficient access to this data. This data will help track the effectiveness of policy interventions and provide a foundation for the next generation of policies. The need for better data is clear: how can we plan a more disaster-free future if we do not understand the present?

The GOA has undertaken a massive effort towards flood risk reduction. However, many of the municipal flood managers surveyed feel the level of flood risk remains high. While there are many paths available to achieve this risk reduction, the GOA's current approach, to phase out funding the existing programs without a clear plan for replacement, seems unlikely to achieve the necessary flood risk reduction. Our survey results present an alternative path: 1) plan for climate change; 2) incentivize property owners to floodproof; 3) increase funding from the GOC and the GOA; 4) ensure that the GOA and GOC finalize open policy questions quickly; and 5) shift the GOA to a leadership role.

Finally, FN people continue to suffer disproportionately from flood disasters. To address this suffering, the GOC, GOA, and FN must overhaul flood management on reserves systematically, holistically, and collaboratively in a manner that recognizes and addresses the differences of each group. Making progress will require intimate knowledge of the unique cultural context on the reserves, which is something only the members have. Without such knowledge, the value of any truth claims and expert analysis are dubious. In closing, we echo Shrubsole (2007, 117)'s concluding remarks which still ring true a decade, and many floods, later:

> *Institutional rather than technical factors lie at the heart of improved flood and hazard management in Canada.*

FOR THE COMPLETE REPORT, SEE:

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Climate Change and Water Allocation in Alberta

David Percy *(University of Alberta)*

ABSTRACT

In an era of climate change, the need for resilience creates challenges for all laws relating to the environment and natural resources. The law of water allocation, which provides secure rights of water use for municipal, industrial, agricultural, hydro-electrical and other social purposes, in particular must be adaptable to both changes in the pattern of water use and the protection of environmental values. The southern regions of Alberta already experience more intense competition over existing supplies of water than any other part of Canada. The existing allocation of water in southern Alberta in particular and the uncertainties created by climate change have placed Alberta water law under intense scrutiny over the past decade.

The criticism of the existing legal regime has covered just about every aspect of Alberta water law. This study will focus on 5 aspects of that criticism to examine whether, and to what extent, Alberta water law should be modified or amended in order to allow sufficient adaptability to cope with climate change.

The study will examine the following propositions.

- It has been suggested that the government is unable to alter existing water allocations held by licensees without paying compensation, either because those licences are akin to property rights or were granted in perpetuity.

- The principle of prior allocation has been criticised for failing to provide minimum levels of environmental protection and particularly for preventing the implementation of minimum levels of instream flow in the province's rivers.
- There is a need to rethink Alberta's allocation system because it "like other versions of prior appropriation, treats surface water as distinct from groundwater" and "that this distinction is bad science and a legal fiction."

In order to address these criticisms, the study will first provide a background sketch of the law of water allocation in Alberta today. It will then examine the merits of each line of criticism and consider whether, and to what extent, the legislation should be changed to respond to the weaknesses identified by commentators.

Introduction

It is not surprising that most commentators consider the impact that climate change will have on our way of life, its observable effects on agriculture and food production and the serious changes it is likely to bring to the natural environment. The challenges that climate change will create for all of our laws relating to the environment and natural resources are less obvious. At least, our laws must be sufficiently flexible to deal with the impact of climate change and adaptable to the new circumstances that we will face. In a nutshell, our laws, as well as our society, will have to be sufficiently resilient to absorb the shocks that climate change is likely to engender.

In the prairie provinces of Canada, climate change is likely to bring significant changes to the availability and geographical distribution of our water supplies, as a result of both increased heat and different patterns of precipitation. The reality of climate change requires that our law of water allocation must

allow for resilience in water use. In Alberta, the law of water allocation is found in the provincial Water Act, which distributes the rights to divert and consume water for all purposes, most visibly for municipal, industrial, agricultural, hydro-electrical and other social purposes. It also provides the statutory basis for the protecting the environmental value of water, particularly in securing minimum levels of instream flow to ensure the health of rivers and the riparian environment.

Because the southern regions of Alberta already experience more intense competition over water supplies than any other part of Canada, the last decade has seen intense scrutiny of most aspects of Alberta water law. This scrutiny has raised questions ranging from how the Province will accommodate new users of water to how it will incorporate the water rights of indigenous peoples in river basins where water supplies are already fully allocated.

All of the questions raised in the recent debate are intensely important and deserve detailed treatment. This paper will focus only on three fundamental defects that some commentators have identified as threatening the ability of Alberta water law to adapt to climate change.

Those defects suggest that:

- The Alberta government is unable to alter existing water allocations held by licensees without paying compensation, because those licences are akin to property rights or were granted in perpetuity (Droitsch & Robinson, 2009, p. 8).
- The underlying principle of prior allocation in Alberta water law fails to provide minimum levels of environmental protection and is incapable of protecting minimum levels of instream flow in the province's rivers (Ko & Donahue, 2012, p. 7).
- Alberta water law needs to be re-thought because it "like other versions of prior appropriation, treats sur-

face water as distinct from groundwater" and "that this distinction is bad science and a legal fiction" (Schmidt, 2011, p. 18).

This study will address these criticisms by first providing a background sketch of the law of water allocation in Alberta. It will then examine the merits of each line of criticism and consider whether, and to what extent, the legislation should be changed to respond to the weaknesses identified by commentators.

The Prior Allocation System: A Backgrounder

Alberta's law of water allocation dates back to the North-west Irrigation Act of 1894 (Alberta Environment & Parks, 2014) and is now found in the Water Act, which came into force in 1999 (Government of Alberta). It incorporates a system of prior allocation that is often described as embodying the principle of FITFR (First in Time, First in Right). The 1894 legislation made two major changes to the prevailing common law. It vested ownership of all water in the Crown and removed the limitation that only riparians (owners of land that adjoins a river or lake) were entitled to take water from a watercourse (Percy, 1977, pp. 146-147). Since 1894, anyone who wishes to obtain the right to use and divert water must first obtain a water licence from the Crown. An exception to that rule allows riparians and those whose land has a natural supply of groundwater to divert water for household purposes up to a maximum of 1250 m^3 of water per year (*Water Act*, 2000, s. 21(1)(2)).[1] The system is described as FITFR because during shortages, when there is insufficient water to supply all licensees, senior licensees are entitled to take their entire allocation of water before a junior licensee can to take any water.

1 The limitation of 1250 m^3 per year for household purposes is found in s. 1 (1) (x) of the Act.

The Original Function of Prior Allocation

Although the 1894 legislation adopted the principle of "prior allocation", the two elements contained in that term were not of equal weight. "Priority" was far less important than "allocation." The main purpose of the 1894 Act was to remove the monopoly over water use that had been enjoyed by riparian owners. The Act granted secure water rights to those who held water licences and removed the risk that riparian owners might interfere with the exercise of those rights.

The dominance of the role of allocation reflected two major concerns that arose at the beginning of the agricultural settlement of the Canadian plains. Firstly, in 1894, the region was in the midst of a serious drought and it was clear that farmers needed secure water rights in order to irrigate their land. Secondly, the riparian rights principle prevented the irrigation of lands that were not located on watercourses. Indeed, the principle even discouraged the full development of riparian lands. The riparian rights principle entitled riparian owners to divert water for domestic use. They could use water for other, non-domestic purposes (such as large-scale irrigation) only if they did not substantially diminish the ordinary flow of the river.

The principle of priority in time was only ancillary the overriding purpose of ensuring that water licences were secure from interference from riparian owners. The drafters of the Act had to deal with the possibility that there might be insufficient water to satisfy the needs of all licensees. They adopted the priority rule from American law to deal with a contingency that, at that time, was very remote. The priority principle has remained largely theoretical. There is no evidence of any case in which a senior licensee was allowed to take its allocation of water so as to deprive an important user of the its licensed supply of water. The priority principle has been unimportant in practice, except on small streams

with seasonal flows, although it undoubtedly represents the default rule that would apply in an extreme water shortage.

The Impact of the 1894 Act

The original 1894 act applied throughout the Prairie provinces of Canada until 1930, when the government of Canada transferred to the respective provinces the public lands and natural resources within their boundaries. At that time, Manitoba (*Water Rights Act*, 1930), Saskatchewan (*Water Rights Act*, 1931) and Alberta (*Water Resources Act*, 1931) each enacted legislation that was virtually identical to the federal legislation that had applied until 1930. The legislation was very durable and it existed without any major changes in principle for almost a century. The majority of water users in Western Canada obtained their licences under the scheme of the 1894 Act and its provincial successors. Prairie governments only began to re-examine the basic structure of this legislation when the growth of population and economic activity began to place stress on the available water resources. Saskatchewan and Manitoba enacted the first major changes in the early 1980's (*The Water Corporation Act*, 1983-84)[2] and Alberta brought its new Water Act into force in 1999.

The following sections will deal primarily with the recent criticism of some of the fundamental principles of the Alberta Water Act.

Dealing with Existing Water Allocations

The rights granted historically under water licences were certainly secure. The Act allowed the government to reduce the size of a licensee's allocation only in the rare event that the works of the licensee were incapable of carrying the full licensed quantity of water or where the licensee was deemed

2 Manitoba updated its *Water Rights Act* in SM 1982-83-84, c. 25.

to have wasted water (*Water Resources Act*, 1970, s. 53(1)).[3] The allocation could be cancelled only if a licensee had committed some misdeed, such as a violation of the Act or Regulations or a breach of the licence. In addition, a licence could be cancelled where a licensee had completely ceased to exercise its rights, but not where the licensee used only a portion of its rights (s. 54).

Many of early water allocations were large in scale and secure in tenure. They remain vitally important today, as the Water Act protects all water licences that were issued before January 1, 1999. Not surprisingly, much of the recent commentary has been highly critical of the nature of these licences. Their continuing importance requires us to examine their central features with absolute clarity, especially in relation to their duration and nature as well as their impact on the public interest and environmental goals.

The Nature of Water Licences: Licences do not Create Property Rights

One important line of criticism treats early licences as if they created property rights in water. It assumes that water originally granted to licensees can only be reclaimed to meet environmental needs if government is willing to take the risk of paying "significant amounts of money" in compensation (Unger, 2008, p. 2). The obligation to pay compensation for the cancellation or curtailment of a resource right arises only if those rights are classified as property rights.

Broadly speaking, a water licence can be seen as granting property rights, contractual rights or statutory permissions. The legal capacity of the government to deal with existing licences differs according to their classification. In order to determine which category they fall into, it is necessary to exam-

3 This 1970 *Water Resources Act* is cited as the last provincial version of the Act that fully reflected the principles of the original federal legislation.

ine both the words of the Act and the language of the licence.

A water licence will create property rights only if the Act or the licence shows that the government had the intention to do so. This intention is ascertained by investigating whether the Act or the licence used language that would normally be taken as conveying an interest in land. This approach is based on the principle that where a person or a government owns property, those ownership rights will continue to exist unless the owner shows a clear intention to transfer them to another person.

There is no indication that the government ever intended to transfer property rights to a licensee. Licences granted under the Alberta Water Resources Act from 1931 to 1999 merely allowed licensees permission "to divert and use water for any or all" the purposes listed in the Act (1931, s. 11(a)). The Water Act now authorises licences "for the diversion of water, or the operation of a works" (1996, s. 51(1)(b)). A typical licence states that the holder is authorised "to divert and use water.... subject to the terms and conditions of the licence."[4] Language of this type grants licensee permission to use water owned by the Crown water, but does not contain any suggestion that a licensee obtains a property right to the water allocated by the licence.

In simple terms, a water licence is similar in principle to an arrangement in which a person grants to someone else the right to use and operate her bicycle. This arrangement cannot mean that the bicycle owner has somehow transferred her ownership interest to the bicycle user. She has simply granted permission for the user to take her bicycle and put it to use. For the same reason, it can be safely concluded that licences do not grant a property interest in water.

4 See e.g., Licence #19647, issued 1993-11-08. The terminology used licences varied over the years, but never suggested the creation of a property interest.

There is a less remote possibility that a water licence might be classified as a contract, which grants the licensee the right to divert and use water in exchange for the payment of a nominal application fee. However, neither the Act nor the terms of the licences use any language to suggest that the parties intended to create the reciprocal obligations that are central to a contract. In addition, the Act gives "no hint of a power in the designated authority [the government] to conclude contracts" (Crommelin, 1981, p. 75, as cited in Lucas, 1990, p. 27). Professor A. R. Lucas (1990) is surely correct when he states that "water licences under the statute do not convey 'contractual interests'" (p. 27).

As Professor Lucas (1990) suggests, as a matter of law water licences are surely no more than statutory or regulatory permissions that grant the right to divert and use water, activities which would otherwise be illegal (p. 32). 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 an affected licensee has any right to obtain compensation unless the legislation contains express provisions to that effect. The Alberta Water Act that contains such an example of this principle in granting the Director the power to suspend or cancel licences issued after 1999 in two cases that were not reasonably foreseeable when the licence was issued. First, where there has been a significant adverse effect on *human health or public safety*, the Director can suspend or cancel a water licence without compensation. Secondly, the same power of suspension and cancellation exists if there has been a significant adverse effect on the *aquatic environment*. In the second case, the affected licensee has the right to obtain compensation, but only because the Act expressly created a requirement that compen-

sation must be paid (*Water Act*, 1996, ss. 55(1)(j), 55(2)).[5] In the first case, the Act is silent on the possibility of compensation and, as a result, no compensation is payable. In contrast, if a water licence created property rights, there would have been a presumption that compensation was payable, unless the legislation expressly provided that there would be no compensation. In the second case, the government chose to make provision for the payment of compensation for cancellation, but it was under no legal obligation to do so.[6]

The Duration of Water Licences: Licences are not Perpetual

For many decades governments granted water licences without any expiry date. Some commentators have concluded that this practice means that those licences were granted "in perpetuity" (Droitsch & Robinson, 2009, p. 8). This characterisation implies that future governments may have limited options in dealing with existing licence because they grant perpetual rights.

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5 An example of legislation that has chosen to permit the cancellation of water licences upon payment of only limited compensation in a jurisdiction that was originally governed by the federal *Irrigation Act*, see the original *Saskatchewan Water Corporation Act*, S S, 1983-84, CW-4.1, s.42(1). It allowed the cancellation of any water licence in the public interest. See now the *Water Security Agency Act*, SS 2005, c.W-8.1, s.54. In contrast to its predecessors, s.41 of this Act recognises the limited ability of a province to cancel a water licence issued by the federal government prior to 1930.

6 A classic example of the government's power to terminate existing rights to natural resources, including water licences, was provided by the first version of the *Alberta Land Stewardship Act*, S A 2009, c.A-26.8. Section 11 of the Act permitted a regional plan to cancel a natural resource right granted under any other statute, but section 19 provided that no person had a right to compensation, except in the limited circumstances prescribed in the Act (that dealt only with conservation directives) or under some other statute. Although these provisions were controversial, there is little doubt that they were legally valid. Revised compensation rules were established in the *Alberta Land Stewardship Amendment Act*, S A 2011, c.9.

However, in law, water licences are not perpetual. There is huge difference between resource rights that are perpetual and those that lack an expiry date. If we assume for the moment that licences are more than statutory permissions and that they grant contractual rights, we can pinpoint the difference between perpetual rights and rights granted without term. In a 1983 case, the Supreme Court of Canada considered a 1905 agreement in which the government of Ontario had sold lands and water powers to a hydro electrical developer, to enable the construction of a dam on the Rainy River (*Fort Frances v. Boise Cascade Canada Ltd.*). As part of the transaction, the developer agreed to reserve 14,000 horsepower of power permanently for use by the town of Fort Frances, at a maximum price of $14 per hp. In the 1983 litigation, the successor to the hydro electrical company tried to terminate the provisions of the 1905 agreement that dealt with the supply of electricity to the town. The Court rejected this possibility because the agreement required the power to be *permanently* available (para. 192). By agreeing to supply the power in perpetuity, the company had tied its own hands. In contrast, if the agreement had been made without any fixed duration, under contract law, it could have been terminated upon the provision of reasonable notice by either party (Waddams, 1999, p. 361).

Thus, even if we continue to assume that water licences convey contractual rights, the absence of an expiry date does not mean that they are perpetual in nature. There is no restriction on government's legal power to alter or terminate licences, provided that the Act contains an express authorisation to do so. When we recognise that water licences are merely statutory permissions (rather than contractual rights) there is no presumption that they cannot be changed. The Legislature has the legal power to change existing licences, although it would have to amend the Water Act to enable it to do so.

The conclusion that that water licences were never granted

in perpetuity thus means that they can be altered more easily than many suppose, although the legal power to do so must be exercised in the light of history and practical reality. The decision to grant water licences that did not expire was a deliberate choice, not a legislative oversight. The Crown granted large licences to owners, such as railway companies, which held vast tracts of land and intended to sell their land to settlers in irrigated parcels with a guarantee of a certain amount of water each season. Terminable water rights would remove that guarantee (Buchanan & Meighen, 1920, p. 3695). In addition, despite their legal nature, holders of early water licences tend to regard them as perpetual. Although nothing in the legal nature of water licences exempts them from future changes, any efforts at reform are likely to be met with the same level of opposition as if they had been granted in perpetuity. Any reform that affected pre-1999 licences would be particularly controversial because those licences are presently immune from change under the Water Act (1996, s. 18(2)).

Prior Allocation and the Goals of Water Management

The principle of prior allocation that underlies the licensing process has also been criticised for preventing the implementation of minimum levels of instream flow and failing to support the conjunctive management of surface water and groundwater. Both of these lines of criticism must be examined in order to assess whether the Water Act requires fundamental reform.

Instream Flow Needs

In contrast to the practices of the last century, modern water management recognises that a decision to grant a water licence involves a two-step process. The first step requires a determination of the minimum flow that is required to protect the health of the aquatic and riparian environment

of a river basin. The second step involves granting a water allocation only if it does not threaten the instream flow needs of the basin. It is easier to implement the two-step process in river basins in which few licensed allocations have been made than in fully allocated basins, where water use by existing licensees can make it difficult or impossible to maintain the desired levels of instream flow. In Alberta, the statutory device of a water conservation objective is used to formulate minimum levels of desired instream flow (*Water Act*, 1996, ss. 1(1)(iii), 15). The water conservation objective for the South Saskatchewan Basin has been set at 45% of the natural rate of flow. Because licences have been issued for amounts of water that exceed 45% of the natural flow of the river, the present law potentially puts the health of the river in the position of the most junior licence in years of low flow (Ko & Donahue, 2012, p. 7). If licensees use their entire allocations they would undermine the protection of natural water bodies and ecological needs would have to be satisfied with whatever river flow remains. If a basic level of environmental protection is to be achieved, the water conservation objective should be satisfied before licensees can withdraw any water (Bjorlund, 2010, p. 8).

Many commentators assert that the priority principle means that "Albertans are stuck with a system that provides few opportunities to preserve river health" (Ko & Donahue, 2012, p. 8). If this assertion is true, there is a strong argument for fundamental reform of the Water Act. However, these criticisms provide a false explanation for the lack of protection of river systems. The problem was not created by the priority principle, but by deliberate policy choices that were made in drafting the Water Act. The decisions to protect water licences granted before 1999 and to grant compensation if the Director suspends or to cancel a post-1999 licence because of a significant adverse effect on the aquatic environment were

not compelled by the priority principle. Prior allocation is a method of distributing the available water to individual users. There is nothing to stop a government from establishing how much water is available for allocation. If the government decides that 55% of the natural flow of the river can be allocated, or that licensees can divert water only if a designated level of instream flow is maintained, the priority principle does not prevent amendments to the Act to that effect.

Most commentators assume that the implementation of minimum flows in heavily allocated rivers would require the government to pay licensees significant amounts of compensation to reassert control over a public resource (Ko & Donahue, 2012, p. 8). However, there is nothing in the principle of prior allocation that requires this result. It is a basic legal principle that the government has a duty to compensate a person only if legislation extinguishes a property right. A water licence is a statutory permission, not a property right (*Water Resources Act*, 1931, s. 11(a); *Water Act*, 1996, s. 51(1)(b)). Even if court were to find that a licence did create a property right, a rule that allows a licensee to divert water only in certain conditions would only limit, but not extinguish, the rights of the licensee and thus no compensation would be payable.

It is always difficult to achieve the protection of minimum levels of instream flows in fully allocated rivers. In Alberta, if the government wishes to do so, it would need to amend some specific rules of the Water Act but, if done properly, those amendments would not be incompatible with the principle of prior allocation or require affected licensees to be compensated.

Conjunctive Management

Several studies have urged the need to rethink Alberta's allocation system because it, "like other versions of prior appropriation, treats surface water, as distinct from groundwater" and commented that "[t]his distinction is bad science and

legal fiction" (Schmidt, 2011, p. 18; Ko & Donahue, 2012, p. 8). This puzzling statement is supported only by a citation to an article on the American law of prior appropriation (Schmidt, 2011, p. 18). It is generally true of some western states, but it is a totally misleading reflection of Alberta law as it has stood for more than 50 years. In 1962, Alberta became a leader in North America when it brought groundwater under the Water Resources Act (s. 2). After that date, all users of groundwater (except for domestic or household purposes) were required to obtain a licence. The Act applied to new users immediately and existing users had to acquire licences within a grace period (which ultimately extended until 1978). Rather than treating surface water as distinct from groundwater, Alberta water legislation has long applied to "all water on or under the surface of the ground" (*Water Resources Amendment Act*, 1981, s. 2(c); *Water Act*, SA 1996, s. 1(1)(ggg)).

As in most systems, the inclusion of groundwater in the Water Act did not lead to the conjunctive management of groundwater and surface water. However, where water is in short supply, there are strong examples that groundwater and surface water are treated as a single resource. The South Saskatchewan River Basin Plan, which guides water managers on the exercise of their discretion, contains a number of directives to this effect. It treats "groundwater that readily flows naturally under the ground to.... surface water bodies" as surface water (Alberta Environment, 2006, p. 1). In making approving applications for licences or transfers of licensed allocations, the Director is required to consider hydraulic, hydrological and hydrogeological effects and to ensure that the application does not create any significant adverse effect in these areas.

There is evidence that these directives are taken seriously. In the Sentinel Well case, in southwestern Alberta, the Director rejected an application from a developer for a groundwater licence because there was a connection between the proposed

well and a nearby lake. The Environmental Appeal Board affirmed the decision on the precautionary principle. Although it was not certain that the well was hydraulically connected to the lake, the Director's decision was justified in the absence of compelling evidence to the contrary (*Municipality of Crowsnest Pass v. Director, Southern Region, Environmental Management, Alberta Environment*, 2009).

Far from acting as a barrier, as the commentators suggest, this type of example shows that the Water Act is conducive to conjunctive management.

Conclusion

The prior allocation principle in Western Canada has endured since 1894. A respect for the venerability of the principle is no reason to resist reform, but a large amount of activity has been carried out under its umbrella. The reform of water law does not begin with a clean slate. Prior allocation has produced many benefits, especially in arid regions, where it enabled massive investments in irrigated agriculture, storage projects to mitigate drought, hydroelectricity and growing cities. No-one would suggest a radical reform of property law without a deep analysis of the impact of reforms on rights that have been created over a long period. The reform of water law creates similar issues because rights to water use have vested in licensees over 12 decades and there must be careful consideration effects of any reform of those rights. In both water reform and home maintenance, it is vital to analyze the precise defects in the existing structure before beginning repairs. This analysis may well suggest that renovation will provide the best solution and that demolition is required only when the situation is beyond repair.

The recent critiques of prior allocation suggest that the defects in water law can be cured by renovation which respects existing rights as far as possible. The critiques have identified

some real problems that limit the adaptability of water law in an era of climate change. Two particular themes recur in the recent literature. They relate to the possibility that the priority principle might threaten the availability of water for vital social purposes during shortages and the need to protect minimum levels of instream flows especially in over-allocated basins.

The most promising initiatives in these areas involve co-operative basin management and minimal disturbance of existing water rights.

It is important to retain a proper perspective on the priority principle. It creates problems that arise more in theory than in practice. In Canada, the priority principle has never deprived a major water user of its water supply and even in the United States the principle is now applied only rarely. The priority principle also has the virtue of simplicity because it sets out a clear default rule that does not require an administrator to decide which users will or will not receive water in the event of shortages. In addition, the clearly defined entitlement to water provided by licences has provided the basis for negotiating water sharing agreements which can satisfy the needs of all users during shortages.

The best example of a water sharing agreement occurred on the southern tributaries of the Oldman River during a serious drought in 2001. Over the preceding winter, it became clear that there would be insufficient water to supply all licensees in the sub-basin. In May 2001 the senior licensees on the system gave notice that they would insist on the application of the priority principle unless all water users agreed to share the impending shortage. This resulted in an agreement with approximately 650 licensees in which irrigation districts agreed to limit their use to fixed amounts of water that were less than their licensed allocations and the remaining licensees agreed to limit their use to 60% of their allocations (Rood & Vandersteen, 2010, p. 1615). Once the

agreement came into force, the regulator carried out intensive inspections to ensure that water users were respecting its terms. The legal mechanism to implement the sharing agreement was provided by a section of the Water Act, which allows a licensee to temporarily assign or part of its unused allocation to another licensee. It enabled senior licensees to assign sufficient water to allow junior licensees to use 60% of their normal allocation. A similar sharing agreement was implemented in the Belly River sub- basin in 2007 (Rood & Vandersteen, 2010, p. 1616) and since that time irrigation districts have announced that in future water shortages they will participate in water sharing agreements in order to ensure that sufficient water will be available to meet human needs and livestock sustenance (Alberta Irrigation Projects Association, 2010, p. 1).

These types of sharing agreement can help to meet the needs of water users during shortages, but they do nothing to ensure that the environmental needs of the basin are addressed. Cooperative arrangements that combine both of these purposes require a more sophisticated approach.

In order to address over-allocation that may threaten the environmental functions of river basins, a first step is to ensure that it does not happen again. The key principle is to prevent the grant of licences that might threaten minimum flow requirements. This step requires the prompt completion of the existing process to establish water conservation objectives in all major river basins and an assurance that licences will not be issued if they endanger those objectives. The second step applies to basins where existing water conservation objectives are not met. Two promising cooperative management arrangements have occurred in southern Alberta suggest a possible solution to this problem.

The Bow River Project (2013) takes water sharing agreements to a new level by adding the goal of protecting the

health of the river throughout the basin. The Project was developed by major stakeholders on the Bow River with the assistance of an expert facilitator. Its purpose was to examine whether the Bow River could be managed to achieve multiple economic, environmental and social goals at a modest cost. The Project produced a preferred scenario, which involved stabilizing upstream storage that was originally for hydro-electrical purposes and establishing a water bank in upstream reservoirs that was capable of managing 60,000 acre feet of water. The establishment of a series of Performance Measures at vital points on the river was the key to achieving this purpose.

The proposed the management system for the Bow River relies initially on the timing of releases from upstream dams and from the proposed water bank. In principle, it works by arranging flexible releases of water from the dams and modifications in the practices and diversions of major licensees to ensure that the agreed performance measures on met.

The management system was tested by the creation of a sophisticated operation model that allowed stakeholders to make water management decisions in real time and to observe the effects on licensees, facilities and the state of the river. A live simulation exercise required stakeholders to make water use decisions while achieving the agreed performance measures. The simulation used the climatic and hydrological evidence from the hot and dry year of 1941. It asked stakeholders to make their decisions based on the much higher water demand conditions of the simulation year of 2011 on a weekly basis. The decisions involved regulating the releases from upstream dams and proposed water bank, maintaining the performance measures for instream flow at three critical points on the river and reducing diversions by licensees at certain times. The stakeholders succeeded in making all the required decisions by unanimous agreement, without any resort to a

panel of experts, who were available to act as umpires in the event of disagreement. The simulation demonstrated that the Bow River can be managed so as to meet the agreed performance measures and to fulfil the needs of licensees (Sheer et al., 2013). It ensures that the province will have a greater capacity to meet its water conservation objectives than a business as usual scenario.

The Bow River Project offers enormous potential for innovative river management. It is now accompanied by a much more sophisticated model which examines how the entire South Saskatchewan River Basin can be managed in five different climate change scenarios (Sauchyn at al., 2016). Rather revising legislation to implement Draconian measures to achieve instream flows, such as a suggested reduction in the water use of all licensees by 1% per year for 25 years (Schmidt, 2011, p. 51), these cooperative arrangements can be readily implemented, perhaps for trial periods, under the water planning sections of the Water Act (2000, ss. 11-13).

These types of cooperative management deserve further research. They offer promising possibilities for both sharing water during shortages and meeting the environmental needs of a river basin. Most importantly they can achieve these goals with less disruption to existing rights than many recent suggestions for heavy-handed regulation.

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Environmental Law, Socio-Ecological Resilience, and Climate Change

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Abstract
The rule of law is the principle that society shall be governed by legal rules rather than individual decision makers and that everyone—law makers and government officials included—is subject to legal order. An oft cited virtue of the rule by law is its ability to foster stability and certainty for citizens and social systems. Environmental law has traditionally embraced the notion of stability by concerning itself with regulating pollution and natural resource use within the parameters of a balanced nature. The virtue of stability in this context is now questionable given contemporary ecological thinking. Specifically, Earth's natural systems, including the climate system, are experiencing unprecedented levels of anthropogenic-induced change owing to the scale and intensity human activity and there are dire implications associated with such dramatic alterations. With change comes uncertainty, the need for rapid adaptation, and the need to promote socio-ecological resilience—the ability for a system to absorb internal or external disruption yet remain within the same regime. This contribution considers law's role in pursuit of enhanced resilience by asking: can the legal system, which is designed to foster stability and certainty for its subject, be utilized to respond, adapt, and/or promote resilience in view of unprecedented

and uncertain change? One increasingly accepted response to law's resilience gap in the climate change context is litigation wherein citizens or environmental group seek innovative remedies against States and/or major greenhouse gas emitters from the courts. This downstream response may not be able to advance socio-ecological resilience to the same extent that a holistic reconsideration of our substantive approaches to the development and implementation of environmental law, but its potential contribution as a driver of change ought not be diminished. The excerpt from an article titled "Filling the Gaps in Canada's Climate Change Strategy: 'All Litigation, All the Time…'?" considers the limited role that litigation has played in influencing the trajectory of Canada's legal approach to climate change mitigation to date and considers the likelihood that it might occupy a more significant role moving forward.

Introduction

The rule of law is the principle that society shall be governed by legal rules rather than individual decision makers. A corollary being that everyone—law makers and government officials included—is subject to legal order. An oft cited virtue of the rule by law is its ability to foster stability and certainty for citizens and social systems. Environmental law has traditionally embraced the notion of stability by concerning itself with regulating pollution and natural resource use within the parameters of a balanced nature that can be "managed and sustained" (Garmestani et al, 2013, p. 37). The virtue stability in the environmental law context is now questionable given contemporary ecological thinking.

Earth's natural systems, including the climate system, are experiencing unprecedented levels of anthropogenic-induced change owing to the scale and intensity human activity and there are dire implications associated with such dramatic

alterations (Steffen et al, 2015, p. 736). With change comes uncertainty, the need for rapid adaptation, and the need to promote socio-ecological resilience—the ability for a system to absorb internal or external disruption yet remain within the same regime (Hollings, 1973, p. 1). If we can't respond appropriately then the risk is that major global threats, like climate change, will "trigger rapid non-linear change" and "social and economic instability" (Garmestani et al, 2013). The tension that emerges when considering law's role in pursuit of enhanced resilience is as follows: can the legal system, which is designed to foster stability and certainty for its subject, be utilized to respond, adapt, and/or promote resilience in view of unprecedented and uncertain change?

Prominent legal scholars such as J. B. Ruhl and Robin Craig have turned their attention to the ways in which law can be designed and implemented to foster resilience and advance adaptation (Craig, 2010, p. 9; Ruhl, 2010, p. 1373; Graig and Ruhl, 2014, p. 1). I strongly agree that a paramount goal ought to be upstream reconsideration of how environmental law in its many forms is conceived of and applied. That said, history suggests that the legal system is often reluctant to change which leads to a resilience gap. One increasingly accepted response to this gap in the climate change context is litigation wherein citizens or environmental group seek innovative remedies against States and/or major greenhouse gas emitters from the courts.[1] This downstream response may not be able to advance socio-ecological resilience to the

1 See M. Olszynski, (2017, October 13), In the growing wave of climate litigation, could the automobile industry be next?, *ABlawg.ca*, retrieved from https://ablawg.ca/2017/10/13/in-the-growing-wave-of-climate-litigation-could-the-automobile-industry-be-next/; M. Nachmany et al, (2017, May 9), *Global trends in climate change legislation and litigation: 2017 update*, The London School of Economics and Political Science, Grantham Research Institute on Climate Change and the Environment, retrieved from http://www.lse.ac.uk/GranthamInstitute/publication/

same extent that a holistic reconsideration of our substantive approaches to the development and implementation of environmental law, but its potential contribution as a driver of change ought not be diminished.

The following excerpt from an article titled "Filling the Gaps in Canada's Climate Change Strategy: 'All Litigation, All the Time...'?" considers the limited role that litigation has played in influencing the trajectory of Canada's legal approach to climate change mitigation to date and considers the likelihood that it might occupy a more significant role moving forward.

Why Litigation?

[...]

Climate change is clearly a matter of collective responsibility in that we all impacted by the consequences of climate change and, to some extent, are all to blame. At the State level, this is represented by the principle of Common but Differentiated Responsibility, as articulated in the UNFCCC, which attempts to parse out the level of responsibility for climate change and the corresponding obligation to respond.[2] This exercise ultimately identifies those developed nations that have benefitted from carbon-intensive industrialization as bearing primary responsibility to lead mitigation efforts and facilitate deviation from this industrialization process.[3]

There is a growing body of literature that argues in favour of an individual's moral responsibility to combat climate

global-trends-in-climate-change-legislation-and-litigation-2017-update/

2 The principle of Common but Differentiated Responsibility, as articulated in the UNFCCC, clearly captures this at the State level. [...]

3 This traditional conception of CBDR will likely have to bend if the global community is to successfully engage cooperation between today's top emitting States, since they are a mixture of developed and developing States that do not neatly fit into this categorization.

change.[4] This emerging ethical responsibility can be organized around recognized dimensions of individual morality, such as the ethical obligation to avoid harming others, to avoid risking harm to others, or contributing to the risk of harming others.[5] The individual or community reaction to this responsibility can take many forms as experimentation and innovation can manifest in a number of ways. At one level, it is open to individuals to exercise their citizenship within prevailing democratic structures and to vote for those politicians who prioritize climate change action. At a different level, individuals can exercise personal autonomy and choose to reduce their own carbon footprint through green lifestyle choices, including consumer decisions, commuter decisions, and energy efficiency decisions. Finally, individuals can contribute to education and awareness initiatives, participate in community organizing, or engage in public demonstrations or acts of non-violent civil disobedience. Each of the above described actions qualify as a sustainability intervention defined here as an action taken by a citizen or group of citizens in the face of perceived government failure with the goal of moving society (locally, regionally, or globally) towards a more sustainable state. To date, these interventions have failed to secure the necessary governmental response[6] and,

4 See E. Cripps, (2013), *Climate change and the moral agent: individual duties in an interdependent world*, Oxford: Oxford University Press; M. Hourdequin, (2010), Climate collective action and individual ethical obligations, *Env. Values 19*(4), 443-464; S. Gardiner, S. Carey, D. Jamieson & H. Shue, (2010), *Climate ethics: essential readings*, Oxford: Oxford University Press.

5 See W. Sinott-Armstrong, (2005), It's not my fault: global warming and individual moral obligations, in W. Sinott-Armstrong & R.B. Howard (Eds.), *Perspectives on climate change: science, economics, politics, ethics* (pp. 285-307), Amsterdam: Elsevier JAI.

6 One persuasive explanation for the failure of citizen action is that there is a fundamental disconnect between society's belief that we should act to mitigate climate change and its understanding of how the climate system works. See J. Sterman & L. Booth Sweeney, (2007), Understanding

consequently, it is necessary to consider the suitability of a more significant intervention.

In 2009, Professors William Bums and Hari Osofsky observed in *Adjudicating Climate Change,* that "[o]ver the course of the last few years, climate change litigation has been transformed from a creative lawyering strategy to a major force in transnational regulatory governance of greenhouse gas emissions" (Burns & Hari M. Osofsky, 2009, p. 1). In the face of "regulatory insufficiency," professor Osofsky observes that "[t]he combination of discontent with existing efforts and a wide range of legal mechanisms applicable to the crosscutting problem [of climate change] make the courtrooms and other quasi-judicial form important loci for dialogue among disparate actors across levels of governance about how to address climate change most appropriately" (Osofsky, 2009, p. 382). Osofsky's point is premised on the fact that climate change litigation can take various forms. Claims based in tort, public trust, insurance, indigenous rights, and existing (or novel) substantive constitutional and/or human right obligations are all avenues available to prospective litigants.

Assuming that one accepts that an individual has a moral obligation to combat climate change, the question becomes whether or not this individual duty is weighty enough to oblige citizens to pursue litigation. This very question was explored in detail, in the United States context, by Professor Christopher Brown (2010) in "A Litigious Proposal: A Citizen's Duty to Challenge Climate Change, Lessons from Recent Federal Standing Analysis, and Possible State-Level Remedies Private Citizens Can Pursue." Here, Brown explores the unique nature and scope of the climate change crisis in light of various theoretical critiques against elevating a moral duty

public complacency about climate change: adults mental models of climate change violate conservation of matter, *Climatic Change 80* (3-4), 213-238.

in this way. He is aware of the practical concern that the outcome of litigation is difficult to predict and highly uncertain and that "the decision to instigate something as expensive, time-consuming, and emotionally trying as litigation should be left to the discretion of would-be litigants," but asserts that regardless of the ultimate consequences of such litigation (i.e., its success in combating global climate change), there is a strong deontological basis that supports citizens pursuing this course of action (Brown, 2010, pp. 387, 393-94).

Building on this theoretical basis for pursuing litigation, there are a few other potential benefits associated with this approach. First, tort-based nuisance claims and other claims seeking damages awards are able to compensate those that have been directly and severely impacted. Second, successful constitutional or human rights litigation has the potential to force legislative changes or executive actions, the benefits of which ultimately extend beyond those directly engaged in the litigation (Brown, 2010, p. 405). In theory, successful litigation of this sort could prompt the action needed to close the existing gaps in Canada's climate change strategy.

A major difficulty of realizing these benefits is that those individuals whose rights are most significantly impacted by climate change and who are, therefore, in the best position to successfully advance the sort of litigation, are likely from a socio-economic strata that would be disproportionately impacted by the economic and personal costs associated with litigation. As the Canadian climate change experience demonstrates, this likely means those Inuit peoples in Canada's far north who are most vulnerable to climate change also bear the weightiest moral obligation to pursue litigation. Environmental justice recognizes that those within a lower socioeconomic-status are disproportionately exposed to the negative consequences of environmental degradation and demands that the costs of degradation be equally and eq-

uitably re-distributed. Arguably, requiring these vulnerable individuals to accept an additional moral responsibility to pursue litigation is highly inequitable and unjust. Put another way, is this not analogous to arguing that the CBDR principle that helps guide the international climate change response ought to be reformulated in a manner that shifts the onus from developed States to developing States, since they are experiencing the most significant effects of climate change? It is the position of this Article that the potential benefits of successful litigation are so significant that this option ought not to be frustrated by this concern. Rather, it falls to the environmental non-governmental organization community and not-for profit or charitable public interest law organizations[7] to work together to identify and pursue strategic climate change-oriented litigation in a manner that institutionalizes and thereby alleviates some of the individual stress associated with this moral obligation. Certain individuals and groups in Canada have already accepted this obligation and have taken to the courts to litigate climate change. The following Part explores why these attempts have been unsuccessful and builds towards the assessment of whether other approaches have a chance of succeeding in light of these failures.

IV. Climate Change Litigation with Canadian Content

Canada is not devoid of climate change litigation, but the Canadian experience pales in comparison to the United States litigation track record (see Gerrard, Howe, & Barry, 2015). This section first introduces two international human rights petitions that engaged Canadian citizens and then turns to existing domestic Canadian jurisprudence.

7 Ecojustice is the primary Canadian organization positioned to take the lead. See *Who We Are*, Ecojustice, https://www.ecojustice.ca/approach/ (last visited June 22, 2015).

A. Petitions to the Inter-American Commission on Human Rights

The Inter-American Commission on Human Rights (the "IACHR") is an autonomous regional human rights body that exists under the Organization of American States (OAS). Two petitions that claim human rights violations based climate change impacts have been lodged at the IACHR; both include Canadian Inuit petitioners.

The first petition was lodged against the United States by the Inuit Circumpolar Council (the "ICC," then known as the Inuit Circumpolar Conference) on December 7, 2005 (Watt-Cloutier, 2005). This petition alleged that the United States, as the world's largest GHG emitter violated a number of human rights of the Arctic's Inuit residents, including the rights to culture, property, life and security, health, subsistence and inviolability of the home. The petitioners sought, amongst other remedies and in light of a declaration that Inuit human rights were being violated, a recommendation that the United States establish new mandatory GHG emissions limits, the creation and implementation of a plan to protect Inuit culture and resources in the face of the impacts of climate change, and the creation and implementation of a plan to assist Inuit in adapting to the impacts of climate change (Watt-Cloutier, 2005, p. 118).

It is striking that the vast majority of petitioners named in the Inuit Petition—49 of 63—were Canadian Inuit rather than American Inuit (Watt-Cloutier, 2005, p. 1). In attempting to hold the United States accountable for a broad range of alleged human rights violations throughout North America's Arctic, Professor Harrington suggests that "the petitioners ostensibly sought the Commission's [IACHR's] approval for a major extra-territorial extension of the scope of application of an international human rights without regard to the sovereign interests of other States in the Arctic, and without support from within international human rights law for such an extension" (Harrington, 2006, p. 522). The petition was

ultimately rejected by the IACHR on the threshold issue of admissibility; however, the IACHR did hold a public hearing where the lawyers representing the ICC and supporting non-governmental organizations made their legal case to the IACHR in the absence of the United States or other interested parties (Harrington, 2006, p. 522).

The second petition was lodged by the Arctic Athabaskan Council on April 23, 2013 (Earthjustice, 2013). This petition again utilizes both United States and Canadian petitioners—this time two individuals from each jurisdiction (Earthjustice, 2013, p. 8). Canada rather than the United States is the target of this petition, and while it alleges similar rights violations (Earthjustice, 2013, pp. 57-78), the nexus presented by the petitioners is "black carbon, a component of sooty fine-particle pollution" that is a "potent climate warming agent" that disproportionately impacts high latitudes (Earthjustice, 2013, p. 2). Canada emits 98,000 tons of black carbon annually (Earthjustice, 2013, p. 2), and the petition asserts that the many regulatory measures available to Canada reduce these emissions. Specifically, Canada could: "require retrofitting [of] the existing fleet of on-road diesel vehicles with particle traps, which would reduce black carbon emissions by over 90 percent; eliminate high-emitting vehicles; require improved efficiency for residential heating with wood and coal; eliminate most gas flaring; and ban agricultural biomass burning" (Earthjustice, 2013, pg. 6). The petition requests that the IACHR investigate the claims, declare Canada's human rights violations, and recommend those steps necessary to limit black carbon emissions and protect Athabaskan culture and resource use (Earthjustice, 2013, pp. 7, 86). No decision on the admissibility of this petition has been made.

This petition, like the Inuit Petition, seeks extra-territorial application of human rights principles by utilizing United States petitioners to challenge Canadian action. Further,

while enhanced regulation of black carbon may be another important step in comprehensively managing climate change, this petition does not seek to close either of the two major regulatory gaps identified in this Article. Further, it must be noted that even if this petition is deemed admissible and proceeds to an assessment of its merits, the IACHR lacks capacity to issue a legally binding decision—a feature of this sort of human rights organization that questions its utility in ever being able to help fill the sorts of gaps at question here (Harrington, 2006, p. 532). Nevertheless, and regardless of whether the Arctic Athabaskan Claim is ultimately deemed admissible, the lasting value of these petitions is their ability to raise the public profile of important aspects of the climate change discussion (Harrington, 2006, p. 521).

B. Domestic Canadian Climate Change Litigation

Compared to the IACHR petitions introduced above, litigation advanced in Canada's domestic courts seems better suited to help fill the lingering gaps in Canada's national climate change strategy. First, in *Friends of the Earth v. The Minister of the Environment* (2008), the applicant, "a Canadian not-for profit organization with a mission to protect the national and global environment," brought three applications for judicial review of executive action pursuant to the KPIA and sought declaratory and mandatory relief from the Federal Court that would enforce Canadian compliance with its KP commitment. Then, four years later in *Turp v. Minister of Justice and Attorney General of Canada* (2012), the applicant sought judicial review of the executive decision to withdraw from the KP, alleging that such an action is "illegal, null, and void as it in violation of the KPIA, the principle of the rule of law, the principle of the separation of powers, and the democratic principle." Despite the fact that in both cases the applicants were unsuccessful and the application for judicial review was dismissed,

certain key takeaways from each decision help inform the possibility of similar litigation succeeding in the future.

Friends of the Earth turned on statutory interpretation of the action-forcing sections of the KIPA. Having already introduced the controversial nature of the KPIA, it is not surprising that its statutory obligations were less than clear. At its core, the applicants argued that the KPIA is unambiguous and mandatory in its legal obligations requiring the government to produce a KP-compliant Climate Action Plan and to publish proposed regulations within a set time frame and then ultimately "make, amend or repeal regulations necessary to ensure that Canada meets its obligations under . . . the Kyoto Protocol" (*Friends of the Earth v. Canada (Governor in Council)*, 2008, paras. 3-6). The Court's justiciability analysis led it to conclude that it "has no role to play in reviewing the reasonableness of the government's response to Canada's Kyoto commitments within the four comers of the KPIA" (*Friends of the Earth v. Canada (Governor in Council)*, 2008, para. 46).

Canadian courts do not subscribe to the American Political Questions doctrine,[8] nor does Canada have a strict constitutionally entrenched separation of powers. Rather, the justiciability analysis turns on an assessment of whether the issue at hand "possesses a sufficient legal component to warrant a decision by a court" (Reference Re Canada Assistance Plan (B.C.), 1991, para. 7); importantly, this does not preclude "largely political questions" (*Friends of the Earth v. Canada (Governor in Council)*, 2008, para. 24). As one might

8 The Political Questions Doctrine, as originally articulated by Justice Marshall in Marbury v. Madison, 5 U.S. (1 Cranch) 137, 179 (1803), provides that: "Questions, in their nature political, or which, by the constitution and laws, submitted to the executive, can never be made in this court." This doctrine has always held a close connection to the separation of powers. For a discussion on Political Questions Doctrine in American climate change litigation, see J. Jaffe, (2011), The political question doctrine: an update in response to recent case law, *Ecology L. Q.*, 38, 1033.

expect, the question of what is sufficiently legal remain uncertain as does the level deference required from the courts to the other branches of government within "Canada's constitutional matrix so as not to inappropriately intrude into the spheres reserved to the other branches" (*Friends of the Earth v. Canada (Governor in Council)*, 2008, para. 25). The Court in *Friends of the Earth* reminds us that if "either the subject matter of the dispute is inappropriate for judicial review or. . . the court lacks the capacity" to resolve it, then it is generally non-justiciable (Friends of the Earth v. Canada (Governor in Council), 2008, para. 25). Because the Court dismissed the application for judicial review, it might be tempting to construe the Court's reasoning in Friends of the Earth to conclude that climate change is now recognized as a non-justiciable issue. Such an interpretation is erroneous. Rather, *Friends of the Earth* stands for the narrower proposition that the KPIA, as drafted, relied on "public, scientific and political discourse, the subject matter of which is mostly not amenable or suited to judicial scrutiny" and "public and Parliamentary accountability" rather than judicial enforcement through judicial review to move Canada towards KP compliance.

In *Turp*, the Federal Court was provided with another opportunity to assess justiciability in the climate change context. Here, the court was less concerned about whether the duties contemplated by the KPIA were justiciable and instead focused on the applicant's contention that the KIPA rendered Canada's withdrawal from the KP illegal and void. It is clear in Canadian constitutional law that the federal executive has authority to conduct foreign affairs and international relations and that this authority is rooted in the executive's Royal prerogative power. It is also clear that the Royal prerogative is a vestigial source of authority that can be altered and even abolished by Parliament. The Court dis-

missed the applicant's argument that the KPIA limited the executive's Royal prerogative authority to withdrawal from the KP in accordance with the mechanism for such action that the treaty itself provides in Article 27 (*Daniel Turp v. Minister of Justice and Attorney General of Canada*, 2012, para. 25). The Court also proceeded to dismiss the applicant's contention that Canada's withdrawal violated the constitutional principles of separation of powers or democracy (*Daniel Turp v. Minister of Justice and Attorney General of Canada*, 2012, paras. 27-31).

The fact that domestic litigation has, thus far, been unsuccessful should not dissuade future litigants from pursuing this course of action. These decisions, and especially *Turp*, approach the sort of actions that could prompt the sort of judicial intervention necessary to help correct Canada's climate change trajectory. In addition to the profile that this litigation can gain for climate change, *Friends of the Earth* and *Turp* have shed light on what is and what isn't justiciable, which helps inform the scope of future action from those citizens who choose to litigate climate change.

IV. Possible Novel Approaches to Climate Change Litigation, Including Litigation Pursuant to Section 7 of the Canadian Charter of Rights and Freedoms.

Support for litigating climate change in Canada continues to gain traction in scholarly literature, if not the courtroom. This progression can largely be attributed to the fact that Canadian environmental lawyers, academics, and non-governmental organizations groups are now pushing to "green" Canada's Constitution by focusing on the nexus between environmental rights and existing human rights framework (see Smith, 2014). The human rights linkage to climate change litigation was introduced earlier in this Article in the discussion of the Indigenous IACHR petitions, and this approach makes sense

given how climate change and human rights interact.[9] As enunciated by Oliver De Schutter (2012), United Nations Special Rapporteur on the right to food:

> Climate change represents an enormous threat to a whole host of human rights: the right to food, the right to water and sanitation, the right to development. There is therefore huge scope for human rights court and non-judicial human rights bodies to treat climate change as the immediate threat to human rights that it is. Such bodies could therefore take government policy to task when it is too short-sighted, too unambitious, or too narrowly focused on its own constituents at the expense of those elsewhere. Fossil fuel mining, deforestation, the disturbance of carbon sinks, and the degradation of the oceans are developments that can be blocked on human rights grounds.

Before exploring the Canadian human rights-climate change nexus in more detail, it is important to acknowledge that future climate change litigation need not be limited to this form. A recent Canadian policy paper entitled *Payback Time? What the Internationalization of Climate Litigation Could Mean for Canadian Oil and Gas Companies*, authored by lawyer Andrew Gage and Professor Michael Byers (2014), identifies a number of innovative litigation-based approaches to combating climate change. In addition to recognizing the availability—and controversy—associated with applying traditional tort principles to the pursuit of climate change damages (pp. 16-17), Gage and Byers also introduce two other approaches. The first utilizes recent research on historical emissions to estimate the corporate exposure for five Canadian companies

9 See M. Averill, (2009), Linking climate litigation and human rights, *RECIEL*, *18*, 189 (exploring the advantages and disadvantages of litigating climate change using human rights).

based on on-going climate change-related damages in foreign jurisdictions. Based on this, laws facilitating damages recovery are likely to be enacted in developing States where fossil fuel emissions are relatively low and climate change damage is particularly pronounced, such as Vietnam, Ghana, and India (Gage & Byers, 2014, pp. 40-41). Damage awards obtained in these countries could then be enforced as debts in Canada, subject to any conflict of laws hurdles (Gage & Byers, 2014, pp. 23-29, 44). Second, Canadian provinces could enact a new legislated liability scheme that creates a cause of action against large industrial emitters, enabling recovery of public expenditure made to rectify climate change damage (Gage & Byers, 2014, p. 35). Such schemes could be based on the approach taken by provinces to recoup the expenses incurred by public health care because of tobacco product use (Gage & Byers, 2014, p. 34-35). The SCC confirmed the constitutional validity of this approach in *British Columbia v. Imperial Tobacco Canada Ltd* (2005), which has since been adopted in every province (Gage & Byers, 2014, p. 35). [...]

The most promising opportunity to use the courts to prompt government action to fill these gaps rests with innovative human rights-based litigation. The Canadian Charter of Rights and Freedoms (1982, hereafter "Charter") has been in force since April 17, 1982 and as a constitutionally entrenched rights-bearing document it serves to protect citizens and constrains government action. The Charter is applicable to all matters that are within the authority of the federal Parliament or provincial legislatures ("Charter," 1982, s. 32). This analysis is most interested with the possibility of engaging strategic climate change litigation using section 7 of the Charter, which provides that: "Everyone has the right to life, liberty and security of the person and the right not to be deprived thereof except in accordance with the principles of fundamental justice" ("Charter," 1982).

Section 7 is most frequently employed in the criminal law context but has proved relevant elsewhere, figuring prominently in recent SCC decisions addressing the constitutionality of private health care insurance (*Chaoulli v. Quebec (Attorney General)*, 2005), safe injection site restrictions (*Canada (Attorney General) v. PHS Community Services Society*, 2011), and doctor-assisted suicide (*Carter v. Canada (Attorney General)*, 2015). It is primarily perceived as embodying a negative right that limits State action; however, the SCC has not closed the door to the possibility that "a positive obligation to sustain life, liberty, or security of the person may be made out in special circumstances" (*Gosselin v. Quebec (Attorney General)*, 2002). Moreover, while section 7 is often utilized to challenge legislative action/inaction it has also been utilized to challenge executive action/inaction, including discretionary decision-making (*Vriend v. Alberta*, 1998; *PHS Community Services Society*, 2011).[10]

The two-part test employed to evaluate section 7 claims reads: "claimants must first show that the law interferes with, or deprives them of, their life, liberty or security of the person. Once they have established that section 7 is engaged, they must then show that the deprivation in question is not in accordance with the principles of fundamental justice" ("Charter"). With respect to the first part of the test and the scope of potential rights depravation, existing section 7 jurisprudence recognizes the right to life as the "right, freedom, or ability to maintain one's existence," the right to liberty as crucial and personal choices that implicate personal independence and dignity, and the right to security as the recognition of one's personal autonomy and physical and psychological integrity (Boyd, 2012, p. 178). With respect to causation, the SCC has indicated that what is a required is "a sufficient causal connection between the state-caused [effect] and the prejudice

10 Still, it is far less common for section 7 to be used to challenge government inaction

suffered by the [claimant];" this standard is flexible and contextual (*Canada (Attorney General) v. Bedford*, 2013).[11] Additionally, it "does not require that the impugned government action or law be the only or the dominant cause of the prejudice suffered by the claimant" (*Canada (Attorney General) v. Bedford*, 2013). Turning to the second part of the test, recent jurisprudence cements that this assessment turns on whether the impugned action is arbitrary, overbroad, or has consequences that are grossly disproportionate to its objective (*Carter v. Canada (Attorney General)*, 2015). Finally, even if both elements can be proved, the government may still avail itself of the infringement through section 1 of the Charter, which provides that rights guarantees are "subject only to such reasonable limits prescribed by law as can be demonstrably justified in a free and democratic society" (Charter, 1982). However, section 1 is infrequently used to validate section 7 violations (Boyd, 2012, p. 180).

Perhaps the most tantalizing aspect of pursuing a section 7 claim against the government in the climate change context is the range of enforcement remedies available to the court in the event it concludes that a section 7 violation exists that is not saved by section 1. Section 24(1) of the Charter provides that anyone whose guaranteed rights have been infringed may apply to the courts to "obtain such remedy as the court considers appropriate and just in the circumstances" (Charter, 1982, § 24(1)); this includes "damages, costs, declarations, injunctions and other mandatory remedies," as appropriate (Roach, 2013). To date, courts have not had to consider the sort of enforcement remedy that would be appropriate in an environmental context because every attempt to use section 7 to challenge environmental harm has been unsuccessful (Boyd, 2012, pp. 180-81). While the "track record of failure

11 Citing favourably to *Blencoe v. British Columbia (Human Rights Commission)*, 2000 SCC 44 (Can.).

may appear discouraging ... this reflects the evolutionary process of the law" that may require a number of setbacks prior to success (Boyd, 2012, p. 181). So, is it possible that a section 7 challenge could be utilized to fill existing gaps in Canada's climate change policy?

Sniderman and Shedletzky (2014, pp. 3-4) have explored the possibility that members of Canada's indigenous community could use section 7 to successfully challenge Canada's decision to withdraw from the KP or its legislative inaction with respect to mandating GHG reduction. They assert that members of Canada's northern indigenous populations are likely the most suitable litigants to advance a section 7 Charter challenge, owing to the heightened impact of climate change at high latitudes and its consequences for physical and psychological security (2014, pp. 4-5). Further, they argue that Canada's withdrawal from the KP likely passes the justiciability threshold in this constitutional context[12] and also that "[i]f it could be shown that government inaction on reducing greenhouse gas emissions caused section 7 violations, courts could intervene" (Sniderman & Shedletzky, 2014, p. 4). These authors conclude that causation presents the greatest obstacle for meeting the first step of the section 7 test, even in light of the contextual and flexible standard endorsed by the SCC, given that GHGs are well mixed in the atmosphere and Canada's "historical contribution ... is a relatively small fraction of the whole" (Sniderman & Shedletzky, 2014, p. 6). Moving to part two of the section 7 test, and assuming that the causation obstacle can be surmounted, Sniderman and Shedletzky identify gross disproportionality as the "most promising argument" available to claimants to assert Canada has not complied with fundamental principles of justice in its approach

12 In order for a claim to proceed to a consideration of its merits, the court must be satisfied that the issue it raises is justiciable. The case on point here is *Operation Dismantle v. The Queen, [1985] 1 S.C.R. 441.*

to climate change (Sniderman & Shedletzky, 2014, pp. 6-7). Finally, and with respect to remedies, these authors question whether a court would be so bold as to declare something like a withdrawal from the KP unconstitutional or whether they would opt to identify a remedy that helps prevent section 7 breaches moving forward, such as recommending "additional measures to help northerly communities adapt to climate change" (Sniderman & Shedletzky, 2014, p. 7). Adding to their discussion of remedies, it is important to note that even in the unlikely event that a clear section 7 violation is found in the climate change context, the courts are likely to exercise their discretion in crafting a remedy that shows considerable deference to the executive and/or legislative branches of government given how politically charged and complex the issue is. For example, consider the remedy given by the SCC in response to Omar Khadr's petition to the courts for judicial review of the Prime Minister's decision not to formally request Khadr's repatriation from the United States, where he was being held at Guantanamo Bay Naval Base on war crime and terrorism charges (*Canada (Prime Minister) v. Khadr*, 2010). The SCC was satisfied that Khadr's section 7 rights had been violated as a result of Canada's participation in his interrogation, but instead of giving a specific remedy, the Court stated:

> [W]e conclude that the appropriate remedy is to declare that, on the record before the Court, Canada infringed Mr. Khadr's s. 7 rights, and to leave it to the government to decide how best to respond to this judgment [...]. (*Canada (Prime Minister) v. Khadr*, 2010)

These conclusions are directly relevant to the ability of section 7 litigation to close the gaps identified in this Article. Specifically, the sort of legislative/executive inaction that has excluded the oil and gas sector and also consistent executive

reluctance to pursue (meaningful) international cooperative action are analogous to the case studies considered by Sniderman and Shedletzky. It is true that successful section 7 litigation is unlikely at this point in time,[13] which means that any prospective litigants (including public interest environmental organizations) that might be considering challenging Canada's decision to not participate in any successor agreement to the KP, or the politically charged decision to continue to exclude the oil and gas sector from national regulatory standards, faces a significant uphill battle. But what if our understanding of the content of section 7 evolves or changes to reflect the centrality of a healthy environment in our day-to-day lives and its connection to basic human rights?

Section 7 has emerged as the centerpiece of the discussion surrounding new Canadian environmental rights. Leading Canadian environmental law practitioner and scholar David Boyd has identified this shortcoming as one of the areas where the Charter, and Canada's Constitution more generally, lags compared to the rest of the world. He notes that "[a]s of 2012, 147 out of 193 national constitutions incorporate environmental rights and/or responsibilities" (Boyd, 2012, p. 88). [In the event that such a right is located in section 7, through strategic litigation or otherwise, this might also open the door to novel climate change litigation.]

Conclusion

Unfortunately, this analysis must conclude that the prospect of successfully closing the significant gaps in Canada's climate change strategy through litigation is, at least for the time being, quite slim. What is clear, though, is that there is considerable room to pursue different types of litigation in the face of climate change, even despite past failures. Moreover,

13 Sniderman & Shedletzky (2014, p. 15) state that "[a]t present, our proposed litigation strategies are likely to fail."

each time a court is confronted with an aspect of this complex and dynamic issue, there is a possibility that something unexpected may happen. Alternatively, if one subscribes to the belief that the impact of litigation transcends the ultimate success or failure of any one case, it is possible to frame "a loss at trial ... [as] a political victory for climate change activists—by framing climate change as a threat to rights and by requiring the government to justify its ongoing failure to reduce Canada's greenhouse gas emissions" (Sniderman & Shedletzky, 2014, p. 16). Even unsuccessful litigation has the effect of raising awareness and attracting considerable media attention to difficult societal issues. So, while "all litigation, all the time" is not a suitable rallying call for those impacted by climate change and those who oppose continued government inaction, litigation must not be discarded since it might play an important role moving forward.

[...]

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Empowerment and Social-ecological Resilience in the Anthropocene

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ABSTRACT

In these times of rapid and escalating social, political and environmental shifts which we now know as the Anthropocene—an epoch whereby human beings now represent an independent geo-physical force impacting upon the planet - we are faced with urgent questions about how we shall live within the earth's carrying capacity. Increasing the likelihood of the continuance of life on this planet into the next century at the very least necessitates collective action. Such efforts must be at the "intersections of sustainability"; the 'pressure points' or emergent spaces of creative tension between often competing worldviews, identities, diverse cultural biographies, sectional interests and political agendas. Our ability to navigate the ripple effect of these overlapping and intersecting dynamics substantially influences the extent to which they either diminish or result in generative possibilities for the future. Public health, in particular the focus on 'upstream' determinants of human-ecological well-being through community action, otherwise referred to 'empowerment', is a potentially significant area of intersectional practice. Its historical roots in Western positivism however, mean that in reality empowerment practice is sometimes inadvertently wielded by practitioners as a double-edged sword – while it may draw strength from public

health's legitimacy as a significant field of Western Scientific medicine, paradoxically the same field is implicated in the individualist paradigm that has created many of our ecological ills in the first place. Never-the-the less, empowerment practice remains a potentially influential field of analysis and action for sustainability practice, provided we can draw on its actual and perceived strengths whilst revolutionizing some of its most fundamental tenets from within.

Aside from resilience discourse largely in the field of mental well-being, and more recent mention of community and Indigenous perspectives of resilience, the concept remains largely under-developed in the context of human-environmental well-being with few mentions of social-ecological resilience. This article re-orientates empowerment practice away from its anthropocentric tendencies towards considerations of human-wellbeing as a component of an interconnected bio-sphere. In doing so, it centralizes social-ecological resilience as a potentially unifying concept which supports epistemological and cultural critique of empowerment practice whilst taking account of the diverse and sometime divergent agency imperatives of different cultural groups and sectional interests. It outlines three critical capacities for empowerment practitioners working at the intersections of sustainability are outlined. It is argued that without such critique, empowerment practice runs the risk of being at best impotent or at worst damaging to human sustainability imperatives in the 21st Century.

THE COMPLETE ESSAY CAN BE FOUND ONLINE AT:
https://www.researchgate.net/publication/323356737_Empowerment_and_Social-ecological_Resilience_in_the_Anthropocene

Indigenous Resilience and Pedagogies of Resistance: Responding to the Crisis of our Age

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ABSTRACT

Historically, Indigenous peoples have displayed remarkable resilience in the face of adversity, notably, in the face of colonization. Over several decades, Indigenous peoples have sought through legal and other means to regain and retain cultural and traditional rights, including traditional practices, languages and identities, as well as the right to culturally appropriate forms of economic development. This resilience by Indigenous peoples has been described as grounded in culture, place and in Indigenous forms of spirituality. In the 21st century, faced with new modes of colonization, this same resilience is giving rise to new modes of both engagement and disengagement on the part of multiple Indigenous communities around the globe. Positioned in the context of profound environmental and global crisis, this article considers Indigenous strategies of renewal and resistance against the background of the changing role and function of the nation-state, drawing on specific legislative changes in Canada and Aotearoa New Zealand.

Introduction

Throughout history, Indigenous peoples have displayed remarkable resilience in the face of adversity (Aspin, 2014). In particular, Indigenous communities have demonstrated resil-

ience in the face of colonization and the effects of extractive industrial expansion and maladaptive development policies on their traditional lands and sacred places. In both resisting and engaging with the settler colonies that sought to usurp their lands, waters and sacred territories, Indigenous peoples have traversed nation states, the rulers of colonial imperialism, and international institutions. They have sought through juridical and other means to regain and retain cultural and traditional rights, including traditional practices, languages and identities, as well as the right to culturally appropriate forms of economic development. In the 21st century, faced with new modes of colonization, this same resilience is giving rise to new modes of both engagement and disengagement on the part of multiple Indigenous communities around the globe. These modes and strategies are played out most vividly in relation to the protection of customary rights to land and water, and in the protection of nature.

Noam Chomsky (2013), speaking of the global crisis of sustainability, observed, "Throughout the world, Indigenous societies are struggling to protect what they sometimes call 'the rights of nature,' while the civilized and sophisticated scoff at this silliness." He noted in particular that,

> Leading the effort to preserve conditions in which our immediate descendants might have a decent life are the so-called "primitive" societies: First Nations, tribal, Indigenous, aboriginal.... The countries with large and influential Indigenous populations are well in the lead in seeking to preserve the planet. The countries that have driven Indigenous populations to extinction or extreme marginalization are racing toward destruction. (Chomsky, 2013).

On an earlier occasion, Bernard Nietschmann (1995) similarly stated that,

> Where there are nation peoples [place-based communities whose relationships with their homelands (both land and water) govern their roles and responsibilities] with an intact, self-governed homeland, there are still biologically rich environments [...] the converse is equally striking: State environments—where the non-nation peoples live—are almost always areas of destructive deforestation, desertification, massive freshwater depletion and pollution, and large-scale reduction of genetic and biological diversity (cited in Corntassel & Bryce, 2012, p. 151).

Both comments highlight a critical point of tension and challenge for Indigenous peoples, that between economic development—most often conceived of as participation in the national and/or global economy—and the preservation of lifeways that not only depend upon thriving ecosystems, they have for millennia defined the identities of many indigenous peoples. However, as Cherokee scholar Corntassel (2012, p. 87) points out, "When asked about living sustainably today, Indigenous peoples inevitably confront the ongoing legacies of colonialism that have disrupted their individual and community relationships with the natural world."

As states increase their strategies of reincorporation or dispossession and extinction in response to both the demands of global capitalism and the demands of Indigenous peoples (Tully, 2008a), these tensions are the backdrop for renewed acts of resistance by Indigenous communities across many areas of the globe. Although usually seen as quite distinct, notions of resistance and resilience are connected (Brown, 2015). In this contribution, these tensions frame my contextualization of the resilience of Indigenous communities. Aspin et al. (2014, p. 156) write that resilience "is a testimony to the refusal of indigenous peoples to accept assimilation or integration as an acceptable strategy for their ongoing survival." They elaborate

through the words of Cohen: "The Indigenous reality is one of resilience, refusal to disappear; it is a reflection of the strength and beauty of peoples who have lived here since humans existed on this land, and will continue to be so" (as cited in Aspin, 2014, p. 156). As a global discourse, the crisis of sustainability refers to both an environmental and an economic crisis. In recent years, the concept of "triple crisis" has come to signify the interrelationship between financial, environmental and food security crises that collectively impact the worldwide sustainability of human society (*cf.* Shiva, 2008; Addison, 2010). Indigenous communities intersect the "triple crisis" of sustainability in multiple ways. Traditional and Indigenous communities occupy about 20% of the world's land surface, often at the margins of arable lands (Ovideo, 2000) and are estimated to maintain within their territories 80% of the planet's biodiversity in, or adjacent to, 85% of the World's Protected Areas (World Bank, 2008). Over 400 million of the world's indigenous peoples live in territories that are highly vulnerable to the impacts of climate change. Indigenous territories also hold hundreds of gigatons of carbon—the recognition of which has significant implications for industrialized countries seeking to secure significant carbon stocks in an effort to mitigate climate change policies (World Bank, 2008, p. 23).

In this contemporary moment, the global and local space within which Indigenous rights to cultural heritage and their traditional relationships with land and territory are mediated and negotiated is directly connected to this "triple crisis of sustainability" as nation-states strengthen coercive and hegemonic efforts to quell Indigenous resistance by reincorporate Indigenous leadership into new and divisive forms of development. Faced with this, Indigenous resilience is that which drives resistance to the destructive forces of new imperialism and to the re-visioning of a more just, equitable and viable future.

This contribution begins with a brief review of Indigenous peoples' role in the transformation of international human rights law, transformation that accrued directly from the protracted, multi-faceted struggle for the recognition and maintenance of Indigenous cultural identities, rights and practices. The changing role of the nation-state as a conduit for globalization and the impact on Indigenous peoples-states relations during the latter part of the twentieth century played a major part in shaping this struggle. An important theme here is the goal of Indigenous self-determination and struggles over land and resources. The paper concludes with the recent resurgences of Indigenous peoples and the nature of, and implications for, resilience in this time of global crisis.

Indigenous Peoples in the Global Arena

Indigenous peoples' consistent struggles to decolonize from the paternalism of the colonial past are well documented, most notably so since the 1970s when Indigenous movements in a sense erupted onto the global stage. The strengthening of international networks of Indigenous peoples saw the emergence of a new 'politics of indigeneity' as a critical component in the affirmation of Indigenous peoples' determination to reclaim their histories, epistemologies, cultural rights and political autonomy. In collaboration with non-Indigenous colleagues, advocates, and civil society movements, this global movement of transversal unity (Soguk, 2009) was in large measure responsible for significant changes in their relationships with the international system of nation states as well as the international juridical human rights system.

A series of meetings that formalized the presence of Indigenous peoples' missions in the United Nations[1] marked the beginning of twenty-five years of protracted struggle for

1 These led to the establishment of the United Nations Working Group on Indigenous People.

the recognition of Indigenous rights, leading finally, to first the passing of the Draft Declaration on the Rights of Indigenous Peoples to the UN General Assembly, and in November 2007, the ratification and passage of the UN Declaration on the Rights of Indigenous People (UNDRIP) into International human rights law. Significantly, of the 159 states represented at the General Assembly at the time of the vote, the only four states to vote against the adoption of the Declaration, i.e. Australia, Canada, the United States, and New Zealand, are former British colonies, each with sizable Indigenous peoples living within their nation-state borders.

These states cited fundamental incompatibilities between the Declaration and their respective constitutional and legal frameworks, eventually endorsing the Declaration to the extent that each reconciled what had been perceived to be inherent incompatibilities with their existing laws. The predominating logic behind their later reconciliation was that the spirit of the UN Declaration on the Rights of Indigenous Peoples was acceptable only because implementation of contentious articles was non-binding. Of critical significance to Indigenous peoples, Article 3 declares that, "Indigenous peoples have the right to self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and economic development" (United Nations, 2007a). Equally critical is the protection of rights to cultural expression, practice of traditions, relationships with their land and territories embedded in Articles 11-3 and 24 -27. Speaking of the Declaration's import, New Zealand Prime Minister John Key declared that his government "did not sign up to anything; [it] affirmed a declaration that is non-binding and aspirational" (New Zealand). For the United Kingdom's ambassador to the United Nations, Karen Price, feeling the need to re-emphasize the non-binding nature of UN declarations, the UN Declaration on the Rights of Indigenous Peoples had to remain

effectively symbolic, since it was "non-legally binding and did not propose to have any retroactive application on historical episodes" (United Nations, 2007b). The government of Canada went further, declaring the Declaration to be "non-legally binding document that does not represent customary international law nor change Canadian laws" (Anaya, 2010). The Declaration itself points to limitations in its proposal. Article 4, for instance, limits the "Indigenous right to autonomy or self-government in matters relating to [only] their internal and local affairs" (United Nations 2007a), echoing the contention over potential secession that states had consistently argued lay at the base of their consistent and continuing objection to any notion of Indigenous peoples self-determination.

While the UN Declaration on the Rights of Indigenous Peoples, notwithstanding its many inherent oversights, was a landmark for the recognition of Indigenous-rights in international law, Indigenous interventions in the global as well as local political arenas, persist. Indeed it is at the intersection of Indigenous demands for the recognition of Indigenous rights and environmental crisis that these counter discourses have emerged as one of the most powerful voices against the devastating impacts of global capitalism. Denied equal representation with states at high-level international conferences seeking to address urgent issues of biodiversity and climate change, Indigenous peoples have sought other venues, often in parallel meetings to the regional and international conferences in which they were denied representation, in which they have repeatedly referred to the warnings of their ancestors and voiced their concerns for the environment and for the denial of their rights to protect their own territories from destructive development processes.

From the first World Indigenous Peoples' Conference on Territories, Rights and Sustainable Development, Kari-Oca I which resulted in the "Kari-Oca Declaration" to oth-

er declarations such as the "Declaration of Quito" (1990), the "Cochabamba Declaration (2010) which called for the establishment of an International Climate Justice Tribunal," and Kari-Oca II (2012), Indigenous peoples have reaffirmed their rights to retain their languages, engage in their cultural practices including subsistence lifestyles, and the urgency of the need to protect nature. They have called attention to the impact of destructive practices in agriculture, mining and water management and to the need for a new global paradigm that restore the harmony between nature and human beings. In all cases, the relationship is described in terms which emphasis its fundamental nature of interdependent, indivisible, and spiritual.

Indigenous peoples' international efforts for recognition of the importance of traditional ecological knowledge and of Indigenous practices of sustainability have achieved many important and significant outcomes. Witness, for example, recognition in the Convention on Biological Diversity (CBD) which resulted from the 1992 UNEP 'Earth Summit' conference at Rio de Janeiro, the International Indigenous Forum on Biodiversity (IIFB) formed at the III Conference of the Parties to the Convention on Biological Diversity (COP III) in Buenos Aires, Argentina, in November 1996, the 2008 World Bank report *The Role of Indigenous Peoples in Biodiversity Conservation*, and more recently, the UN Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).

Important as they are, however, as with the UNDRIP and other international human rights instruments, due to the nature of the international structure of governance, these mechanisms fail to protect Indigenous peoples' rights to protect their traditional lands and practice their customary lifestyles. Indeed, as Tully argues,

> Instead of freeing [Indigenous peoples] from long-standing structure, the struggle for recognition has tended to reproduce it in an altered and ameliorated form without effectively challenging, negotiating and modifying the forms of deeply sediments colonial conduct of both non-Indigenous and indigenous peoples that sustain it. (Tully 2008b, p. 67-68)

Yet despite the inherent limitations of the UNDRIP, its ratification and eventually, endorsement by the CANZUS group of states (of which Canada was the last to sign), was widely seen as having a significant impact on Indigenous peoples-states' relationships. From some perspectives, it marked the culmination of the shift from assimilation by states to the recognition of the right to self-determination, a right that in some cases was advanced through re-negotiated treaty settlements (*cf.* Aotearoa New Zealand and British Columbia, Canada) was under-scored by much-heralded apologies from governments (Canada, New Zealand, Australia), by long-fought for recognitions of the right to be consulted about industrial development on their traditional territories and the development of co-management regimes and benefit-sharing agreements, and by reconciliation strategies which attempt effect redress for the appalling treatment of Indigenous children in residential schools during the twentieth century. From other perspectives, the shift in state policies from assimilation to accommodation of rights in a politics of recognition that Corntassel (2007) describes as the "illusion of inclusion" results in a reconfiguring of the same forms of colonial power that Indigenous peoples' demands for recognition sought to transcend (Coulthard 2012, p. 152).

The recognition of Indigenous rights, won through long protracted struggles and often at great personal and community cost, is at all times mediated by states' proscribing of

conditionalities that limit the extent to which these outcomes achieve their aims and objectives. While Indigenous peoples' demands for recognition of customary rights and practices constantly challenges the legitimacy of settler states, states, on the other hand, are continuously seeking new ways to limit or redefine these rights and re-incorporate Indigenous natural resources into their own economic agenda. James Tully describes this in terms of "participation in relations of governance of production, consumption, militarism, securitization, leisure and so on" (Tully 2008b, p. 160). In this fashion, the recognition of Indigenous peoples' rights has been accompanied by further retrenchment and resistance on the part of some states and renewed efforts to re-incorporate Indigenous peoples into the capitalist state. A process well entrenched since the early days of colonialism, this has typically involved reshaping and corporatization of traditional Indigenous governance structures, the interpretation of 'capacity-building' as capitalist modes of economic development and the incorporation of local Indigenous communities within capitalist structures which took for granted ideologies based upon notions of *homo economicus* and the diminishment of traditional Indigenous values of collectivity and relationality.

The backdrop to this politics is the restructuring of the nation state by neoliberal forms of imperialism (McMichael, 1995), a shift to a universal 'debt regime', the emergence of new economic structures of global governance and the redefinition of notions of development and state sovereignty. In the 1980s and 1990s, the development of regime theories and the popular liberal notion of 'governance without government' raised critical questions about a reconfiguring of the principles and practices of democracy. During this period the concept of 'rolling back of the state' gained considerable purchase in some quarters, as did notions of 'limited democracy' (Cox, 1994). Some theorists argue for a state that is considerably

weakened, or rolled back, leaving the floor open for alternative structures of governance, while others argue that while globalization has seen changes in the role of the state, the state has always acted as an agent of capital and that far from being diminished, the role of the state as an agent in the establishment of global capitalism has been integral.

Here the notion of the 'hollowing out of the state' has been a useful explanatory tool (Jessop 1997). Jessop (and others) has been careful to point out that, "Just as globalization does not generate a single set of pressures that affect all states equally, there is no common response by all states to the multiple forms assumed by globalization" (2010, p. 42). Under neoliberalism, Jessop states, the relationship between the state and the market is fraught with contradictions. Nonetheless, in 2008, the "continued reciprocal interdependence of 'market' and 'state' as complementary moments of the capital relation" (Jessop 2010, p. 39) was brought sharply into focus as the financial crisis of neoliberalism brought the essential nature of the states-market relationship to the fore.

Imperial Relations in a Post-Colonial World

In 1898, informal imperialism was a means of asserting US rights to free markets "in all the old countries which are being opened up to the surplus resources of the capitalistic countries and thereby given the benefits of modern civilization" (Conant, 1898, cited in Tully, 2008b, p. 132). The popular assumption that the decolonization program begun in the 1960s also represented the end of imperialism has been slow in its decline. As Tully remarks, global democracy authors have promoted the notion that the global transformations of the 1990s and the shift to global governance represented a welcome move towards global democracy (*cf.* Held, 2004). The reality, however, is that not only is the international human rights system troublingly flawed, it fails at the

most fundamental level to protect the rights of Indigenous peoples living within internally colonized territories. The cause of this failure lies in the dominance of capital over human rights. This most notably includes the exercise of cultural rights and norms and the rights to protect traditional lands from destructive forms of exploitation. As Jessop (2010) points out, states are heavily implicated as agents in this process. Whereas internal and external forms of colonization achieved considerable success in gaining access to the natural resource wealth of Indigenous peoples, today the increased recognition and reassertion of Indigenous customary rights, particularly in response to Indigenous opposition to environmentally damaging development projects, represents a significant barrier to the full realization of the interests of capital. The response from states has been instructive.

In Aotearoa New Zealand in 2004, faced with the refusal of Māori to accept the extinguishment of their rights through the ongoing treaty claims process, the National government's response was to overturn the previous jurisdiction of the Māori Land Court to hear and determine Māori customary claims relating to the foreshore and seabed, thus effectively extinguishing Māori claims to the foreshore and seabed (*New Zealand Foreshore and Seabed Act*, 2004). In 2006, the New Zealand Government vociferously opposed the passing of the UN Draft Declaration within the UN Human Rights Council. By 2012 and in the second term of the National government administration led by then Prime Minister John Key, legislative action rapidly escalated. It included the passage of legislation aimed at undercutting existing environmental protection embedded in the *NZ Resource Management Act* (2012), the freeing up of restrictions on certain kinds of development on customary Maori lands, and placing major state-owned hydro power stations on the open market in a move that presaged wide-scale marketing of the country to foreign investment,

opened up vast swathes of the country to gold and oil mining, including deep sea oil mining, and granted approval for an open-cast coal mine on Denniston Plateau on ecologically unique conservation land. The response by Māori community people in the region where deep sea oil exploration was commencing was to take to the ocean—by a range of methods, including swimming—to protest the intrusion of oil drilling in their customary fishing areas. Similar protests were held around much of the New Zealand coastline. In a country well known for the exercise of the democratic right to protest, the reaction by government was to pass under urgency legislation by means of which protests on the open ocean within certain conditions are deemed illegal and incur extraordinarily punitive outcomes.[2]

Parallel processes occurred in Canada. The enactment of the two huge omnibus bills passed rapidly into law by the Canadian federal government and the well advanced plans to build an extensive pipeline network carrying oil south into the United States (the Keystone pipeline), west to the coast of British Columbia for export to China (the Northern Gateway pipeline), and east to the opposite coast, prompted a fresh resurgence of Indigenous activism and protest which has galvanized communities across the continent of North America. In March 2012, following the announcement of the first Omnibus Bill[3] which devastated environmental protection of waterways, including impact assessments of over water pipelines, and in temperatures of minus 25 degrees centigrade and below, a group of youth from a remote Northern Aboriginal community began a 45 day 4,000 km trek on foot, dragging

2 *Cf.* the NZ Crown Minerals Amendment Act 2013, otherwise known as the "Anadarko Amendment" in recognition of the fact that its passage enabled the Anadarko oilrig to begin operations in New Zealand waters in the face of fierce public opposition.

3 Jobs, Growth and Long-Term Prosperity Act S.C.2012, c.19

their necessities by sled. Their objective was to meet with the Canadian Prime Minister to demand federal protection of the waterways. The refusal of the Prime Minister to meet with them when they arrived in Ottawa, exhausted and ill, but having gathered many supporters along the way, fuelled already high tensions and concerns. Following months of gathering outrage, in November 2012, four young Aboriginal women began a movement that became a national uprising under the nomenclature of "Idle No More," joining the wide resurgence of opposition against oil pipeline expansion across Indigenous lands. As in all Indigenous counter-movements, traditional ceremonies are integral to this movement. They reconnect body, mind and spirit to the land and to the ancestors. Ceremony provides the framework and the means to hold the space for reclamation of rights, reclamation of land, reclamation of spirit. Today, across the globe the Indigenous resurgence movement is reuniting Indigenous communities as well as hearts and minds using the tools of non-violent protest against the destruction of their lands—ceremony, dance, prayer, singing, and the politics of refusal.

Negotiating the Spaces

The right to determine their form of development is a central plank in Indigenous demands for recognition of the right to self-determination. Hence it is important to remind readers that nothing in the previous section should be read as implying that Indigenous communities have no involvement in natural resource extraction. Faced with the resurgence of Indigenous opposition to the encroachment of resource extraction on their customary ands, and the upholding by the Courts of the right to consult, many corporations have responded by offering significant benefit-sharing arrangements. Given that in most cases, the development projects may occur with or without their consent, some Indigenous leaders legitimately argue

that participation makes good economic sense, especially if it lifts their communities out of their long experience of poverty and disadvantage (Andersen, Dana, & Dana, 2006). Bolivia provides a useful insight in this regard. Latin America, the site of the most radical opposition to neoliberal restructuring in the past five years, emerged as one of the strongest examples and symbols of hope for the Indigenous sovereignty movement, as Chomsky acknowledges. By the 1980s, the internationalization of the Guatemalan Mayan struggle and other Latin American Indigenous movements saw Indigenous Latin America become highly visible in the global community. In the 1990s, the Indian movements of Ecuador, Quechua, Mexico's Zapatistas, and the Aymara and Quechan peoples of Bolivia, and the awarding of the Nobel Peace Prize to one of Latin America's foremost Indigenous women, Rigoberta Menchu, signalled new levels of Indigenous engagement and visibility in Latin America which impacted on Indigenous movements throughout the world. During the same period, the increasing influence of new forms of liberalism had a proscribing influence that shaped these relationships in problematic ways. In January 2006 in Bolivia, the presidential inauguration of the Indigenous leader of a nationally unified movement which was reclaiming control over Bolivia's natural resources signalled a new moment in the relationship between the nation state of Bolivia and Indigenous peoples, giving effect to the right of Indigenous peoples to control their own natural resources and to open new possibilities for deepened, more inclusive forms of democracy. Two of Morales' key policy planks are economic prosperity and the re-nationalization of resources. The re-nationalization of oil development and its removal from the control of foreign interests is integral to these aims.

In both Canada and Aotearoa New Zealand, a number of prominent Indigenous leaders advocate for participation in oil development, provided it is done 'sustainably'. Indeed, as the

excesses of laissez-faire capitalism deposit their legacy of toxification into the lands and water on which many Indigenous communities depend, the choice not to engage likewise becomes almost impossible to sustain. As Jeff Corntassel asks,

> what happens when the medicines, waters, and traditional foods that Indigenous peoples have relied on for millennia to sustain their communities become contaminated with toxins? What recourse do we have against those destructive forces and entities that have disconnected us from our longstanding relationships to our homelands, cultures and communities? (Corntassel, 2012, pp. 87-88)

David Kepue Ole Nkediany similarly asks, "how far can Maasai change but still be Maasai?" When livelihoods, lifestyles and place all change, then how is identity, culture and resilience maintained" (as cited in Brown, 2015)? At the heart of this dilemma is the tension between rights and responsibilities, between economic development and participation in the benefits of globalization, and preservation of the lifeworld in a time of unprecedented ecological and economic crisis.

In a time when the demand for the world's remaining resources, combined with new technologies to extract previously inaccessible resources in the remotest regions, are putting even the most isolated minorities and Indigenous peoples under increasing threat from governments and private companies wanting to profit from the resources found on or under their lands, the supremacy of market-based capitalism coupled with what can only be described as a frenetic and frantic last grab at the diminishing (and, due to melting ice and permafrost, newly-accessible) minerals propels renewed policies of exclusion and disenfranchisement. From the point of view of investors, Indigenous communities that oppose destructive policies of excessive natural resource exploitation

represent one of the greatest stumbling blocks to 'realizing' these assets. For states, there are two possible responses, either reincorporation of Indigenous communities into market capitalism or new forms of dispossession and extinction through legislation. Reconciliation strategies that result in the extinction of Indigenous claims to rights achieve both, as do benefit-sharing agreements which exchange rights to customary practices of sustainability for income-generation. For Indigenous communities similarly, there are two broad sets of responses, accommodation with a view towards greater economic self-determination, or resistance. Between each end of the scale, of course, lies a much more nuanced range of responses, including "transformation from within" in the classic master's house and tools approach. Tully accurately identifies critical problems with this approach. When these tactical approaches are viewed alongside the corresponding way in which imperial power is informally exercised, these forms of resistance model the ways in which subalterns are "conscripted" to "unwillingly play a role in developing these imperial relationships" (Tully 2008b, pp. 162).

As the realities of increasingly fragile ecosystems, the severity of droughts, increasingly high temperatures and devastating storms demonstrate, the time for nuanced responses and endeavours to transform 'from the inside' may have run out. For if there is a single signifier of the abject failure of globalization in the twenty-first century, it is surely the damage that has been wreaked upon the earth's biodiversity, and the consequential fragility of sustainable life on this planet. Against the backdrop of the commodification of the biosphere and the ongoing excesses of global capitalism's reach into local economies, the failure of neoliberal globalization to bring promised benefits to Indigenous peoples or indeed, to the overwhelmingly largest percentage of humanity is best demonstrated by the enormity of the triple

crisis of sustainability. The extreme by recent reports such as the 2012 World Bank report entitled *Turn Down the Heat: Why a 4°C Warmer World Must be Avoided* which notes that countries' current emission pledges and commitments are alarmingly inadequate and "would most likely result in 3.5 to 4°C warming, emphasizing that this would be "marked by extreme heat-waves, declining global food stocks, loss of ecosystems and biodiversity, and life- threatening sea level rise." In May 2013, new research from Europe showed that a 4fflC global temperature rise is well within the range of possibility this century, the cost of which will mean 'human disaster' for the planet and includes the effect of the world's oceans reaching their capacity to absorb much of the world's carbon pollution creating "catastrophe across large swaths of the Earth, causing droughts, storms, floods and heatwaves, and drastic effects on agricultural productivity leading to secondary effects such as mass migration." In November 2013, a group of scientists led by Jim Hansen declared that the agreed limit of 2fflC of global warming places the survival of humanity at extreme risk (Hansen et.al., 2013). The recognition of Indigenous people's knowledge and contributions to a more sustainable way of living represented in frameworks such as the UN Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) are of course, critically important. Yet in themselves, as measures that will effectively engage Indigenous communities in the addressing the crisis of existence with which humanity is confronted, they are insufficient. Nothing less than the full and equal participation of Indigenous peoples in polices and strategies to combat escalating global climate change will achieve any just and effective means of achieving climate justice and environmental sustainability.

While continuing to engage with nation-states and the global institutions of world governance, Indigenous peoples are not waiting on these institutions for this recognition. As the state-centric world system continues to fail indigenous communities and the financial/industrial/militarist lynchpins of capitalism's global architecture falter, there is an identifiable surge in the transversal movements of Indigenous peoples' resistance. The resurgence of Indigenous movements is predicated not only on the recognition of Indigenous self-determination. At a more fundamental level, it calls for the restoration of the relationship between human beings and the lifeworld, for a profound recognition of our deep interconnectedness across all species and for the recognition of the sacred in all things. Resilience, on this account, is the stand by Indigenous peoples who put their bodies on the line to protect the rights of nature. Resilience is the re-enacting of deep sacred connection. Looking towards an uncertain and increasingly problematic future, it is perhaps our best hope for survival.

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Robust Action Strategies for Tackling the World's Grand Challenges

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ABSTRACT

Organizations are increasingly interested in contributing to so-called grand challenges such as climate change and poverty alleviation. In this chapter, excerpted from "Tackling Grand Challenges Pragmatically: Robust Action Revisited" (Ferraro et al., 2015), we summarize a novel approach to addressing the world's grand challenges based on the sociological concept of robust action. Grounded in prior empirical organizational research, we identify three robust strategies that organizations can employ: participatory architecture, multivocal inscriptions, and distributed experimentation. We demonstrate how these strategies operate, the manner in which they are linked, the outcomes they generate, and why they are applicable for resolving grand challenges. For those readers interested in a fuller exposition, we suggest consulting the original article (Ferraro et al., 2015) as well as a companion article that ex-

1 The authors contributed equally to this chapter. It is excerpted and adapted from Ferraro, Etzion, and Gehman (2015) and reprinted by permission from Sage Publishing. The original article won the 2017 Roland Calori Prize for the best paper published in *Organization Studies* during 2015-2016. Subsequent work has explored the usefulness of robust action strategies in several sustainability related contexts (e.g., see Etzion, Gehman, Ferraro, & Avidan, 2017).

amined the relevance of robust action strategies in three sustainability related contexts and compared our theory of robust action strategies with alternative management approaches (Etzion et al., 2017).

THE COMPLETE ESSAY CAN BE FOUND ONLINE AT:
https://ssrn.com/abstract=3129512
or
https://www.researchgate.net/publication/323178494_Robust_Action_Strategies_for_Tackling_the_World's_Grand_Challenges

Can Environmental Ethics Embrace Socio-Ecological Resilience?

Jennifer Welchman

ABSTRACT

The Environmental Ethics community has been unified in its opposition to the dichotomies of humanity and nature and of social and ecological communities entrenched in traditional Western thought. In place of these traditional dichotomies, environmental ethics emphasizes linkages and networks of dependence within and between the species and processes composing the environments in which we live in order to undermine destructive presumptions of human superiority over the rest of nature. So one might have expected that the recent emergence of socio-ecological concepts of resilience would be welcomed by environmental ethicists. Unlike earlier concepts of social resilience, socio-ecological resilience does not treat ecological restoration and social system restoration as disconnected or dichotomous. But no general embrace of the concept has occurred.

In this paper I will discuss sources of ethical resistance within several different branches of the environmental ethics community; including Biocentrism, Ecocentrism, and Weak Anthropocentrism (or Environmental Pragmatism). While I concede that some Biocentrists n and some Ecocentrists may be unable to embrace this concept of resilience, I argue that nothing about the concept should make it unacceptable for

the more pragmatic Weak Anthropocentrist majority—including those such as O'Neill, Holland, & Light who argue that some wild species and environs might be irreplaceable even for human flourishing. Nevertheless, the ethical concerns responsible for resistance within some branches of environmental ethics should not be ignored. It is vital that the environmental ethics community (among others) engage with proponents of socio-ecological resilience to ensure the concept does not devolve into a simplistic economism for which resilience requires no more than conservation of instrumentally valuable resources and ecosystem services. Environmental philosophers will not be able to play this useful role unless they are prepared to engage in the development of this concept of resilience going forward.

Introduction

Environmental ethics is as diverse a scholarly community as any in philosophy. Disagreement is common about most of the questions around which the field is organized: what the ideal moral relationship of humans should be to other species of life, to biotic communities, and to our environmental as a whole. Despite these internal disagreements, the community has been unified in its opposition to several dichotomies entrenched in traditional Western thought: humanity versus nature, social versus ecological communities, which underwritten extinction of wild species and degradation of ecosystems in the service of human interests. In place of these dichotomies, environmental ethics emphasizes linkages and networks of dependence within and between the species and processes composing the environments in which we live in order to undermine the presumption of human superiority over the rest of nature.

In view of this, one might suppose that the recent emergence of socio-ecological concepts of resilience for disaster

management and community planning would be welcomed by environmental ethicists as a marked improvement over earlier concepts that treated ecological and social resilience as differing in kind and largely irrelevant to one another. Socio-ecological concepts of resilience do not treat ecological and social system restoration as disconnected or dichotomous. Take for example the position adopted by the Resilience Alliance, which defines resilience as

> The capacity of a social-ecological system to absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and functions. It describes the degree to which the system is capable of self-organization, learning and adaptation (Holling 1973, Gunderson & Holling 2002, Walker et al. 2004). (n.d.)[1]

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1 Resilience Alliance.Org: visit https://www.resalliance.org/resilience. For background on the Resilience Alliance, see Carl Folke, "Resilience: The emergence of a perspective for social–ecological systems analyses," *Global Environmental Change*, 16 (2006) 253-267. See also John M. Anderies, Marco A. Janssen, and Elinor Ostrom, (2004), "A framework to analyze the robustness of social-ecological systems from an institutional perspective," *Ecology and Society* 9: 18. [online] URL: http://www.ecologyandsociety.org/vol9/iss1/art18/; Fikret Berkes, (2007), "Understanding uncertainty and reducing vulnerability: lessons from resilience thinking," *Natural Hazards*, 41, 283–295; and Timothy J. Foxon, Mark S. Reed and Lindsay C. Stringer, (2009), "Governing long-term social-ecological change: What can the resilience and transitions approaches learn from each other?," *Environmental Policy and Governance*, 19, 3-20. On trade-offs and socio-ecological system resilience see Marco A. Janssen and John M. Anderies, (2007), "Robustness Trade-offs in Social-Ecological Systems," *International Journal of the Commons*, 1, 43-65 and Jon Paul Rodríguez, T. Douglas Beard, Jr., Elena M. Bennett, Graeme S. Cumming, Steven J. Cork, John Agard, Andrew P. Dobson, and Garry D. Peterson, (2006), "Trade-offs across space, time, and ecosystem services," *Ecology and Society*, 11(1), 28. [online] URL: http://www.ecologyandsociety.org/vol11/iss1/art28/

In addition, not only do socio-ecological concepts of resilience acknowledge human dependence on the natural environment, they typically recognize ecological integrity as a component of resilience. As Smith and Stirling (2010) note,

> In social-ecological systems research, the objective is usually to support resilience in existing desired systems or, less frequently, transform such systems into more desirable states .... Perspectives may differ, often implicitly, on the detail, but the desirability of states is typically judged in terms of the normative qualities highlighted in sustainability debates. These comprise various dimensions of human well-being, social equity, and ecological integrity. These qualities are addressed primarily in terms of a localized social-ecological setting.[2]

As this definition combines elements of earlier ecological and social conceptions of resilience, one might suppose the environmental ethics community would embrace these newer hybrid concepts of resilience and approve their use in guiding planning for the challenges that global climate change will pose sustainable socio-ecological communities in the future. Acceptance, however, has not been either philosophically unproblematic or widespread.

Resistance to Socio-ecological Conceptions of Resilience in the Environmental Ethics Community

It was inevitable that there should be some theorists of environmental ethics who would not consider socio-ecological resilience an adequate conception of resilience for community and regional planning. Proponents of some non-anthropocentric

2 See also Fikret Berkes, (2007), "Understanding uncertainty and reducing vulnerability: lessons from resilience thinking," *Natural Hazards, 41*, 283–295.

value theories, such as Biocentrism and Ecocentrism, have commitments at odd with the kind of value socio-ecological resilience concepts grant ecological integrity and/or other species of life.[3] Biocentrists consider all living beings independently inherently valuable simply in virtue of being alive. Because they believe every living being, human and non-human, has interests in maintaining their lives and fulfilling their goals, biocentrists argue that we should assign the same respect to the interests of other species that we assign the corresponding interests of our fellow human beings.[4] Biocentrists differ on the question of whether human interests should be granted greater moral significance than those of sentient non-human animals or non-sentient life. However, Biocentrists of all stripes would agree that at the very least, we should avoid hindering the interests of living beings whose continued existence does not threaten our own. The problem with socio-ecological concepts of resilience from Biocentric perspectives is that they do not assign the diverse nonhuman species with whom we share ecological systems inherent moral worth. *Biodiversity* of non-human species is recognized as instrumentally valuable, that is, valuable to the extent it supports ecosystem services important to human beings. Imagine that an ecosystem service significant to us (carbon dioxide capture and storage) could be enhanced by human manipulation of other living beings

3 I shall only be briefly introducing these two families of environmental ethical theorizing. For an excellent general introduction to the field, see Andrew Brennan and Yeuk-Sze Lo, "Environmental Ethics", *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition), edited by Edward N. Zalta, https://plato.stanford.edu/archives/win2016/entries/ethics-environmental.

4 See Paul Taylor, (1981), "The Ethics of Respect for Nature", *Environmental Ethics*, 3, 197–218 for an early influential argument for Biocentrism. For a general introduction from a leading contributor to the field, see Robin Attfield, (2016), "Biocentrism", *The International Encyclopedia of Ethics* [online version], 1–10. DOI: 10.1002/9781444367072.wbiee670.pub2

whose existence does not threaten our own, perhaps by genetically engineering trees to increase their absorption of carbon dioxide. Provided such a strategy increased the socio-ecological resilience of human communities, the fact that genetic alterations to the trees' natural genomes would hinder and distort their natural life processes would not be morally problematic.

Ecocentrists, unlike Biocentrists, consider species and ecosystems to be self-maintaining systems analogous to living organisms, thus they argue species and ecosystems as wholes ought also be recognized as having interests in survival meriting moral respect.[5] For Ecocentrists, a further problem with socio-ecological concepts of resilience is that the values assigned ecological integrity are also primarily instrumental. Or to put it another way, it is the set of ecosystems services an ecological system provides that is valued, rather than ecosystems themselves. As Marion Hourdequin notes,

> The idea of ecosystem services, when first introduced, served to awaken us to the wonder of the natural world. Discussions of the pollination "services" of bees and other insects, for example, drew our attention to the surprising and remarkable ways in which we depend on nature. Yet dominant contemporary approaches to ecosystem services aim to tame, control, optimize, and market those services. (2017, p. 458)

5 Aldo Leopold's discussion of what he called a "Land Ethic" in *A Sand County Almanac* (first published in 1949) has been a continuing source of inspiration for Ecocentrism in North America (*A Sand County Almanac*, New York: Oxford University Press, 1987). Leopold's suggestions were subsequently developed as a holistic philosophical ethical theory by philosophers such as J. Baird Callicot and Holmes Rolston, III. For foundational discussions, see in particular Rolston's (1985), "Duties to Endangered Species," *Bioscience*, 35, 718-726 and *Environmental Ethics: Duties to and Values in the Natural World*, Indiana: Temple University Press, 1988. See also Callicott's *In Defense of the Land Ethic: Essays in Environmental Philosophy*, Albany: SUNY Press 1989).

The consequences can be dire. As Aldo Leopold pointed out, when we assess non-human species or other components of ecological systems solely in terms of the ecosystem services they provide us, we are apt to find that many play no significant role whatsoever. "Of the 22,000 higher plants and animals native to Wisconsin," he remarked, "it is doubtful whether more than 5 per cent can be sold, fed, eaten, or otherwise put to economic use" (1987, p. 210). If an important ecosystem service for a human community could be enhanced by a development plan that would extirpate a species of insect of little significance for supporting any important ecosystem service, presumably extirpating that insect would not result in a diminution in scoring for socio-ecological resilience. Because socio-ecological concepts of resilience do not give adequate recognition or respect to the intrinsic value of natural ecological systems, many Ecocentrists would prefer to retain distinct concepts of social and ecological resilience but with the caveat that the resilience of a social community should not automatically take precedence over the resilience of ecological communities where they overlap. Or as Felipe Barvo Osorio puts it (reformulating Leopold's famous Land Ethic Principle), "A thing is right when it tends to preserve the resilience of the biotic community. It is wrong when it tends otherwise" (2017, p. 121).

Some Ecocentrists, like some Biocentrists, may be able to countenance adoption of socio-ecological strategies for making human communities and their natural environs more resilient in the future—all depending upon how they interpret the central principles of their ethical positions. But as versions of each theory provide principled grounds for rejecting these strategies, others will not. Thus some Biocentrists and some Ecocentrists will never be able to embrace them. However most within the environmental ethics community are neither Biocentrists or Ecocentrists. The majority are "Weak

Anthropocentrists," that is, theorists who understand ethics as a system designed to ensure recognition and protection of the rights and/or interests of human beings, but who also extend ethical concern to the welfare of sentient animal life.[6] Since Weak Anthropocentrists do not share the value commitments which account for Biocentrists' and Ecocentrists' resistance to socio-ecological resilience as a goal for regional and community planning, one might expect that Weak Anthropocentrists would welcome replacement of dichotomous conceptions of social and ecological resilience in favour of a more unified conception that incorporates elements of both. Yet even the most 'pragmatic' of environmental theorists in this camp hold positions that make this ethically problematic.

In *Environmental Values*, three leading "Environmental Pragmatists," John O'Neill, Alan Holland and Andrew Light, argue that "while our environmental crisis might require radical changes to political and economic institutions, there is no reason to assume it requires a new [nonanthropocentric] ethic" (2008, p. 8). What we need are concepts of value that better reflect the plurality of goods we realize through "our everyday encounters with human and non-human beings and environments" (2008, p. 8). Taking their cue from Aristotle, the authors argue that encounters with particular environments are essential for at least one important constituent of human flourishing, the good of 'self-comprehension.' This, they explain is the ability to make sense of one's self *as* a being maintaining a continuous identity through a lifetime. They argue that we achieve this through the construction of coherent narratives about ourselves and our lives; narratives that require the back-

6 So called "strong" anthropocentrists either hold that human beings have no ethical duties towards nonhuman beings or hold that the rights and interests of human beings always outweigh the ethical importance of any interests that members of non-human species may possess. For an early foundational discussion, see Bryan Norton, (1984), "Environmental Ethics and Weak Anthropocentrism," *Environmental Ethics*, 6, 131-148.

ground of "a larger narrative context of what happens before us and what comes after," to provide our own narratives stability and context. Natural entities and environs play a key role because "they embody that larger context" (2008, pp. 198 & 163). This leads them to conclude that the persistence of certain natural entities and environs are *irreplaceable* for achievement of this ingredient of human flourishing. Of course, our ability to make sense of ourselves and lives will not unravel if we do not restore every disturbed natural environ to roughly its condition prior to disturbance. But if we were to freely alter and adapt our natural environs whenever we thought fit, we could lose the basis for a central constitutive good of human life. For these Environmental Pragmatists (and any who accept their arguments), socio-ecological concepts of resilience that do not incorporate some strong preservationist commitments will be ethically problematic goals for social policy-making and planning on (weak) anthropocentric grounds.

I shall argue that if theirs is the strongest case against adoption of planning policies targeted at socio-ecological resilience, there is no good reason why the majority of environmental ethics community should not do so. Close examination of their arguments suggests natural entities and environs are *not* irreplaceable constituents of human flourishing in sense their argument requires. I will argue that their conclusion is premised on what I take to be a conflation of two kinds of narratives—historical and heritage—that when disentangled, entail quite the reverse. If I am correct, then there are no reasons why for mainstream environmental ethics should not embrace socio-ecological resilience concepts and objectives. In what follows, I will briefly review the arguments O'Neill, Holland and Light put forward for recognizing self-comprehension as a constitutive good and for supposing that the persistence of certain natural entities and environs is a condition of maintain the good of self-comprehension over time, before offering my reply.

Human Flourishing and Constitutive Goods

For those unfamiliar with the category of 'constitutive' goods, a brief explanation may be necessary. In *Nicomachean Ethics*, Aristotle notes that while the things we pursue as good are plural, they can be grouped into three categories by reference to the reasons we have for judging them good: instrumental, intrinsic (or 'final'), and constitutive (1934, 1096a). He writes:

> Since there are evidently more than one end, and we choose some of these (e.g. wealth, flutes, and in general instruments) for the sake of something else, clearly not all ends are final ends; but the chief good is evidently something final...Now such a thing *eudaimonia* [flourishing or happiness] ... is held to be; for this we choose always for [its]self and never for the sake of something else, but honor, pleasure, reason, and every virtue we choose indeed for themselves (for if nothing resulted from them we should still choose each of them), but we choose them also for the sake of *eudaimonia*. *Eudaimonia*, on the other hand, no one chooses for the sake of these. (1934, 1097a)

Pure instrumental goods are things we would not desire absent belief in their utility for obtaining other things we want. Intrinsic (or 'final') goods are ends of courses of action pursued for their own sakes, such as pleasure, health, friendship, and *Eudaimonia* (a flourishing life.) Pure intrinsic goods, such as *eudaimonia*, are desired solely for their own sake. However, other intrinsic goods, such as pleasure, health, and friendship, though desired for their own sakes, are also desired as *constitutive* of pure intrinsic or final goods, such as *eudaimonia*.

Constitutive goods aren't external means to a good or flourishing life, they are parts or ingredients of what is to

flourish as a human being.[7] This gives us an additional reason to pursue them, over and above their intrinsic goodness to us.[8] Moreover some constitutive goods may be considered *objective* constitutive goods as their goodness would seem to be a matter of fact rather than personal taste. This is because the ingredients of a flourishing human life are partly determined by our species' biological and psychological make-up. We human beings do not flourish, whatever our tastes, if we cannot obtain instrumental goods such as food, water, and shelter. Similarly, we do not flourish, whatever our tastes, when we are 1) denied social relationships, 2) deprived of aesthetic or intellectual stimulation, or 3) denied opportunities to realize the internal goods of culture. Loneliness, boredom, and alienation may not physically kill us outright (as do starvation, dehydration, and hypothermia), but they can so diminish the goodness of a life that it is no longer worth living. Thus just as some instrumental goods are objective instrumental goods for human being generally, so also some constitutive goods are objective constitutive goods for human beings generally—things worth having for their own sake but also as essential constituents of a minimally flourishing human life.

Knowledge, beauty, culture, and friendship have long been acknowledged as goods objectively constitutive of flourishing

7 The distinction be can be illustrated by comparing the ingredients of a cake with the utensils and tools used to make it. Spoons, mixing bowls, cake pans, and the oven in which a cake is baked are all external to the cake, playing a merely instrumental role in creating it. By contrast, the ingredients, the flour, eggs, sugar, and flavorings of which the cake batter is composed are not external to the finished product nor do they play an instrumental role in creating it. These ingredients are constitutive of it. Moreover the goodness of the final product is a function of the goodness of the ingredients constituting it.

8 Because constitutive value arises from part-whole relations, it is not unrelated to, but nevertheless distinct from, the notion of 'contributory value' that Ben Bradley (2001) presents in "The Value of Endangered Species", *The Journal of Value Inquiry*, 35, 43–58.

for human beings. This is why we expect parents to take pains to ensure their children become able to realize these goods by fostering their curiosity, developing their aesthetic sensitivity and tastes, engaging them with cultural practices, and encouraging social relationships. Self-comprehension, the capacity to make coherent sense of one's self and one's life has not been recognized as a constitutive good of human flourishing for the same length of time, but according to O'Neill, Holland, & Light, it is no less valuable for that. And in so far as particular natural entities or environments enable or provide the material bases for realizing any of these objective constitutive goods, concern for our own and future generations' flourishing gives us moral reasons[9] to protect and maintain a range of these sorts of entities and environments, even if they had no identifiable instrumental value. This would not of course require us to preserve every instance of such entities or environs or preserve them in essentially the same condition. If, for example, future generations are to have the opportunity to become literate in their cultural and scientific traditions it will be necessary to ensure that books and scientific archives are preserved for them. But it wouldn't be necessary to preserve every book ever written or every archive created. Nor would it matter whether their form changed over time; if physical books and archives were passed on in electronic digital form.

The Irreplaceability of Environs for Self-Comprehension

According to O'Neill, Holland, & Light, however, this is not the case for entities and environs essential for realizing the constitutive good of self-comprehension. If we are to fulfill our duty of care for future generations, we must sustain *specific,*

9 Concern generated by such general principles of moral obligation (or moral virtues) such as of benevolence, non-malevolence, and justice, as seem applicable to our relations with one another and our future descendants.

particular species and environs, those that are irreplaceable as embodiments of the larger narratives we require as contexts for our own. Because faithful pursuit of socio-ecological resilience would allow trade-offs among species and adaption of environs to our needs, we cannot rely on policymakers or planners focused on community resilience so defined to preserve irreplaceable species or environs.

What makes an entity or environ "irreplaceable" for self-comprehension? The authors suggest that irreplaceability for narrative purposes is a matter of a thing's history. They write:

> Many things ...we value not merely as a cluster of properties but as particular individuals individuated by a temporal history and spatial location ... Thus while in general I may simply value a hammer as an object that does a job well ... I may value this particular hammer even with its frustratingly loose head, because this hammer was passed on to me by my father who was given it by his grandfather ... I attach a particular significance to these objects, and that ... is a matter of their history. For that reason, things like this are said to be irreplaceable, and their loss matters in a way that the loss of other functional objects does not. The loss of my grandfather's hammer matters in a way that the loss of a hammer I bought yesterday does not. The latter I can replace, the former I cannot. It has no substitute. (O'Neill, Holland, & Light 2008, p. 145).

They argue that environments become to be irreplaceable in the same way. A recreated forest may perform the same functions as the forest it replaces, but would not have the same overall value,

> since its history would be different. It is the particular forest with its particular historical identity, bearing the im-

> print of the lives of a community that went before us, that gives the place its significance in our lives today. No reproduction would do. (O'Neill, Holland, & Light 2008, p. 146).

As Erich Matthes notes, as it is presented, this argument proves too much. Everything is individuated by its own history, so it would follow that absolutely "everything is meaningfully irreplaceable," an inconvenient entailment that Matthes calls the "proliferation problem" (2013, p. 39). If we are to avoid this problem, something else *about* the history must play an essential role in individuating objects in the relevant sense. For example, if the hammer in question hadn't actually been used by four generations of one family, but lain forgotten, gathering dust in an attic corner, would we be tempted to consider it irreplaceable? Surely not! The kind of history that individuates the authors' hammer is one intertwined with many histories. Why does that matter? Presumably because such a history would fit an entity (like this hammer) to serve as a stable point of reference around or upon which multiple overlapping narratives can be coherently integrated. An environment like a forest whose history is intertwined with that of a community is presumably fitted to serve the same purpose.

This seems plausible. If there were no common points of reference enduring through the lives of succeeding generations, it is unclear clear how shared social narratives could be constructed or how individual narratives could be "placed" within them. Happily, this solution also resolves the proliferation problem. What meaningfully individuates a thing as a particular of irreplaceable value for individual or collective self-comprehension is that it appears within—and so can anchor together—multiple narratives, keeping them from disassociating and drifting away on random, unrelated courses. If they do, then they will have a constitutive value over and above any instrumental value they possess, one that warrants preserving them.

Why the Irreplaceable Argument Fails

It's an attractive solution but unfortunately it won't do. Its initial plausibility rests on a conflation of two distinct kinds of narratives: historical and heritage. As David Lowenthal has pointed out, while these two kinds of narratives often overlap, they have distinct characters and purposes. Historical narratives are descriptions meant to reflect past reality. Heritage narratives, on the other hand, are normative and didactic tales presenting characters and events as integral for formation of a group's collective identity. As such, Lowenthal argues, their function isn't to give us "a testable or even reasonably plausible account of some past" (1998, p. 121). It is to make vivid those characters and events, associated with a particular group, which it takes to be significant for the formation of its members' personal and social narratives. As such, heritage narratives have no necessary relationship to empirical facts of a group's history.

Authentic *historical* relicts of the past are of irreplaceable value for historical narratives because historical narratives are meant to be true descriptions of events we cannot now observe. Since we cannot rely on the evidence of our senses we must rely on the evidence of 'things' that have survived from the past. By contrast, *heritage* narratives are normative not descriptive. They do not require evidence, thus historical relicts do not have irreplaceable value for the heritage narratives to which we turn when trying to coordinate and integrate our own and others' narratives.

Historical relicts can be useful for heritage purposes. It's a commonplace that authentic historical relicts can be very effective in facilitating vivid imaginative connection with the persons, places, or events with which a particular narrative would have us identify. But note that the value in question is a functional or instrumental value—and thus replaceable. And experience confirms this. Historical reconstructions can work

just as well as genuine antiques for heritage purposes. Consider the popularity of reconstructions such as Nova Scotia's Habitation, Plymouth, Massachusetts' Plantation, London's Globe Theatre, and Poland's Old Warsaw, each of which foster imaginative engagement with the characters and events of heritage narratives without reliance on genuine antiques.

As heritage narratives are not obliged to conform to past reality, the characters and events they valorize are often fictional and thus have no relicts. In these cases, artful configuration of a space set aside for imaginative engagement can be helpful for heritage purposes, such as, Prince Edward Island's Ann of Green Gables House and London's 221B Baker Street Museum, spaces cleverly configured to facilitate vivid engagement with the characters of 19th century fictions. But strictly speaking neither particular relicts nor artful configurations of space are actually necessary for vivid imaginative engagement. Take for example Nova Scotia's Grand Pré, now a world heritage site, which first became a tourist destination thanks to the success of Henry Wadsworth Longfellow's 1847 poem, *Evangeline*.[10] Delighted by its depiction of peasant life in the 18th century Acadian village of Grand Pré, readers travelled to Nova Scotia to better immerse themselves in the world of the poem; hoping to walk where Evangeline was said to walk, looking seaward, as Evangeline might done, over the long lost Acadians' verdant fields, and listening to the wind in Longfellow's "forest primeval" with its "murmuring pines" and "hemlocks," standing "bearded with moss," "like Druids of eld," which Longfellow assured them still remained to mourn the Acadians' departure from Grand Pré, "While from its rocky caverns the deep-voiced, neighboring ocean, speaks, and in accents disconsolate answers the wail of the forest" (2000).

Even readers who mistakenly supposed Evangeline had

10 See Ian McKay and Robin Bates, *In the Province of History, the Making of the Public Past in Twentieth Century Nova Scotia* (Montreal & Kingston: McGill-Queen's University Press, 2010).

been a real person could not make the further mistake of supposing they would find her relicts at Grand Pré. Longfellow's poem made it perfectly clear that "naught but tradition remains ... of Grand-Pré," as it described the villages' destruction by British colonial authorities in 1755. Local tradition put the village site near a stand of elderly French willows adjacent to the stonework of a disused well (none dateable to the Acadian period) so that's where early visitors went. What would they have seen or heard? Not the Bay of Fundy, for the site is too low and too far away. There would be verdant fields before them, but thanks to extensive redevelopment, these fields did not resemble any Evangeline could have seen, had she existed. And as for the poem's most striking visual image, the primeval forest of evergreen pines and hemlocks? It never existed. If Longfellow had ever visited Grand Pré, he would have realized that the surrounding forests were deciduous, bare in winter and a blaze of color in the fall. Nevertheless, visitors routinely left well satisfied. To encourage interest in less imaginative tourists, various additions were made to the site over time, including a statute of Evangeline, a cross, and a memorial chapel.

Longfellow's popularity has faded but Grand Pré remains a top Canadian heritage destination. The Acadian diaspora visits—as do the descendants of the Empire Loyalists and other Anglo-American settlers who had replaced the Acadians. Memorials to these succeeding waves of immigrants have since been added to the site, as well as a Visitors' Centre celebrating Acadian history. But the village of Grand Pré has not itself been recreated. Parks Canada realized that the site's drawing power isn't a function of what it contains but simply what it is: a space set apart for imaginative engagement with whatever heritage narrative, actual or mythical, visitors bring to it. This should not surprise us. Heritage narratives aren't embodied in things, but words. It wasn't relicts of the Trojan wars that anchored Greek identity for centuries; it was

the retelling of Homer's *Illiad*. All one has to do to sustain a heritage narrative is to retell it.

Since neither natural species nor environs ever play irreplaceable roles in sustaining *heritage* narratives of collective identity, the kind of trade-offs and adaptions that might be proposed in the interests of achieving socio-ecologically resilient communities would not seem to pose threat to their sustaining either the community's collective identity or the personal self-comprehension of their members over time.[11] Justice to future generations of human and sentient animal life does not require us to leave every remaining wild place untouched, however important the resources that could otherwise be developed, nor preserve every wild species (even the human botfly or guinea worm), however undesirable their contribution to the resilience of the human and animal communities where they occur.[12]

Conclusion

Environmental Pragmatists O'Neill, Holland, & Light are right to remind us that there is more to human flourishing than subjective satisfaction and the instrumental goods by which subjective satisfaction is achieved. Thus if socio-ecological concepts of resilience are taken up by policymakers, it will be vital for the environmental ethics community (among

11 Some may be irreplaceable as evidence for historical narratives, in particular those historical narratives that are also When religious narratives. For some such narratives, an entity or environ may be irreplaceable for the continuance of the narrative and its role in helping to form and anchor personal self-comprehension. While there are several plausible examples in North America of places that might be said to be irreplaceable for religious/spiritual historical narratives, the total number would make up a very small percentage of the North American landscape.

12 Each species is the target of on-going eradication efforts that do not seem unjustified, given the suffering each causes its human victims and the absence of reasons to suppose the extinction of either one would lead to a collapse of the ecosystems in which it occurs.

others) to engage actively in discussions of socio-ecological resilience to ensure the concept does not devolve into a simplistic economism for which ecological resilience requires no more than conservation of instrumentally valuable resources and ecosystem services. Environmental philosophers will not be able to play this useful role unless they are prepared to engage in the development of this concept of resilience going forward. Fortunately, there would appear to be no ethical reason why the majority in the environmental ethics community should not do so.

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Intersections of Sustainability: Transdisciplinary Research Network on Climate Change, Water Governance and Futures

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