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Divergent Perspectives on Water Security: Bridging the Policy Debate

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Environmental policy discussion is replete with references to water security, food security, ecosystem health, community resilience, sustainable development, and sustainable urbanism. These terms are, by their very nature, ambiguous and difficult to define; they allow room, however, for a variety of actors to conceptualize water, food, ecological, economic, and urban problems in ways that allow them to move forward on contentious issues. This article focuses on the idea of water security and asks how it is conceptualized and used for regional policy debate in western Canada. We asked fifty-eight water stakeholders from the Saskatchewan River Basin to define water security, identify major barriers to security, and prioritize water problems. Responses showed there are myriad ways to think about water security, ranging from narrow conceptualizations, such as reliability, quality, and quantity, to broader sustainability perspectives about the nature of resource development and its social and economic consequences. The human dimensions of water security (governance, land use, and competing demands) were assigned higher priority than its biophysical aspects (flooding, droughts, and climate change). Framing water security to emphasize the human capacity to manage uncertain and rapid biophysical and societal change offers the opportunity to unite actors who otherwise would be separated by core environmental values, definitions of water security, provincial context (Alberta vs. Saskatchewan), and occupation. **Key Words:** decision context, New Ecological Paradigm, sustainable development, water security.

环境政策的讨论,充满着有关水资源安全、粮食安全、生态系统健康、社群恢复力、可持续发展,以及可持续城市主义等指涉。这些概念本身是模糊且难以定义的,但却给予了各类行动者概念化水、食物、生态、经济以及城市问题的空间,并使他们得以在争议的议题中推进。本文聚焦水资源安全的构想,探问该构想如何被概念化,并被运用于加拿大西部区域政策的辩论中。我们请萨斯喀温河流域的五十八位水资源利害关系人定义何谓水资源安全、指认安全性的主要障碍,并对水资源的问题进行排序。回应者显示出各式各样思考水资源安全的方式,包含可信度、水质及水量等狭义的概念化,到资源发展的本质及其社经后果等更为广泛的可持续性观点。水资源安全的人类面向(治理、土地使用,以及竞争的需求),被赋予较其生物物理面向(洪泛、乾旱及气候变迁)更高的优先性。将水资源安全构思为强调人类管理不确定性和快速的生物物理及社会变迁的能力,提供了团结行动者的契机,否则这些行动者可能会因为不同的环境核心价值、水资源安全的定义、各省的脉络(阿伯塔省对抗萨斯喀温省),以及职业差异而分崩离析。 **关键词:** 决策脉络, 新生态典范, 可持续发展, 水资源安全。

La discusión sobre políticas ambientales está repleta de referencias a la seguridad hídrica, la seguridad alimentaria, la salubridad ecosistémica, la resiliencia comunitaria, el desarrollo sustentable y el urbanismo sustentable. Por su propia naturaleza, estos términos son ambiguos y difíciles de definir; sin embargo, ellos le hacen campo a una variedad de actores para que conceptualicen sobre problemas hidrológicos, alimentarios, ecológicos, económicos y urbanos, de modo que les permitan avanzar en cuestiones debatibles. Este artículo está enfocado en la idea de seguridad hídrica, preguntándonos como se conceptualiza este asunto y cómo se utiliza en la discusión sobre la política regional en el occidente del Canadá. Le pedimos a cincuenta y ocho personas con interés en problemas del agua de la cuenca del Río Saskatchewan que definieran lo que entienden por seguridad hídrica, identificaran las principales barreras que hay contra la seguridad y clasificaran los problemas del agua. Las respuestas ponen de presente la extraordinaria variedad de opiniones acerca de la seguridad hídrica, desde conceptualizaciones tan estrechas como la confiabilidad, calidad y cantidad, hasta más amplias perspectivas de sustentabilidad acerca de la naturaleza del desarrollo del recurso y sus consecuencias sociales y económicas. A las dimensiones humanas relacionadas con la seguridad hídrica (gobernanza, uso del suelo y demandas competitivas) se les confirió mayor prioridad que a sus aspectos biofísicos (inundación, sequía y cambio climático). El ubicar la seguridad hídrica para enfatizar la capacidad humana en el manejo de cambios sociales y biofísicos, rápidos e inciertos, ofrece la oportunidad de unir actores que de otra manera estarían separados por valores ambientales medulares, por definiciones de seguridad hídrica, el contexto provincial (Alberta vs. Saskatchewan) y la ocupación. **Palabras clave:** contexto decisorio, Nuevo Paradigma Ecológico, desarrollo sustentable, seguridad hídrica.

Water security is an umbrella term for a variety of water-related issues. Cook and Bakker (2012) reviewed the emerging academic and policy literature and identified four water security themes around which policy discussion and research is based: (1) quality and

quantity, (2) hazards and vulnerability, (3) affordability and access, and (4) sustainable development. Emphasis on water quality and availability is the focus of recent scientific assessments of global shortage and potential stress (Falkenmark et al. 2007; Vörösmarty

et al. 2010). A hazards and vulnerability perspective appears in UNESCO-IHE's (Institute for Water Education) definition; it emphasizes protecting water systems against hazards (floods and droughts) and safeguarding water functions and services for humans and the environment (Schultz and Uhlenbrook 2007). Meeting human needs stresses access and highlights inequality; it incorporates the challenge of rising food demands for an increasing global population as portrayed by Rockström et al. (2004) and Forouzani and Karami (2011). The final and most expansive definition, organized around the broad theme of sustainable development, represents water security as "the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risk to people, environments, and economies" (Grey and Sadoff 2007, 547–48).

Broad conceptualizations of water security, including access and sustainability, lead quite naturally to growing interest in the root causes of water insecurity (e.g., shortage, poor quality, and lack of access and affordability). The World Development Report (United Nations Development Programme 2006), *Human Development Report Beyond Scarcity: Power, Poverty, and the Global Water Crisis*, emphasized unbalanced power relations, poverty, and other inequities. Concern for root causes shifts the focus from physical availability and hazards to governance, politics, policy, and why societal institutions at a range of scales are unable to manage water in the face of climate change, population growth, rapid resource development, and changing diets and lifestyles. Power dynamics include control over bargaining and the ability to legitimize local narratives (Cascao and Zeitoun 2010). Inevitably, the water security of some rests on the insecurity of others (Zeitoun 2011). Insecurity also transcends interconnected resource sectors as, for example, between food and water. This issue has been raised in western Canada, where Hurlbert et al. (2009) and Corkal, Diaz, and Sauchyn (2011) observed that the increasing use of water for irrigation agriculture has enabled the region to increase food production and maintain exports but at the cost of potential shortage, and thus insecurity, in the water sector. Water for irrigation agriculture comes at the expense of water for industry, municipalities, environmental flows, and future development. Increasingly difficult choices must be made among sectors, users, and regions; the need to make these choices strains traditional water management frameworks.

The notion of water security has moved beyond academic circles to influence local and regional discourse about water problems and value-based policy decisions. The province of Saskatchewan recently (October 2012) reorganized its water governance structure under the auspices of a new Water Security Agency and is in the process of developing a 25-Year Saskatchewan Water Security Plan (Saskatchewan Water Security Agency 2012). Use of this term begs the question of what water security means for governance and planning. We conducted an online survey of fifty-eight water stakeholders, including farmers, water managers,

scientists, industrial representatives, municipal water providers, watershed stewards, and members of First Nations communities as a prelude to convening four stakeholder workshops to define the decision context for water policy debate and its related science agenda. Survey goals were to (1) elucidate water security themes relevant to water stakeholders, (2) examine relationships between themes and priorities for particular water problems (flooding, drought, water quality, water quantity, competing demands, land-use management, water governance, and long-term climate change), and (3) look for policy spaces where differing perspectives—all under the auspices of water security—converge and form the basis for policy discussion.

Policy Spaces and Decision Contexts

In a set of influential books, political scientists Stone (2002) and Fisher (2003) argued that the policy process is in fact a political contest and debate about core human values and the meaning of basic goals, including equity, efficiency, liberty, and security. Stone claimed that these goals are continuously reconstructed and contested; their varied interpretation is the object of considerable political struggle. Fisher noted that ambiguous terms often play important political functions because they offer a space that allows conflicting actors to find ways to live with their differences. Ambiguity allows actors to blur or hide their differences and assists them in avoiding barriers that would otherwise block consensus. It is possible for people to benefit from the same policy for altogether different reasons. Ambiguous terms such as *water security*, *sustainable development*, and *community resilience* provide opportunities for people with diverse values, motivations, and expectations to reach consensus and move forward on collective action.

The first step in the process of policy debate often involves defining the value-based decision context—the range of concerns about an identified problem, the relative priority associated with each of them, and the competing sectors and their respective roles in the decision process. In a water resources planning context, this might involve values regarding flood control, water storage, lake levels, environmental flows, and risk of shortage. Keller, Kirkwood, and Jones (2010) asked water stakeholders in central Arizona, including representatives of federal agencies, Indian tribes, state entities, local water departments and regional agencies, regional public water providers, private water providers, private sector users, and environmental groups, to list their evaluation concerns and then assign weights to each concern. Results showed substantial diversity in the weighting of concerns across stakeholder groups. Representatives from local water departments and regional agencies emphasized the sufficiency of water supplies, whereas members of environmental groups placed high priority on potential biophysical impacts. Results pointed to the importance of the trade-off between system reliability



Figure 1 Saskatchewan River Basin in western Canada drains a surface area of some 405,000 km²—almost the size of France.

and environmental flows as a basis for public discussion, conflict resolution, and future decision making.

A systematic assessment of stakeholders' concerns has three purposes. First, it allows participants to focus on regionally important problems that are the basis for natural resources policy debate and decision making (Brunner 2010). Second, weighting evaluative concerns enables a refined understanding of how stakeholder priorities differ and allows for detailed follow-up questioning (Feng et al. 2007). Third, evaluative concerns aid in the development of a hierarchy of objectives based on stakeholder input that forms the basis for future planning (Keeney and Raiffa 1975; Keeney 1992; Kirkwood 1997, 1999).

Data and Methods

Our study of the decision context for value-based water policy was based on a survey of fifty-eight water stakeholders from the Saskatchewan River Basin (SRB) who later attended four workshops sponsored by the University of Saskatchewan's Global Institute for Water Security to set the stage for water security research and policy analysis. Two workshops were held upstream in Alberta communities (Kananakis and Medicine Hat) and two were downstream in Saskatchewan (Saskatoon and Cumberland House; Figure 1). Participants self-identified as being engaged in water management in the SRB. They were approached via snowball sampling starting with watershed groups such as the Bow

River Basin Council, South East Alberta Watershed Alliance, and Partners for the Saskatchewan River Basin. Leaders of watershed groups were contacted using a script, and group leaders were asked to forward invitations to their membership to satisfy particular interest groups. Participants included resource (land, forest, fisheries, etc.) managers, farmers, ranchers, urban water managers, scientists, members of environmental groups, and members of First Nations and Métis (Aboriginal people who trace their heritage to mixed First Nations and Europeans) communities.

Workshop participants were asked to complete an online survey that required them to rank a set of pre-defined water security issues. The survey was designed to ensure that rankings ranged from 1 (highest priority concern) to 8 (lowest priority concern). A few participants who could not access the online survey were asked to complete a paper-based version of the same survey prior to the workshop.

The sample contained forty-two men and sixteen women. There were four occupational groups, including government ($n = 27$), nongovernmental organizations (NGOs; $n = 14$), industry ($n = 9$), and other ($n = 8$). Government participants included individuals from federal, provincial, regional, and municipal levels of government, as well as representatives from watershed authorities. Industrial participants included persons involved in research and development, forestry, irrigation, agriculture, power development, and mining. The NGO group consisted of participants from

environmental organizations focused on watersheds, fisheries, advocacy, parks, conservation, wildlife, waterfowl, and wetlands. The “other” category included a homemaker, a biologist, a regional planner, and individuals who did not respond to the occupation question.

Participants responded to two open-ended questions: (1) “What does the term water security mean to you?” and (2) “What are the barriers to water security in the Saskatchewan River Basin?” They were also asked to rank a set of water security concerns consisting of flooding, drought, water quality, water quantity, competing demands, land-use management, water governance, and long-term climate change. Although there is obvious overlap across these categories, water resources problems often are linked and overlapping. Categories capture both the biophysical aspects and human dimensions of water security and cover the broad range of issues mentioned in the academic debate about water security (Cook and Bakker 2012).

We used Dunlap et al.’s (2000) New Ecological Paradigm (NEP) scale to measure the basic environmental attitudes of respondents. The NEP consists of fifteen questions about the essential relationship between humans and the natural environment, including whether we are approaching the limit of the number of people who can be supported globally, whether humans have a right to modify the natural environment, and whether human ingenuity will ensure that we do not make mistakes in managing the environment. These questions have been updated and revised from an earlier version published by Dunlap and Van Liere (1978) and have been used extensively to measure attitudinal change (Dunlap et al. 2000), differences in attitudes across samples (Albrecht et al. 1982; Edgell and Nowell 1989; Pierce et al. 1992), and levels of policy acceptance (Kotchen and Reiling 2000).

The overall NEP score for our sample of respondents was 54.5 (out of a possible 75) with a high score of 71 and low score of 33. Differences in NEP scores were observed, though not statistically significant, between residents of Saskatchewan (56.4) and Alberta (53.0), men (54.3) and women (54.9), and respondents younger than 40 years (56.3) and 40 years and older (52.5). A statistically significant relationship at the 0.05 level was present between employment sectors and NEP scores; industrial representatives had significantly lower NEP scores than those from government and nonprofit sectors (48.6 vs. 55.6, respectively), suggesting that they were less concerned than government and nonprofit workers about the growing capacity of humans to manipulate and control natural systems, potential limits to growth, and the right of humans to rule over nature.

Results

Water Security Definitions

Open-ended answers to the question “What does the term water security mean to you?” emphasized

concepts at either end of Cook and Bakker’s (2012) spectrum, including narrow concerns about water quantity and quality and broader concerns about sustainable development, including what respondents called the *triple bottom line*, the notion of balancing the needs of society, the economy, and the environment. Issues of quality and quantity were reflected in responses that described the importance of “adequate water supply to maintain my business and lifestyle,” “the availability of water to meet the needs of all water users,” and users having “reasonable supply of quality sufficient to meet needs.” Numerous respondents mentioned the importance of reliability in such comments as: “that there is sufficient amount when the water is needed,” “I have good quality water, in sufficient quantity, when I need it,” and “having adequate amount of sufficient quality water in the right time and place.” These comments are consistent with the findings of Rayner, Lach, and Ingram (2005), who studied the work practices and organizational culture of water management agencies and found a consistent privileging of reliability over quality and cost as a management priority. They argued that this stems from the traditional role of water utilities in harnessing an inherently unreliable resource and making it available when urban customers turn on their taps, during critical times in the farmers’ growing seasons, for fish at low stream flow, and to hydroelectric power plants when peak demand occurs. Unfavorable public scrutiny of water agencies often is associated with unreliability, and thus agencies have evolved to eschew negative public attention and engagement.

A substantial number of respondents (53 percent) mentioned the word *sustainability* or alluded to future needs, the triple bottom line or value-based trade-offs. Typical of their responses were “the sustainable, steady access to sufficient supplies of water on a watershed basis that is of acceptable quality for humans, ecosystems and wildlife without damaging the environment,” “that each person has access to clean drinking water and that economic development is sustainable with regard to its impact on water quality and quantity,” and “available supply of safe (healthy) water for ecosystem function and human uses, forever.” Moving beyond even the sustainability theme was a First Nations respondent who defined water security as “safe, accessible, grounded, sacred, natural.”

Although only a few respondents referred explicitly to hazard and vulnerability and access and affordability themes when asked what water security meant to them, many articulated these themes when asked about barriers to water security. The barriers question unleashed concerns about poverty, greed, human values, competing demands, the current system of allocation, governance, inadequate leadership, public understanding of critical water issues, planning, and physical hazards, such as climate change and drought. Three core themes emerged from these answers: (1) outdated and inadequate governance capacity (a multijurisdictional, decentralized system lacking vision and leadership); (2) rapid growth, including

both industrial and residential development and the political culture that promulgates it; and (3) physical hazards, primarily climate change impacts.

Although several participants expressed a single-minded concern for climate, it was more common for people to combine climate with growth or governance in responding to the barriers-to-security question. One respondent, for example, mentioned “climate change, population growth, and lack of public awareness and slow pace of civic/institutional change.” Another worried about “gaps in coordinated planning by all orders of government, and a lack of long-term planning to integrate climate-induced water stress.” Yet another with a more scientific bent talked about the paucity of “knowledge for water science (including climate, infrastructure, management, governance, undervaluation of water, participation, etc.).”

Respondents had deep reservations about the capacity of current legal, regulatory, and planning frameworks to accommodate growth under climate change. One respondent referred to “overallocation; vague governance and lack of transparency in decision making when it comes to license approvals or amendments (including of use); declining flows due to long-term climate change; increasing demands for water; provincial government that refuses to make hard decisions because of fear of political difficulties inherent to it.” Most represented growth in neutral terms, but several held very negative views about the resource development sector. In response to the barriers-to-security question, one mentioned “greed by all of us, particularly oil, gas, and mineral extraction interests.” Another implicated the public sector in this process for “valuing economic growth over inclusive responsibility” and its “drive for economic growth over long-term sustainable communities.”

Viewpoints of local and regional stakeholders echoed larger global themes about the root causes of insecurity referring to “greed,” “poverty,” “competing uses and abuse of such uses,” “ignorance,” “inequitable distribution of water licenses,” and “engrained and inefficient water rights” as barriers to security. It was clear, however, that respondents had markedly different understandings of what water security meant to them and what mechanisms are needed to achieve it. These mechanisms ranged from structural change in the political economy to better enforcement of existing rules and public education.

Water Management Priorities

Respondents were asked to assign ranks from 1 (most concerned) to 8 (least concerned) to the eight water concerns noted earlier (Table 1). Water quality, a long-standing and pervasive issue in western Canada, was the highest rated management concern. Schindler and Donahue (2006, 7210) elsewhere have referred to “an impending water crisis in Canada’s western provinces” where the low-density, multijurisdictional, rural landscape strains water quality. Regulation occurs primarily at the provincial level, except on First

Table 1 *Water concerns as ranking by respondents from 1 (most concerned) to 8 (least concerned)*

Concern	<i>M</i>	<i>SD</i>
Water quality	3.45	1.82
Governance	3.66	2.29
Water quantity	3.83	1.98
Land use change	4.16	2.19
Competing demands	4.57	2.26
Drought	4.93	2.08
Long-term climate change	5.36	2.41
Flooding	6.04	2.09

Nations lands, where regulatory responsibility rests with federal authority. Violations of drinking water standards and boiled water advisories are common in many rural communities and stem from both treatment problems and failure to protect source water through local and regional land management (Patrick 2011; see Figure 2). There also are widespread and visible problems of eutrophication of lakes and rivers. Concern for quality ran the gamut from those who saw water security in narrow quantity–quality terms to those with a more holistic and comprehensive view of quality. One such respondent referred to the need for a “governance model that extends to land use management to protect source waters, as well as ensure the quality of water returned to the basin to protect the interests of those using the resource downstream.”

Overall, the human dimensions of water security received high priority with quality ranking first, governance ranked second, water quantity ranked third, land use management at fourth, and competing demands ranked fifth. Biophysical aspects ranked lower, with drought ranked sixth, long-term climate change seventh, and flooding ranked eighth. With several exceptions, respondents seemed more concerned about society’s capacity to manage environmental change through governance, land-use management, and water allocation schemes than with the biophysical features themselves. These findings echo conclusions of a recent UNESCO assessment of water security that focused on international cooperation, the science–policy interface, and institutional and human capacities to deal with water security (UNESCO-IHE 2012).

Stakeholder Characteristics and Management Priorities

In addition to the content analysis and ranking of management concerns, we developed a multiple regression model to test relationships between priorities and environmental attitudes (NEP score), water security perspective (sustainability oriented or not), province of residence (Alberta or Saskatchewan), and occupational sector (private sector or not; see Equation 1).

$$\begin{aligned} \text{PRIORITY}_i = & a + b_1\text{NEP} + b_2\text{WS} \\ & + b_3\text{PROVINCE} + b_4\text{INDUSTRY} \end{aligned} \quad (1)$$

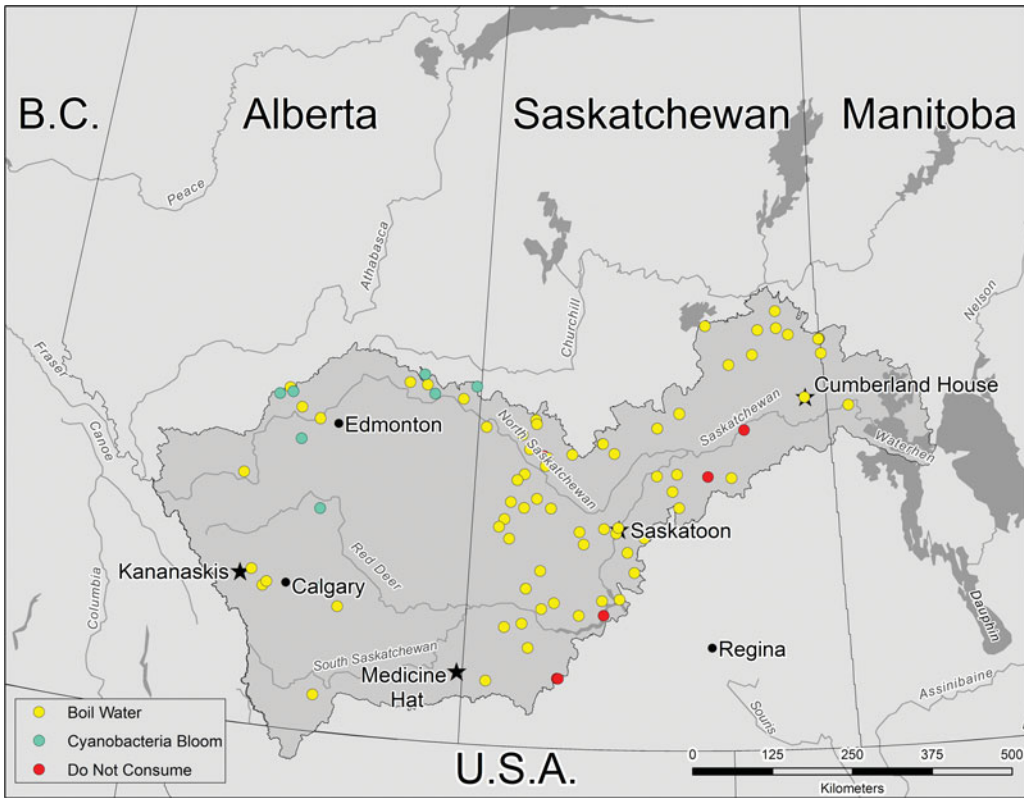


Figure 2 Water advisories in the Saskatchewan River Basin, 2000–2012. Source: Water Chronicles (2013). (Color figure available online.)

where $PRIORITY_i$ is the priority assigned to water concern i ; NEP is the score on the NEP Scale of fifteen questions; WS is a dummy variable representing water security definition: sustainability oriented (1) or not (0); PROVINCE is a dummy variable representing province: Alberta (1) or Saskatchewan (0); and INDUSTRY is a dummy variable for industry: private sector (1) or government and NGO (0).

There were eight separate regression models, one for each water management concern. Low scores signified high priority for a particular concern; thus, a

negative relationship meant participants regarded a particular concern as one of high priority. Overall levels of explanation were modest, but statistically significant relationships offered some insight into variations across stakeholders (Table 2).

Those who held strong environmental attitudes placed high priority on climate change but low priority on drought and water quality. High NEP scores reflected concern about the balance of nature being disrupted by human activity. Respondents appeared to associate this imbalance with anthropocentric climate

Table 2 Regression coefficients with water concerns as the dependent variable

Concerns	NEP score	Water security (1 = yes, 0 = no)	Province (1 = AB, 2 = SK)	Industry (1 = private, 0 = other)	R ²
Water quality	0.050 (0.070)*	0.946 (0.030)**	0.231	2.139 (0.002)***	0.215
Governance	-0.014	-0.820	-0.322	-0.247	0.037
Water quantity	-0.003	-0.006	-0.268	-0.706	0.022
Land use change	0.046	1.190 (0.037)**	-1.114 (.040)**	0.155	0.148
Competing demands	0.028	-1.288 (0.027)**	-0.322	-1.919 (0.012)**	0.187
Drought	0.071 (0.033)**	0.413	1.089 (0.050)**	0.445	0.131
Climate change	-0.074 (0.041)**	-0.898	1.343 (.029)**	-0.164	0.217
Flooding	-0.011	0.462	-0.577	0.296	0.033

Note: AB = Alberta; SK = Saskatchewan.

*Significant at the 0.10 level.

**Significant at the 0.05 level.

***Significant at the 0.01 level.

change but not with drought or water quality issues. Drought can be seen in the Prairies as part of Earth's natural cycles rather than as part of the increasingly problematic relationship between industrial society and the biophysical environment. Quality might be seen as a place-based, local problem rather than a global-scale concern relevant to those with high NEP scores.

Those who embraced sustainability-based definitions of water security assigned higher than average priority to the problem of competing demands. The notion of sustainable development has been widely embraced in western Canada, where rapid economic growth often requires making difficult decisions about a fully committed resource. Williams and Millington (2004) made a useful distinction between weak and strong sustainability in which weak sustainability retains the idea of human dominance over nature and subscribes to the view that humans must make difficult choices for economic progress to continue. Strong sustainability, on the other hand, requires a deeper rethinking about the relationship between humans and the environment and about the very nature of progress itself. The statistical association between those invoking sustainability in their definitions of water security and the importance of resolving competing demands suggests that respondents had a strong strain of weak sustainability.

There were statistically significant interprovincial differences in the way participants translated water security into on-the-ground water problems. Alberta's participants placed more emphasis on land use change, whereas Saskatchewan's were more worried about climate change and drought. We attribute the former to Alberta's rapid rate of recent growth and the latter to Saskatchewan's position downstream from Alberta. More than 40 percent of Alberta's participants rated land use change as their primary concern (Figure 3A). From 2006 to 2011, Alberta posted a remarkable five-year population growth rate of 10.6 percent (Statistics Canada 2013) and attained an annual per capita income 50 percent higher than Canada as a whole (\$75,000 vs. \$50,000; Center for the Study of Living Standards 2012). Full allocation in the most densely settled portions of Alberta, widespread land intensification, and the emergence of water markets (Alberta Water Exchange 2012) have clarified the inherent connections between land use and water management.

In Saskatchewan, development is more recent, and the Saskatchewan River is far from fully allocated. There are, however, questions about the resilience of the Master Agreement on Apportionment, a 1969 framework that governs interprovincial water allocations. In simple terms, the Master Agreement requires that Alberta pass 50 percent of the annual natural flow of eastward flowing streams, including the North and South Saskatchewan Rivers, to Saskatchewan, which is in turn required to pass 50 percent of that flow to Manitoba (Prairie Provinces Water Board 2012).

Survey results signaled heightened concern for climate change and drought in Saskatchewan and reflected the worry that Alberta might have increasing difficulty maintaining its responsibilities to Saskatchewan as per the Master Agreement in the face of a changing climate and more extreme droughts (Figures 3B and 3C).

The economic sector also provided insight into respondents' ranking of water problems. Representatives from industry gave higher priority to competing demands and lower priority to water quality. They ranked competing demands first, quantity second, and governance third. Stakeholders employed in government and NGOs ranked quality first, governance second, and quantity third. These findings foreshadow the issues that different groups will bring to the policymaking table. They also point to overlapping interests in quantity and governance—in developing the human institutions capable of allocating and managing water supply in an era of climate change and increasing demand.

Discussion and Conclusions

The term *water security* is increasingly used to frame global debates about sustainable development, ecosystem health and biodiversity, food shortage, and national defense. Although there is no generally agreed-upon definition for the term, it was the organizing theme for a recent G8 Belmont Forum Initiative for Freshwater Security, focus for the 2013 Stockholm World Water Week, and subject for the 2014 World Water Forum. Lack of clarity regarding its definition and relevance to policy has not impeded its use in the call to arms to solve global water problems. Although some scientists and academicians are understandably uncomfortable about the contested and vague nature of this term, we invoke Stone's (2002) and Fisher's (2003) view that policy debates are often characterized by disagreements about the definitions and end goals. Ambiguity allows discussion to begin and later enables different players to meet their needs through the policy process. Our main objective in this article was to explore the ambiguity surrounding the term water security in western Canada: Who holds what position about water security and why? Where are there points of agreement between competing views?

We asked SRB stakeholders how they defined water security and what they saw as barriers to basin security. Their definitions ranged from very narrow characterizations of whether there would be a water supply to meet the needs of today's users to whether there is adequate and affordable water of sufficient quality to meet the needs of humans and the environment, now and in the future. The prominence of human over biophysical concerns underscored the importance of governance, land management, and regulatory mechanisms to resolve competing demands, however water security is defined. The environmental managers, farmers, water managers, and First Nations peoples who responded

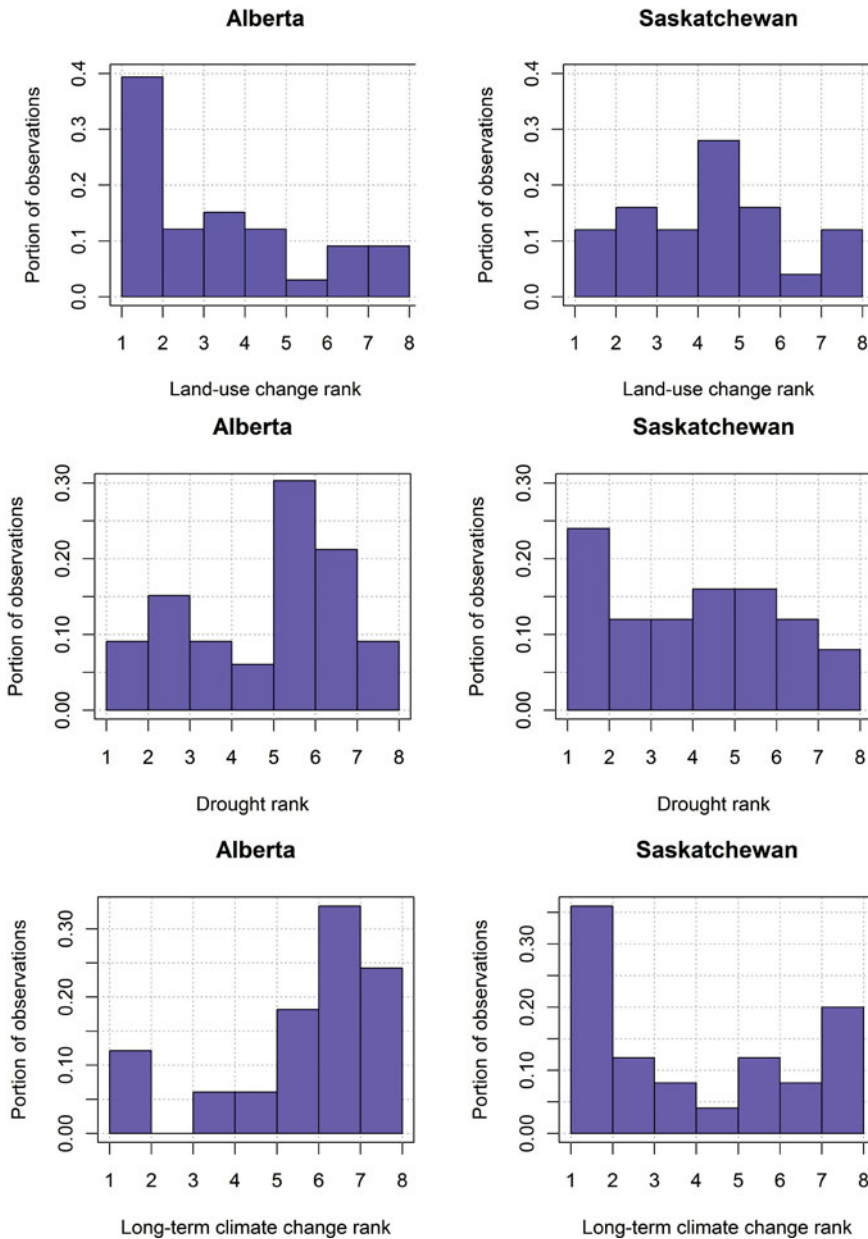


Figure 3 (A) Relative ranking of land-use management in Saskatchewan and Alberta. (B) Relative ranking of drought in Saskatchewan and Alberta. (C) Relative ranking of climate change in Saskatchewan and Alberta. (Color figure available online.)

to the survey tended to place climate and economic growth in the background as conditions that need to be monitored and managed in the inherently social process of achieving water security.

We were disappointed, but not surprised, with the weak explanatory results of our regression analyses. They confirmed, in fact, the highly ambiguous and contested nature of the term water security. When people do not agree on what water security means, it is difficult to measure their water security concerns in any systematic way. The concerns themselves

were highly interconnected; for example, for land-use change and water quality, long-term climate change and drought, and competing demands and water quantity. Although we might have been able to identify a more independent set of concerns, we then might have missed the connections that the respondents themselves drew between the concerns. These connections undoubtedly will serve as points of consensus in forthcoming debates about water security. Also problematic for the statistical analysis was our use of sustainability as an explanatory variable. Deeper reading of

stakeholders' water security definitions revealed how widely that term varied in use and meaning. It was clear from this reanalysis that we had respondents who saw sustainable development as a means to achieve economic progress without substantial change in business-as-usual water management practices. For others, sustainability entailed a very different view of the development process, reflecting concerns for the environment, future generations, and social equity, and the need for a new governance model that reflects this more holistic view. Finally, the NEP explained priorities about climate, drought, and water quality but did not serve as a useful framework for other priorities associated with water security. It could have been, as noted earlier, that priorities were too interrelated to be easily explained. Alternatively, the current discussion of water security encompassing quantity and quality, access, affordability, and social justice is beyond the traditional ecological worldview as manifest in the NEP.

This case study of water security agenda setting in western Canada has wider significance for climate adaptation and the global water security debate. Empirical studies have shown the pervasiveness of contemporary water problems and their vulnerability to a changing climate, but adaptation in the water sector remains essentially a local and regional problem. Regional actors frame the problem, and local processes structure how political values are translated (or not) into action (O'Riordan and Jordan 1999). Our study of water stakeholders provides a baseline against which evolving attitudes and remedies can be viewed. It demonstrates how regional actors embrace different features of the water security narrative and work them into their own priorities and concerns. Most important, results suggest that common definitions are not necessary for meaningful societal discussion of complex environmental issues. That our stakeholders seemed more concerned about the linkages between problem sets than the problem sets themselves suggests that successful policies will ultimately unite competing concerns, as in our case, where stakeholders linked concerns about climate, growth, and governance. There is opportunity to move forward in the policymaking process by finding these points of mutual interest among stakeholders who would at first glance hold divergent perspectives on what water security is and what it means for their region. ■

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