Proposing a Water Ethic:
A Comparative Analysis of
Water for Life: Alberta's Strategy for Sustainability

by
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Author's declaration for electronic submission of a thesis

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Because water is basic to life, an ethical dimension persists in every decision related to water. By explicitly revealing the ethical ideas underlying water-related decisions, human society's relationship with water, and with natural systems of which water is part, can be contested and shifted or be accepted with conscious intention by human society. Water management over the last century has privileged immediate human needs over those of future generations, other living beings, and ecosystems. In recent decades, improved understanding of water's importance for ecosystem functioning and ecological services for human survival is moving us beyond this growth-driven, supply-focused management paradigm. Environmental ethics challenge this paradigm by extending the ethical sphere to the environment. This research in water ethics considers expanding the conception of whom or what is morally considerable in water policy and management.

First, the research proposes a water ethic to balance among intragenerational equity, intergenerational equity, and equity for the environment. Second, the proposed ethic acts as an assessment tool with which to analyse water policy. *Water for Life: Alberta's Strategy for Sustainability* is the focal policy document for this analysis. This document is an example of new Canadian policy; it represents the Government of Alberta's current and future approach to water issues; and it implicitly embodies the ethical ideas that guided the document's production. To assess *Water for Life*'s success in achieving the principles of the proposed water ethic, this case study used discourse analysis, key informant interviews, and comparison to a progressive international policy document, *Securing Our Water Future Together*, the 2004 White Paper of Victoria, Australia.

Key conclusions show that *Water for Life* is progressive by embracing full public participation and a new planning model, a watershed approach, knowledge-generation initiatives, and water rights security. However, barriers exist that can disrupt the strategy's success, including the first-in-time first-in-right water allocation system, the strategy's lack of detail, inadequate protection of aquatic ecosystems, ambiguity of jurisdiction over water in First Nations communities, and under-developed connections between substantive issues. The thesis also outlines recommendations for Alberta and implications for other jurisdictions. Additionally this research offers guidelines and an assessment tool grounded in broad ethical concepts to water policy development. It encourages making ethical ideas explicit in assessment and formation of equitable and sustainable water policy.

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DEDICATION

This thesis is dedicated to my grandmother, Gwen Mallard (1917–1999). Her compassion and activism for other living beings inspired me to think beyond my own anthropocentric interests.

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1. WATER ETHICS AS AN APPROACH TO THE 'WATER CRISIS'

1.1 INTRODUCTION

Ethical concerns have received little explicit attention in the politics of water management in Canada. Only recently have water ethics received focused interest in the international water community. Because water is metabolically basic to life, an ethical dimension persists in every decision related to water. Water ethics at once express human society's approach to water and act as guidelines for behaviour. Ideas around water are often implicit and embedded as assumptions. They can be entrenched in behaviour and difficult to contest because they are difficult to "see". By explicitly revealing water ethics, human society's relationship with water, and with natural systems of which water is part, can be contested and shifted or be accepted with conscious intention. Water ethics also provide explicit but fundamental guidelines or terms of reference to guide management and future renditions of water policy. These guidelines may also be applied as an assessment tool. The purpose of this thesis is both to reveal ethical ideas present within select cases of water policy and to provide ethical guidelines for assessment and formation of equitable and sustainable water policy.

In Canada and abroad, awareness of water scarcity, caused by overuse, pollution, or natural and increasing aridity, is surfacing in individual and societal consciousness. While this awareness has long challenged historically arid countries, awareness of impacts from overuse and pollution of water on natural ecosystems is relatively recent. Only by recognizing our moral relationship with water and natural systems can we begin to fundamentally rectify an increasingly destructive relationship with our environment. Postel (1992, 23) outlines the problematic relationship of human use of water and the impact on ecosystems: "Historically, we have approached nature's water systems with a frontier philosophy, manipulating the water cycle to whatever degree engineering know-how would permit. Now, instead of continuously reaching out for more, we must begin to look within—within our regions, our communities, our homes, and ourselves—for ways to meet our needs while respecting water's life-sustaining functions". Postel (2002, 3) suggests adopting and advocating "a guiding water ethic" to make the fundamental shift away from voracious and manipulative approaches to one that recognizes ecological limits and the value of all life.

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Human survival depends on ecological services—for our drinking water, our food. Thus protection of ecological integrity, through ensuring adequate quality, quantity, and timing of water for ecosystems, is essential (Revenga *et al.* 1998; Arnell 2002; Postel and Richter 2003; Smakhtin *et al*. 2003). This ecological and hydrological understanding has not been well integrated into policies, institutions, and practices (Revenga *et al*. 1998). Instead, technological advancements, through damming, diverting, and drilling, have focused on increased control over water sources to avoid "the vagaries of the hydrological cycle" (Acreman 2004, 8), to allow populations to grow, and to allow settlement in areas where it would otherwise be almost impossible to live. Meanwhile water supplies have remained the same or dwindled through consumptive use and environmental degradation (Postel 1992; De Villiers 2000; Shiva 2002), which leads to relative scarcity. This disconnection between ecological reality and human behaviour illuminates a brewing water crisis and may point to lack of explicit consideration of ethics.

Many researchers argue that this emerging water crisis is the result of relative scarcity and mismanagement rather than absolute scarcity. As relative scarcity increases, competition and conflict can increase with poor governance (Rijsberman and Mohammed 2003). A supplement to the *Conference Report for World Water Vision* states, "[t]here is a need for profound change in how water is managed if we are to achieve any sense of sustainable water use in the near future" (Strzepek 2001, S9). The United Nations World Water Development Report suggests that the "water crisis" is one of governance caused by mismanagement of water, where attitude and behaviour problems "lie at the heart of the crisis" and leadership inertia and the world population's lack of awareness of the problem's scale inhibit corrective actions (United Nations 2003, 4). Otchet (2001, S139) suggests the "crisis" is not a question of absolute water scarcity but a question of distribution of water, of knowledge, and of resources—a question of governance—and therefore we need to "get a grasp of water ethics". Thus, if the crisis is one of water governance rather than absolute scarcity, there is ample opportunity to effect change through an ethical approach.

1.2 WATER ETHICS

Ethics are moral guidelines for human behaviour that function at societal and individual levels—although this thesis considers ethics only at the societal level. Conventional ethics embrace only human concerns. Environmental ethics challenges this moral isolation and attempts to include the environment within the ethical sphere. Water ethics is an example of applied environmental ethics—an application to a particular genre of environmental issue.

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UNESCO's series on water ethics is a particularly informative exploration of ethics in water (Acreman 2004; Hassan 2004; Priscoli *et al*. 2004). From issues of water for agriculture, industry, municipalities, and ecology to issues of water infrastructure and governance, discussion of water ethics questions relationships among humans, water, and ecosystems. By questioning these relationships, the values behind them become explicit and thus can be confronted critically. Discussion of the ethics behind policy and its development also has the potential to catalyse public discussion, in this case about human relationships with nature, and to create social change for the benefit of the environment and ultimately ourselves. Dorcey suggests one implication of sustainable development, and the complexity it adds, to water resources management is "heightened ethical concerns" where "[t]here is growing appreciation of the ethical judgements that can no longer be ignored in making decisions about water resources management. Specific considerations will be required of the ethical precepts that should govern both biophysical and socioeconomic analyses and the design of governmental arrangements" (Dorcey 1991, 24).

If water is scarce, due to reduced availability, accessibility, or quality, how should needs, for both humans and the environment, be met? On what framework can decisions be made? How we meet these challenges is not only a pragmatic choice but an ethical one. Particular ethical principles—as exemplified by the ethos created by industrialization (Hassan 2004) and a supply-driven ethos—have implicitly guided natural resources and water management over the last century or more. These principles do not support a sense of equity that includes ecological needs or those of future human generations. To prevent conflict and meet needs now and into the future, equity and sustainability are important societal goals. My research in water ethics and policy considers readjustment of the balance of fairness and who or what is considered in the equity equation. This research will contribute to the growing discussion of an ethical paradigm in water governance that could lead to more equitable and sustainable approaches to water use.

1.3 RESEARCH OBJECTIVES

Because ethics can be a valuable approach to resolve water challenges, this research questions what set of water ethic principles would support equity and sustainability. To ground the research, the water ethic principles defined in this work act as criteria to analyse selected freshwater policy examples for their attempt to balance the requirements of ecosystems and humans, now and in the future.

The research questions are as follows:

1. Based on literature and international statements on water issues, ***what principles should comprise a water ethic seeking to foster equity and sustainability?***
The literature reveals the dialogue of what is considered ethical water use. This ethic seeks to support intragenerational equity, intergenerational equity, and equity for eco-systems in freshwater policy and management practices.

2. ***How does a recent Canadian policy statement, in this case Alberta's* Water for Life*, compare to the defined water ethic?***
Studying *Alberta's Water for Life: Alberta's Strategy for Sustainability* as an in-depth case study places my research within the Canadian context. Comparison to the water ethic illustrates how the region recognizes environmental and current and future genera-tion needs in its policy.

3. ***How does the Canadian policy example compare to a selected "progressive" inter-national example of water policy, in this case* Securing Our Water Future Together, *the 2004 White Paper of Victoria, Australia?***
This comparison allows me to assess where the 2003 Alberta policy statement stands in comparison to an international example in its progress towards implementation of a sustainable and equitable water ethic. The Australian example, as a "best" case example, has been selected based on its explicit desire to meet environmental requirements in water policy as well as the needs of current and future generations.

A water ethic is at once a reflection of prevalent attitudes towards water management, a mechanism for social change by encouraging different attitudes and behaviour through moral guidelines, and an assessment tool. A proposed water ethic aiming to balance intrageneration-al, intergenerational, and environmental equities will be used to assess the two selected policy documents. While ethical thinking is somewhat abstract and removed from action, policy provides a vehicle to move from abstract ethical principles to action. Thus this research looks at water policy to understand the ideas intended to guide subsequent action.

We are increasingly recognizing human reliance on ecological systems, the impacts of nonchalance towards their protection, and the necessity to act on this recognition. Within Alberta, the *Water for Life* strategy will help determine the future of this protection for human survival and ecosystems. New and growing demand for water and increasing scarcity due to recent years of drought require changing water management practices. As an example of new policy direction in Canada, Alberta's *Water for Life* strategy implicitly embodies the ethic(s)

that guided the document's production. The question is how well actors in Alberta will implement it to support sustainability and equity considerations in Alberta. The ethical implications involved in the formulation and the implementation of the strategy are crucial to understanding outcomes and achieving the broad principles stated in policy.

The policy of Victoria, Australia, provides an apt comparison, as it shares with Canada a British-influenced culture and parliamentary government structure. In both Victoria and Alberta, major river systems rise in the mountains and flow through semi-arid plains. A fuller comparison of the two cases is provided in chapter 6. Australia, on a whole, seems to be one country far ahead in recognizing the needs of the environment, as its states have implemented management strategies and methodologies to meet those needs (Postel and Richter 2003). The effectiveness of these strategies is yet to be determined as implementation is relatively recent.

1.4 THESIS OVERVIEW

Chapter 2 discusses the research design and methods that guided this research as well as their relevance to answering the research questions. Chapter 3 builds the argument for expanding the ethical sphere from humans to holistic ecosystems and that expansion's relevance to the discussion of water ethics. Chapter 3 also proposes a water ethic with principles that support balancing intragenerational equity, intergenerational equity, and equity for the environment; and it discusses what these ethical principles could mean in practice. Chapter 4 discusses Alberta, Canada's *Water for Life: Alberta's Strategy for Sustainability*, and chapter 5 discusses Victoria, Australia's 2004 White Paper on water, *Securing Our Water Future Together*. The proposed water ethic (chapter 3) provides a set of criteria with which to assess the two policy documents. The results of each policy statement's analysis are compared to each other in chapter 6. Drawing from the results of the document analysis, interview responses, and comparison to Victoria's document, chapter 7 discusses successes and recommendations to Alberta's *Water for Life* and implications for other jurisdictions.

2. RESEARCH METHODOLOGY

2.1 INTRODUCTION

This qualitative case study research explores principles of water ethics and examines the underlying ethical precepts of selected water policy examples. The 2003 *Water for Life: Alberta's Strategy for Sustainability* provides the primary case study. To analyse this strategy in triangulation fashion, the water ethic acts as an assessment tool, interviews provide on-the-ground local insight, and comparison to another policy example— *Securing Our Water Future Together*, the 2004 White Paper of Victoria, Australia—highlights positive and negative implications of the document.

2.2 RESEARCH OVERVIEW

Research design links theory and general considerations with specific methods to answer questions such as who, what, when, where, and how (Palys 2003). The research design of this thesis aims to answer the three research questions:

• What principles should comprise a water ethic seeking to foster sustainability and equity?

• How does Alberta's *Water for Life* compare to the defined water ethic?

• How does the Canadian policy example compare to a selected "progressive" international example of water policy, in this case *Securing Our Water Future Together*, the 2004 White Paper of Victoria, Australia?

Four methods of inquiry are used to answer the research questions: a literature review to develop a water ethic; discourse analysis of the policy documents; key informant interviews; and comparison to a "best" case example. Using discourse analysis (based on the water ethic), interviews, and comparison as multiple sources of information to assess the primary case study allows for a convergence of evidence "in triangulation fashion" (Yin 2003, 14).

The four main steps in this research are as follows:

(1) A broad literature review provides the theoretical framework upon which this research builds. From the literature on environmental ethics and justice, water issues

and water ethics, and international statements on water issues emerge a number of principles, which I refer to as a proposed water ethic. See chapter 3 for discussion of this process, the literature, and the principles. The literature review also includes background material for the in-depth Canadian case study of Alberta and for the Australian "best" case example. This material provides for the situational and intertextual contexts as well as justification for using Victoria, Australia, as a best case example. This literature is discussed in chapters 4, 5, and 6.

(2)   Discourse analysis is a method used to analyse the policy documents. The ethical and non-ethical ideas expressed, implicitly or explicitly, in the selected policy statements are inferred from analysis of the language used in the documents—its vocabulary and grammar, structure, and content. The resulting description, combined with background information from the situational and intertextual contexts, can elucidate discourses present in the text and the underlying ethical principles because discourses rely on and embed ideological and ethical ideas. In this deconstructive process, the water ethic principles act as a set of criteria against which to compare each of the policy documents. The conclusions of these results are discussed in chapters 4, 5, and 6.

(3)   To gain more information of the Albertan context, I undertook open-ended interviews with key informants. Key informants were recruited on the basis of participation in Alberta water issues and through snowball sampling. Informants provided information on the situational context of the *Water for Life* policy document. Analysis of the interviews involved description (transcription and annotation), classification (coding schemes and categories and splicing and splitting), and connection (associations and interactions) (Kitchin and Tate 2000). See chapter 4 for these results.

(4)   Upon completion of analysis of the policy documents and interview responses, comparison of policy examples is possible. The comparison of Alberta's document to that of Victoria provides insight into how ethical concepts may be expressed and operationalised in policy, how they might be highlighted or marginalised, how policy statements may view the human-nature relationship, and how ethical ideas may be dominant, shifting, or marginalised. See chapter 5 for the comparison results.

2.3 DEFINING A WATER ETHIC

The first research goal is to define a water ethic. The four steps in defining this ethic are: first, to determine the overriding goals of the ethic; second, to outline an appropriate framework to fulfill these goals; third, to define principles that support the framework; and fourth, to outline characteristics of each principle that move the water ethic from theory to practice.

Literature provided the broad outline of ethical principles, as well as a number of the principles' specific characteristics. Key sources were reports commissioned through the United Nations, such as the 1987 Brundtland report, *Our Common Future* (WCED 1987); the *Dublin Statement* from the International Conference on Water and the Environment (ICWE), Dublin, Ireland, 1992; and the Bonn Keys (2001), which are five guiding principles that came out of the International Conference on Freshwater in Bonn, Germany, 2001. The series of essays on water ethics by a UNESCO sub-commission of the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), including *The Ethics of Freshwater Use: A Survey* by Lord Selborne (2000), provided explicit discussion of issues and principles to consider in developing an ethical framework for freshwater policy and management. Literature on global water issues makes explicit the practice of principles of this water ethic. All of these sources informed the definition of the water ethic. Chapter 3 explains the process, goals, framework, and principles that comprise the water ethic, and what they might mean in practice.

The interview responses helped define the specific characteristics for the principles, thus forming a degree of an inductive case study approach, where researchers listen and develop categories and theoretical dimensions from the informants' perspectives (Palys 2003).

2.4 DISCOURSE ANALYSIS

Discourse analysis of the selected policy statements—including textual analysis and some study of the intertextual and situational contexts—reveals embedded ideas with respect to perspectives on human-human relationships, human-nature relationships, and how to alter the current reality in water management. This section defines discourse analysis and explains how this research uses it as a method.

Discourse analysis is a qualitative approach to analyse message or text content. Neuendorf (2002, 5) defines it as a type of analysis that "engages in characteristics of manifest language and word use, description of topics in media texts, through consistency and connection of words to theme analysis of content and the establishment of central terms". While Neuendorf discusses the approach primarily in terms of media analysis, this approach can analyse any public communication, whether written or spoken (Fairclough 1989).

Inherent within any public communication is a conveyance of a particular worldview. Dryzek (1997, 8) defines a discourse as "a shared way of apprehending the world", as "embedded in language", and as enabling "those who subscribe to it to interpret bits of information and put them into coherent stories or accounts". Discourse analysis can provide a method to understand the particular worldview of the communication. Neuendorf (2002, 5) establishes that discourse analysis attempts to reveal the underlying motives or ideologies of the communicator(s) as well as "the overall characteristics of meanings". Kitchin and Tate (2000) describe discourse analysis as a deconstructive or hermeneutic approach as opposed to content analysis (which is objective and quantitative) and biographical approaches. Because language is laden with assumptions and ideas, however implicitly, analysis of language is highly relevant to accessing underlying ideology and ethics in particular texts.

Government policy documents, for example, are often public communication of a government's approach and actions towards a particular topic. These documents arise out of particular institutional and societal contexts, each with dominant, co-dominant, competing, or complementary discourses which influence policy production. The language an institution uses indicates the discourse type(s) from which the producers are drawing. Some policy may in fact emerge as a product of social 'struggle'. In particular, policy that legitimizes environmental rights, or at least recognition of ecosystem needs, displays a shift in discourse and power of specific ideas. This shift may be seen as a cumulative effect of environmental activism and thought and improved scientific knowledge (in other words, social struggle and discourse change). Fairclough (1989, 85) posits, "[i]deology is most effective when its workings are least visible". If implicit ideas are dominant and made explicit, one consciously chooses to either accept what had been the underlying ideology or reject it. The environmental movement, for example, has caused open questioning of dominant anthropocentric values, including the economic, political, and social assumptions, upon which human societies rest. This movement has attempted to reveal and challenge the underlying assumptions constituting "common sense" and consequently our approach to the world and interactions with natural systems. Discourse analysis is a way to reveal these assumptions.

Fairclough (1989, 24) defines discourse as "the whole process of social interaction of which a text is just a part". Discourse thus includes two processes: the process of production, where text is the product, and the process of interpretation, where text is the resource (Fairclough 1989). All such "text" is a product of interplay between the text producer and the society within which the producer functions. The interpreter of the text also interacts with this text as a member of the same social order as the producer or a different one. Thus there are three elements of discourse: text, interaction, and social context (Fairclough 1989). Whether a text reproduces the dominant social order or challenges it, "a text instructs us how to see the

world" (Prior 2004, 321). Classification systems (or systems of meaning) espoused by certain texts provide the basis for particular discourses and therefore provide a way to look at the world. These systems of meaning are often culturally bound or provide for in-group under-standing of and language about particular aspects of the world. Texts representing particular systems of meaning may even take on "ontological precedence" over empirical evidence of observers (Prior 2004). The purpose of a text is to package and stabilize "the order of things as they appear within a wider realm of discourse" (Prior 2004, 321). Thus analysing a text's discourse provides a method by which to analyse society and its social institutions and 'un-pack' its dominant or shifting ideologies and power relations. Critical discourse analysis particularly focuses on shifting power relations (Fairclough 1989), whereas other types of discourse analysis may focus more simply on deconstruction of language. Explicit analysis of ideology behind text is essential to shift the power of ideas and create societal change. If change is desired for how we perceive our rights and responsibilities with regard to ecosys-tems and current and future human generations, this may be one way to do it. The first step is to make those perceptions explicit.

2.4.1 Discourse analysis as a method

Because discourse analysis identifies the threads of discourse that run through the text, it provides an appropriate method to make ideology and ethics explicit. Although most ap-plications have focused on ideology, this thesis is concerned with ethical ideas present in text. Ethics and ideology are both based on ideas about the world; however, ethics are rooted in moral relationships and ideologies are rooted in specific worldviews and assumptions. This re-search's application of discourse analysis for identification of underlying ethics is appropriate, as a comparison makes clear (Table 2.1).

Table 2.1 Comparison of ideological (or critical) discourse analysis and ethical discourse analysis (this thesis' approach to discourse analysis).

	Ideological (or critical) discourse analysis approach	Ethical discourse analysis approach
Overall purpose	Explain text based on social interaction/power dynamics revealed in the text	Understand ethical paradigm that structures the text
View of language & discourse	Language as social interaction & discourse embedded in social context	Language as social interaction & discourse embedded in social context
Analyzing what?	Language, content, contexts in the text, bodies of literature, or other public communication	Language, content, contexts in the text
Analyzing for what?	Ideas, assumptions constructing text's discourse	Ethical/non-ethical ideas, assumptions constructing text's discourse
How?	Series of questions related to language, content, contexts	Series of questions related to language, content, contexts
Result?	Reveal and 'unpack' relationships of ideologies and power dynamics	Make explicit ethical ideas in text

Through deconstruction, discourse analysis offers a way to examine the text's deeper meaning. It allows the analyst to study what lies beneath the vocabulary, grammar, and structure choices of the text's producer. Through a series of questions that correspond to careful reading of the text and research of the situational and intertextual contexts, an analyst can elucidate the dominant, marginalised, or emerging discourses present in the text. Therefore, analysing the discourse evident in the selected policy documents regarding approaches to freshwater is highly relevant when attempting to elucidate the underlying ethical principles that guide the water policy and subsequent management practices. This methodology, then, addresses the research question: *How do the selected policy statements compare to the proposed water ethic?*

The thesis focuses primarily on text—in the form of the two selected policy documents—and secondarily on situational and intertextual contexts—as evident in interview responses and literature sources—while interaction with the text is implicit in my analysis of the text. The situational context is the social, political, and biophysical circumstances in which the text functions. Understanding the social and political contexts provides insight into why the documents are the products they are. The intertextual context is the history of discourses and texts within which the current text belongs. Distinguishing the presuppositions of the text, or what is understood as common ground for the readers, hints at the text's intertextuality

(Fairclough 1989). In the case of this research, awareness of associated legislation and documents helps justify inclusions and exclusions in the documents as the government is presupposing readers' understanding of that associated literature.

2.4.2 Discourse analysis questions

Fairclough (1989) states there are three stages to discourse analysis: description, interpretation, and explanation. A set of questions at each stage guides the researcher's analysis of the text. The questions first analyse small unit (word), grammatical, and global structure and content aspects of the text, and then focus on contextual analysis. Interpretation of the answers to these questions leads to an explanation of the text.

Description of text involves analysis of the formal features of the text: vocabulary, grammar, and structure. These formal features represent the text producer's experience of the world including content, knowledge, and beliefs; they represent social relationships; they indicate the producer's evaluation of the reality relevant to the text and thus the subjects and social identities; and they connect parts of the text and provide for intratextuality (Fairclough 1989).

The second stage of the discourse analysis process is *interpretation*. This stage endeavours to discern the processes of production and interpretation and the background assumptions they rely upon (Fairclough 1989). Production processes of the documents are somewhat evident in the documents' introductory statements and associated websites. In the case of Alberta, how the document was produced was also discussed by interview participants, who also contribute to interpretation of the document. Both text producers and text interpreters (i.e., me) interpret the situational and intertextual contexts as part of the production and interpretation processes. In addition, the producer must assume the background knowledge and ability of interpretive procedures of his or her readers. The procedure of interpretation occurs at many levels, often simultaneously: words and sentences, implicit meaning of sentences, local coherence of sequences, and global coherence associated with discourse types (Fairclough 1989, 144). In conjunction with the third stage of analysis, explanation, the aim of interpretation becomes to elucidate the social significance of the text. These stages together, supported by description of text, demystify that significance and thus erode implicit power relations as another goal of the overall analysis process—although it is not a goal of this thesis.

The *explanation* stage of discourse analysis aims to delineate the power relations, domination, and ideologies that are embedded within the assumptions of the text and that "make ordinary discourse practice a site of social struggle" (Fairclough 1989, 162). While understanding power relations is often an end goal of discourse analysis, this research focuses pri-

marily on the ideas embedded within the text and their relative importance. For example, how prevalent is the idea of water for ecosystems present in the document and how is it expressed?

Fairclough (1989, 2003) offers valuable tips on textual analysis and provides specific questions to do so. Dryzek (1997) provides an excellent example of description, interpretation, and explanation of discourse through his exposition and classification of environmental discourses. However, his approach is broad and not on the level of textual analysis. Nevertheless, his four questions, on which he bases his exposition, are useful for the conceptual part of this textual analysis. Dryzek's work overall offers useful descriptions of environmental discourse, on which I later base my discussion of the discourses present in the policy documents. Many of the questions used in the analysis of the policy documents are from the Fairclough and Dryzek books; I created others to fit the purpose of the research (Appendix A).

Careful reading and answering the set of questions formulated by Fairclough, Dryzek, and myself resulted in a detailed deconstruction of each policy text. I coded this information using a similar coding scheme to that used in analysis of the interview responses (see section 2.5). I then grouped this coded information by principle. I could then infer the perspective each policy document had toward each water ethic principle. Due to the very detailed nature of the results, chapters 4 and 5 discuss only the conclusions I drew from these results. The analysis process was not quantitative because counts and perhaps even frequencies may be distorted by the appreciably different lengths of the two documents. Quantitative results did not seem relevant to understand how each document recognizes ethical ideas. While this process was not strict discourse analysis, the process was certainly informed by the discourse analysis approach and its fundamental goal of making the implicit explicit.

2.4.3 Case study research and discourse analysis

The qualitative case study approach recognizes the importance of contextual conditions for the phenomenon under study (Palys 2003). This approach fits well with discourse analysis due to the latter's focus on situational and intertextual context. The case study approach has comparative value as well. Thus the case study approach in this research is intertextual and extends geographically, in that it considers two cases. The scope of this research did not allow for historical comparison. Understanding of what is new in the document does become evident to some degree in the interview responses and does help illuminate the current ethical considerations.

2. 5 INTERVIEWS: PROCESS AND ANALYSIS

Key informant interviews complement discourse analysis by providing the situational context. Eliciting information and perspectives directly from the 'ground' added great value. Because the questions were formulated to specifically address my questions about the strategy, the respondents directly responded to the ethical concerns of this research.

2.5.1 Interview recruitment

The site of the interviews was Alberta, Canada. Respondents were not sought in Victoria, Australia, due to time and financial limitations on the scope of the thesis. I sought respondents who had involvement in Alberta water issues so that they could respond to questions about Alberta's strategy. My goal was to speak with people from various sectors: provincial government, such as senior civil service; municipal government; non-government organizations, including environmental non-governmental organizations; First Nations communities; and primary industry, including oil and gas, hydroelectricity generation, agriculture, and forestry.

Two provincial-wide committees—Alberta Water Council and the Advisory Committee on Water Use Practice and Policy—were the first lines of recruitment. The Alberta Water Council is "a partnership between governments and stakeholders with a vested interest in water issues. Membership consists of representatives of four broad categories including: industry, non-government organizations, provincial ministries and agencies, and other governments" (Government of Alberta 2004a). Its primary role, as articulated in *Water for Life*, is to be a provincial-level multi-stakeholder group that "reports on the implementation of the water strategy and investigates and makes recommendations on water issues in Alberta" (Government of Alberta 2003, 17). The Advisory Committee is also multi-stakeholder, including "representatives from provincial and municipal governments, industry (agriculture, energy and forest sectors), environmental organizations and the public-at-large" (Government of Alberta 2004b). Its purpose is to inquire on an *ad hoc* basis about emerging issues of interest to Albertans, such as the oil and gas industry's use of water.

From contact with members of these two groups, a few members agreed to participate and suggested further people to contact. At the Canadian Water Resources Association National Conference 2005 in Banff I met a few more people who agreed to participate in the interviews. Through these contacts and the snowball method I was able to interview people from provincial and municipal government, the industrial sector (including agriculture, hydroelectricity generation, and oil and gas), a private consultant, members in the non-governmen-

tal sector, as well as academics. This sampling provided responses from key interest groups in Alberta (see References for personal communication respondents).

Thirteen face-to-face interviews were completed from June 20 to June 30, 2005. One further interview was completed over the telephone on August 15, 2005. Face-to-face interviews were far more personal and developing a rapport with the respondent was easier than during the telephone interview. During the face-to-face interviews gauging the reactions and conversational cues—such as whether a pause represented thought or readiness to proceed to the next question—was far easier than over the telephone. Because only one interview was over the telephone, the overall quality of the interviews remained high.

All interviews were audio-recorded with the agreement that each respondent would later have an opportunity to review material that I intended to quote. I chose audio-recording to facilitate my memory and improve accuracy. Kitchin and Tate (2000) suggest a number of limitations for audio-recording. Some interviewees may feel uncomfortable with being recorded. In this study all participants had the opportunity to choose not to be recorded; none did. None of the interviewees seemed uncomfortable once he or she was assured the opportunity to review the quotations. Kitchin and Tate (2000) state that knowing the interview is being recorded can cause the interviewer to stop paying close attention to the responses. This situation was occasionally the case in the beginning, but I believe that was due to initial nervousness. Audio-recording does not record body language; however, given the nature of the study, body language observation had little relevance. The authors also suggest a quiet location. This suggestion, while obvious, was not always possible and background noise did inhibit understanding small sections of a few interviews. Kitchin and Tate (2000) correctly point out that analysis of the resulting data can be time-consuming, estimating six to nine hours per hour of recorded interview. Transcription of the interviews took a month to complete.

2.5.2 Interview questions

Open-ended interview questions were deemed most appropriate for this exploratory and small-sample research (Palys 2003). This format asked the respondents to directly answer the question but allowed new and unexpected directions to emerge from the unique perspective of each respondent (Palys 2003). These new directions provided valuable information and the data were rich in content. Because the topics of ethics and water policy are complex, "rich data" seemed to be the best type of data to gather, as opposed to standardised data that would result from structured or semi-structured questions (Palys 2003). To facilitate comparison of the data, thematic content coding was used in the analysis, a technique Palys (2003) suggests to overcome the difficulty of comparing unique responses. The open-ended format allowed

the interviews to flow conversationally and allowed me to interject related or probing questions. Hence I was able to glean more detail and information on related topics.

Due to the nature of open-ended interview questioning, the danger of interviewer bias was present (Kitchin and Tate 2000). Through a fairly neutral demeanour during much of the interviews and through an explicit but fairly neutral question approach, I attempted to avoid bias. Generally the respondents were fairly strong in their perspectives and did not seem in danger of being swayed too easily from them.

The interview questions (Appendix B) were meant to be specific, in order to "tap into" content relevant to the study (Palys 2003, 172). At the same time, the questions were open to allow explanation and to allow the respondent to address other topics of interest (Kitchin and Tate 2000). The questions did not encapsulate every element of the ethical principles, as articulated in chapter 3, because those definitions resulted from an iterative process. However, the main descriptions and some of the elements were addressed in the questions—and many more were suggested in the responses. Indeed, the respondents themselves added many points to consider about each of the principles.

The ethical ideas basic to this thesis drove the formulation of the interview questions. They were meant to elicit opinion on how *Water for Life* measures up to the proposed water ethic in the opinion of each respondent. The first question positioned the participant within the water interests in Alberta; the response indicated the respondent's specific concern about Alberta's water and thereby partially explained the perspective he or she held. The next seven sets of questions explored the participant's view of how the strategy addresses each of the principles of the proposed water ethic. Each set of questions began by stating a principle posited by "some people" as positive for coping with water issues. This explicit address of certain ethical principles allowed me to indirectly ask the participant for reaction to the proposed principles without leading the participant to a correct answer. I asked the participant to comment on how the strategy addresses that issue, followed by how they think that principle could or could not be implemented. This line of questioning queries the participant's knowledge and perception of the strategy and how well it will be implemented. Because the participants are experts or have a stake in Alberta's water issues, the responses overall seemed quite well informed.

The next question gave the participant an opportunity to provide more personal views of what a water ethic should be and offer suggestions for what other principles or topics should be considered in the ethics of water issues. The last question gave the respondent a chance to critique the set of interview questions used as well as to identify and suggest other useful questions.

I formulated and occasionally asked extra questions to those involved in the development of the strategy, to those who have been involved for many years, or to those who have studied the history of water policy in Alberta. The responses to these questions supplement the literature sources about the strategy and Alberta's *Water Act*. All questions and information for respondents (information letter, consent form, and feedback letter) were approved by the University of Waterloo's Office of Research (Appendices C, D, and E).

2.5.3 Evaluation of the questions

The first question was valuable to directly address the respondent's involvement and viewpoint on water issues in Alberta. The second question seemed relatively straightforward but because it was the first question asking about the water strategy, a number of the respondents gave general comments about the strategy and addressed issues relating to some of the other questions. The third question turned out to be quite problematic. The understanding of a common resource or what I meant by it was not clear to most respondents. Clear definitions and understanding of meanings by the interviewer are clearly very important during the interview process. However, the process and the responses have helped me understand the concept better.

The fourth question was somewhat clear. However, various interpretations ensued and thus helped define the overall meaning of water security for all. The fifth question elicited quite clear responses. However, a few respondents informed me that using the term 'directly affected' is problematic as it is a legal term used during the licensing appeal process. The term 'immediately' affected may be a better term to use. By the sixth question all respondents seemed to understand the structure of the questions. The eighth question seemed to be cause for more thought than some of the other questions but seemed to be understandable for the respondents, especially when I asked specifically what they thought about land and water connections, quality and quantity connections, groundwater and surface water connections, and the idea of collaborative governance in Alberta.

The following question, asking the respondent about what other ethical considerations she or he thought was valuable, was generally appreciated for the opportunity it gave for the respondent's own take on the ethical issues. Some did not answer the question as directly as requested but offered other tangential thoughts about water issues and what concerned him or her most. The last question gave the respondents an opportunity to evaluate the questions, although many kept in mind my topic of interest. One respondent even summarized what she thought my research was about. I used the extra questions sparingly because the respondents had already donated a great deal of their time. While I considered all interview responses on

an equal basis, some respondents seemed more knowledgeable than others about the strategy, the current situation in Alberta, and water issues in general.

2.5.4 Analysis of qualitative data collected from interviews

Kitchin and Tate (2000) offer a simple comprehensive approach to analysis of qualitative data, particularly interview data. They suggest three stages after data collection: first, *description* is transcription and annotation of as much of the data as possible; second, *classification* deconstructs the data into categories or themes through coding strategies in order to begin to interpret and "make sense" of the data; and, third, *connection* of the data leads to understanding the relationships among the data and developing coherent theories and conclusions from the data.

These steps were essentially followed once interviews were complete. Following the descriptive stage of full transcription, the transcripts were coded according to the themes, based on the seven ethical principles, evident in the interview responses. A few other themes—urban-rural dynamics; legislation and the first-in-time first-right principle and allocation system; First Nations issues; and transboundary issues—also came up frequently in the responses and were separately coded.

The coded responses were classified into their respective "master" categories, each being one of the seven principles (Kitchin and Tate 2000, 242). Other master categories were created to draw out more information and further deconstruct the interviews. These additional categories included: the *Water for Life* strategy compared to previous Alberta water policies; barriers to implementation; positive aspects of the water strategy; negative aspects of the water strategy; other ethical (or ethically oriented) principles thought important; and points of consideration that do not fit within any of the other master categories, but offer valuable background information.

Themes that did not have an explicit category were either associated with one other theme and therefore were consistently categorised with it, or occurred in association with a number of themes and were therefore categorised with each of those respective themes. For example, transboundary issues could be considered either with the common resource principle, because the transboundary nature illustrates that the resource is shared, or it could be placed within the holistic principle, because the transboundary nature of water means dealing with water issues cannot be site-specific but must consider from and to where the water flows. I chose in the end to classify transboundary issues with the principle of water as a common shared resource. Themes such as legislation and the first-in-time first-in-right principle came

up throughout the interviews in association with many of the master categories. My analysis strategy was as follows:

- organize and collate the opinions from all the interviewees about how the strategy addresses each of the principles
- comment about comparison to past policies
- identify what they indicated or implied were barriers to implementation
- identify statements expressing what was good about the strategy
- identify statements expressing what was less positive about the strategy
- identify what other ethical principles were considered important
- identify valuable points of consideration that do not fit within the categories
- note questions I should have asked, indicating participants' particular concerns

Once statements were categorized into their master categories, they were again separated according to which characteristic of the principle they best matched. Chapter 3 characterises and discusses each of the principles. The main characteristics of the principles provided both the criteria for the master category and the subcategories to further separate the data in the analysis. Thus the criteria are "conceptually and empirically grounded" (Kitchin and Tate 2000, 239). This further deconstruction of the data was summarized in tabular form cross-referenced with the specific characterisations of each principle. While part of deconstruction, this summary also allowed for comparison and links to be drawn among the data, thus beginning the third stage of qualitative analysis, connection.

Following deconstruction of the data, and as part of the connection stage of analysis, I was able to see patterns, similarities and dissimilarities in perspectives, and could begin to draw conclusions as to what aspects of the strategy supported and did not support the water ethic principles. With these data and with conclusions drawn from the discourse analysis of the text, I was able to draw overall conclusions about the Alberta strategy.

2.6 COMPARISON OF POLICY DOCUMENTS

Comparison of Alberta's *Water for Life* and Victoria's *Securing Our Water Future Together* is intended to situate Alberta's strategy within a broader intertextual and international context. International examples not only reveal emerging freshwater discourse but also options for positive future directions. Comparative assessment of the two policies indicates where policy and management could be heading to achieve intragenerational, intergenerational, and environmental equity. This comparison reveals positive and negative aspects of both Alberta's strategy and Victoria's policy.

Based on conclusions about Alberta's strategy from the discourse and interview analyses and discourse analysis of Victoria's policy, I compared the two documents in a simple matrix based on the principles and their characteristics as sub-categories, followed by a column each for Alberta and Victoria (see chapter 6). The comparison is largely conceptual. However, the characteristics of each of the principles serve as objective measures, first for analyses of the documents and the interview responses, and then for the comparison. These characteristics ground the thesis and the comparison. In this way, I summarised how aspects of each document meet or do not meet the ethical principles.

This comparison is limited by the differences between the compared objects. Alberta and Victoria each represent a sub-national jurisdiction. However, comparison of Victoria's White Paper 2004 with Alberta's water strategy is similar to comparing a novel to a short story, respectively. Differences are inherent in size, specificity, and genre although both are considered policy. However, the focus on ethics requires higher-level conceptual analysis, not highly specific substantive analysis. Thus document differences do not unduly hamper the comparison and the conclusions drawn.

2.7 TERMINOLOGY

This thesis uses the term "ethic" as a set of moral principles; and "ethics", if used with a singular verb, as the study of morals and moral philosophy; or, "ethics", if used with a plural verb, as the rules or standards governing conduct of individuals or a broader group. Water ethics is the study of the ethics of water use, and water ethics are the various codes of conduct that govern how water is used. This thesis situates itself within the study of water ethics, while it attempts to outline a water ethic, complete with a set of principles to guide water policy and management.

Determination of consistent usage for the terms "ecosystem" and "environment" poses a challenge for the following chapters. These terms are often used interchangeably yet are not strictly interchangeable. For example, literature often describes ecological needs for water as "environmental flows" or "environmental requirements" or "needs" for water. These "needs" or flow regimes are multidimensional and imply amount, duration, and frequency of water flow. The term "ecosystem" is more inclusive, suggesting the dynamic relationships of living and non-living components; whereas "environment" suggests nature that is more static and more easily "othered" as surroundings. Yet the flow regime literature, which is ecologically based, maintains the more common term of environment in its terminology. This situation inevitably leads to interchangeable use of these terms both in this thesis and elsewhere.

In a holistic approach, ecosystems should include humans. However, to discuss and distinguish needs for and allocation of water, I use ecosystems to refer to natural ecosystems that exclude humans, and discuss human needs separately. This dilemma of inclusion or exclusion represents a fundamental difficulty in considering humans as part of whole systems while distinguishing ecological needs for water as separate from those of humans.

The policy documents' use of these terms adds a further challenge. Alberta's strategy fairly consistently uses "aquatic ecosystems"—which it defines as areas where "living and non-living elements of the environment interact" thus suggesting dynamic relationships (Government of Alberta 2003, 28)—to refer to natural ecosystems. Less often it uses the term 'environment' in similar contexts, suggesting interchageability of terms. The more frequent use of "aquatic ecosystems" implies a scientific approach and a partial attempt to avoid the potential political polarization of the term "environment". The Victoria policy, on the other hand, most often uses "environment" but defines both terms in its glossary. Its definition of "ecosystem" also suggests dynamic relationships among living and non-living components that interact as "an ecological unit" (Department of Sustainability and the Environment 2004, 154). But more often the Victoria document uses the term "environment", which it defines as "[s]urroundings in which an organization operates including air, water, land, natural resources, flora, fauna, humans and their interdependence" (Department of Sustainability and the Environment 2004, 154). Perhaps it uses the latter term to fit with international flow regime literature and because the policy emerges from the perspective of the organization, Department of Sustainability and Environment. For simplicity, I use the term most prevalent in the document under discussion.

2.8 LIMITATIONS

As with all research methods, limitations are inherent. The qualitative methods—literature review, discourse analysis, interview analysis, and document comparison—I use are subjective to varying degrees (Palys 2003; Fairclough 1989) and analysis of these qualitative data is iterative and subjective (Kitchin and Tate 2000). The method of discourse analysis by nature is subjective and reliant on the researcher's capabilities of perception and inference (Fairclough 1989); however, the inferences are tempered by key informant interviews and theoretical literature where possible. By outlining the water ethic principles' characteristics from the literature, I attempted to ground the analysis in the literature and remove as much bias as possible from the interpretation. Inevitably, some ideas and questions arose after the interviews—answers to which would have been useful.

The small sample size for the interviews was an obvious limitation to being representative of all groups. No First Nations contacts were readily available, thus the aboriginal perspective is lacking in this research. Although the interviews were intended to supply situational context and not strict statistically representative sampling, the absence of a First Nations' perspective on water management in Alberta leaves ample room for further research.

The research assumes that all approaches to natural resources management and policy, including water, are based on a set of values and views of the world. The research is explicitly normative and questions many of the values guiding natural resources management. The research's methodology assumes the ability to infer ethical principles from policy documents. The research assumes that water may be sustainably managed to provide enough for everyone and every living being. Governance structures are considered necessary to enact the changes and create an enabling political framework.

2.9 CHAPTER SUMMARY

The preceding sections outline the research design and offer specific discussion of the research methods that I used to answer the research questions. Discussion of the challenges of terminology and methodology comprised the latter portion of this chapter. The following chapter develops the theoretical framework of the thesis and defines a proposed water ethic as guidelines and an ethical assessment tool. Subsequent chapters offer the empirical results of the methods used. Due to the detailed nature of the research, chapters 4, 5, and 6 present the main conclusions I drew from the results.

3. ETHICS, JUSTICE, AND WATER: A WATER ETHIC

Ethical values are the principal factor in social cohesion and, at the same time, the most effective agent of change and transformation.

World Commission on Ethics of Scientific Knowledge and Technology
UNESCO
The Teaching of Ethics (COMEST 2003, 2)

3.1 INTRODUCTION

An ethical approach is a legitimate, important, and often ignored approach to effect change in environmental decision making. Ethics are moral principles that embody "the conceptions, interests and ideals from which human behaviour springs and value systems on which they are based" (Selborne 2000, 1). As such, ethics offer a "moral standard as to what you can do and what you cannot do…and/or a standard as to what damage, pain, loss, poverty, thirst, etc. can be inflicted upon your fellow human beings" (Harremoës 2002, 117). While ethics are standards and offer guiding principles, they are always contestable and indeed should be questioned so as to reinforce their currency, relevancy, and validity in dynamic social change. For example, perhaps the moral standard that Harremoës mentions above should expand beyond humans and question what morally can be inflicted upon the nonhuman world and thus change our behaviour towards it. Ethics at once create change and reflect change.

This chapter presents a rationale for developing a water ethic; it suggests a process to define a water ethic; it discusses the goals and overall ethical framework for a water ethic; it then outlines and characterises the seven principles to make up a water ethic. These principles act as criteria with which to guide analysis in the following chapters.

3.1.1 Rationale for a water ethic

Water is a fluid substance with numerous and unique functions on this planet: biological, physical, and chemical (Falkenmark 2003). Water connects the land, the soils, the plants, and the animals into functioning wholes as ecosystems. Water also plays special roles in human economic and social systems—such as cleanser, dissolver, coolant, convector, and life enhancer—that differ from other living or non-living 'environmental inputs' such as rock or trees. Given water's unique roles, ethics regarding water deserve distinct attention as well

as an integral role in natural resources policy. As water becomes relatively short in supply in many parts of the world, the importance of water ethics becomes increasingly apparent.

Decisions regarding water use transpire in specific social and cultural contexts and are thus subjective and value-laden. These values influence individual and societal behaviour and help determine conceptions of morality and fairness. Thus ethics guide water-use decisions and simultaneously guide production of and are expressed in policy and law that emerge from social institutions. Natural resources policy and law reflect and shape society's values with regard to relationships within society and between society and the ecosystems. Policy statements emerge from the nexus of abstract theory and action. Therefore, it is crucial to highlight and articulate abstract ethical principles in policy before it engenders action.

Environmental ethics moves beyond consideration of the relationship among individuals and their society to consideration of individuals' and society's relationship with nature. Water ethics may be considered an important application of environmental ethics to a specific aspect of the environment (Priscoli *et al.* 2004). This thesis aims to define a set of principles comprising a water ethic to guide water-use management. The ethic is broadly defined to allow universal application but is intended to be implemented as would be appropriate to specific social, political, cultural, and biophysical contexts.

In 1998, water ethics became an important focus for UNESCO's International Hydrological Programme under a Working Group on the Use of Fresh Water Resources. A series of essays on this topic has since been published. Selborne (2000, 37), one author of this series, justifies the discussion of ethics in terms of water and policy with the statement: "if ethics are to be the basis for resolving intricate questions involving a multiplicity of often conflicting perceptions, a foundation of agreed upon principles must underpin public policy". Ethics are necessary because principles "address the need to contribute to the water debate by identifying a number of fundamental concerns that go beyond science" (Selborne 2000, 37). Because science cannot expect to solve or even identify all scientific or technical challenges, "we must recognise that values will of necessity have a role in the choice of research questions, methods and applications" (Hillman 2004, 35). Ethical considerations are not a separate process but "must inform each and every aspect of freshwater use" (Selborne 2000, 37). Just as politics are considered in most public policy decisions, so should ethics be a central consideration, especially regarding the human-environment relationship.

3.1.2 Defining a water ethic

Assuming creation of a water ethic will cause positive change in water policy, management, and overall conception of water issues, how does one create a water ethic? This thesis'

approach is to sequentially answer these questions: What are the goals for a water ethic? What ethical framework could be used to support those goals? What principles would support such a framework? What do those principles mean in practice? Answering these questions is the endeavour of this chapter.

3.1.3 Goals: equity and sustainability

Two key goals drive this research and discussion of water ethics: equity and sustainability. Equity connotes a sense of fairness. Sustainability suggests the idea of maintaining the conditions for and of life into the future. These goals are not intended to be end states but ongoing processes that define human activity. Experts suggest these two concepts are central to realizing better water management. An example is a recent statement on international water issues from the International Conference on Freshwater in Bonn 2001—a preparatory conference for the Rio+10 Summit in Johannesburg, South Africa in 2002. The Ministerial Declaration from Bonn posits equity and sustainability as the two primary goals for water management: "the equitable and sustainable use and the protection of the world's freshwater resources [are] a key challenge facing governments on the road to a safer, more peaceful, equitable and prosperous world" (Batz 2001, 20). Many other literature sources imply the importance of equity and sustainability in freshwater management, such as Chapter 18 of Agenda 21 (United Nations 1993). Thus, equity and sustainability should be central to a water ethic.

In the UNESCO survey on water ethics, Selborne (2000, 37) proposes that principles "should reflect the concepts of sustainable development and environmental justice, which are underpinned by equity: equity between geographical entities, between the industrialized and developing world, between rural and urban populations, between generations and between the managed and the managers". Although Selborne considers equity as the underlying idea for both sustainable development and for environmental justice, this thesis perceives equity and sustainability separately but as mutually reinforcing. Environmental justice is explicitly about equity and fairness and will be discussed in section 3.2. The concept of equity, while an important element of sustainable development as social and intergenerational equity, may become lost among other nuances of sustainability. Equity connotes fairness and, as such, I would argue, has greater and more immediate resonance for humans than sustainability. Distinguishing the idea of equity and sustainability, particularly in the case of water, serves to emphasise the importance of equity. Such separation allows a broader discussion of equity beyond social equity and intergenerational equity to include equity for ecosystems. Thus I will discuss sustainability and equity as two separate goals.

3.1.4 An ethical framework

If equity and sustainability are the two primary goals of this research, what principles would be necessary to form a water ethic? To grapple with competing needs for water, this research proposes a water ethic based on an equity framework—a framework that also strives for sustainability. Hurka (1993) proposes one way to frame thought of ethics and recipients of ethical awareness. While his discussion focuses on climate change policy and its consequences, I used this framework, in a simplified form, as a way to think about the equitable distribution of water and to develop an equity framework for a water ethic. His discussion considers sequentially intragenerational equity, intergenerational equity, and equity for the environment—concepts that ideally support the goals of equity and sustainability.

Hurka's framework considers anthropogenic consequences in terms of the current human generation everywhere having ethical standing, future humans everywhere having ethical standing, and the natural environment having ethical standing. If *all current humans everywhere* have ethical standing, then all humans must be considered for equitable distribution of clean water. This ethical stance means that water security must be ensured for all humans as a basic right; basic needs must be met; and this right must not be threatened. If *future humans everywhere* have ethical standing, all future generations must be considered for and ensured equitable distribution of water. This ethical stance means sustainable use of water through water and habitat conservation. If *the natural environment* has ethical standing, then the environment must be considered for equitable distribution of water as well as for protection from pollution and environmental degradation. This ethical stance means the natural environment is considered a water user as much as humans are users and is thus allocated its fair share to meet its basic needs or requirements.

This ethical framework offers a useful way to conceptualize ethical relationships among humans and between humans and ecosystems. Embedded within this framework is the idea of ethical expansion—expansion beyond our day-to-day interactions of everyday community life to further geographical areas than our small community spheres, to the future when our grandchildren will be living their day-to-day lives, to the nonhuman beings and elements interacting around us. This expansion is applicable in addressing the equitable distribution of water and is instructive for developing an equitable and sustainable water ethic. The following sections discuss the goals of the water ethic, equity and sustainability, and then what principles are important in water management to support these goals and recognize Hurka's framework.

3.2 EQUITY

Equity, or the perception of equity, is fundamental for a peaceful society. Equity is about just distribution of "goods and services, wealth and income, or opportunity and disadvantage" (Stone 2002, 39). If the resource in distribution is in abundant supply, the question of equity is not an issue; if, however, supply is scarce, the question of distributive equity is most certainly an issue (Wenz 1988). How equity is perceived determines how justice is formulated and implemented. These perceptual differences mean "[d]istributions…are at the heart of public policy controversies" (Stone 2002, 39).

Distribution of water, its benefits and its burdens, is a significant and pertinent example of potential controversy over principles of distributive justice and equity. As Wenz (1988, 6) points out, where water "is scarce, societies have devised elaborate methods of apportioning the water among those who need and desire it….But where water is plentiful [enough to serve everyone's wants and needs], the situation is entirely different…people do not care how much they or their neighbours consume".

Stone (2002) distinguishes three dimensions to explore in distributive questions: who are the *recipients*, what is the *item* being distributed, and what is the social *process* that determines distribution? The issue of water illustrates the complexity these dimensions of distribution produce. Who should receive water and its benefits and how much? Who should receive the burdens of water (i.e., pollution) and how much? What are the characteristics of the item—its boundaries, its value? Which process should determine the answers to these questions? The water ethic later in this chapter addresses these questions of distribution.

According to Hillman (2004) distributive justice is only one of three key elements of a justice framework and just water management; procedural justice and relational justice are also important. Distributive justice addresses such questions as "who gets what, who pays for what, and according to what criteria" and focuses on the outcomes of decision making (Hillman 2004, 21). The distributive aspect of water management, particularly the issue of criteria, becomes more important and complex as more interests and participants are acknowledged in the process (Hillman 2004). Procedural justice addresses "the institutional *processes* of decision making", where the opportunity to have a voice in the process and the ability to influence the decision are central dimensions (Hillman 2004, 22). Emerging procedural trends in water management emphasise participatory and adaptive managerial processes through multi-stakeholder processes, community management, adaptive ecosystem management, and ecologically sustainable development (Hillman 2004). The relationships between stakeholders or participants are the concern of relational justice, which focuses attention on inclusive multi-stakeholder processes in water management (Hillman 2004). It highlights the broader

social relationships that "frame the struggle over distributive justice" (Hillman 2004, 22). Understanding who the *recipients* are and what *item* is being distributed contributes to distributive justice; evaluating the social *process* that determines distribution contributes to procedural justice; and understanding the social *dynamics* contributes to relational justice. Although Stone does not consider relational justice as a dimension of distribution, these social dynamics have a large impact on the process and outcome of distribution.

Water law has always mediated distributive and relational justice: water's use among users. Water law is intended to avoid conflict and "detrimental side effects" among water users (Caponera 1992, 2). Water policy and legislation have often evinced the attitude that water is "inexhaustible", yet equitable distribution of the benefits and burdens has always been at issue in water law (Caponera 1992, 3). Traditionally water policy and legislation have been formulated without regard for the environment, instead framing use of water as within a human system rather than human systems within a natural one. Nor have future generations been explicitly acknowledged in water law and policy. Inclusion of the nonhuman world and future generations in the net of recipients, in addition to humans here and now, expands the conception of equity. This expansion necessitates a more inclusive procedural justice and demands a shift in relational justice. Relevant law and policy likewise could shift. To address the possibility of such expansion to include the natural environment and future generations, three justice paradigms will be discussed: environmental justice, ecological justice, and ecosystem justice. Each of these considers who the recipients are, what social processes contribute to justice, and what the relationships are among stakeholders.

3.2.1 Environmental justice

Environmental justice refers to fair distribution of environmental 'goods' and 'bads', or quality and risk, among humans. While the concept relates humans to their environment, the concept is largely anthropocentric as the distribution is only among humans, not humans and nature (Lee 2005; USEPA 2006). Environmental justice is based on the premise that some segments of populations are more exposed to environmental risk than others (Ikeme 2003). It can also be concerned with meeting human basic needs (Low and Gleeson 1999) and providing a positive right to "a safe, healthy, productive and sustainable environment" (Mitchell 2002, 350).

When formal mechanisms to evaluate situations in terms of environmental justice are absent, proxy mechanisms can arise, such as race, class, gender, and even dominant discourses (Low and Gleeson 1998; Hillman 2004) and result in discriminatory decision making and disproportionate effects "across dimensions of class and race" (Mitchell 2002, 424; Pellow

et al. 2002). Environmental justice aims to prevent or rectify unfair conditions and decision making because all people have equal rights (Ikeme 2003). Thus environmental justice is concerned with both distributive justice and consequentialist (goal-based) reasoning and procedural justice and deontological (rights-based) reasoning (Ikeme 2003). Overall, environmental justice is about fairly distributing costs and benefits, the process to do so, and how "an explicit outcome of the process should be a shift in social relations" (Hillman 2004, 24).

How does environmental justice contribute to water ethics? Most immediately it addresses protection from water pollution and provision of safe water in sufficient quantities for all people. Ensuring a just process through full public participation represents the procedural concern of environmental justice. Thus two principles emerge from environmental justice theory: water security for all to meet basic needs, and full participation in water management decision making. For further discussion see sections 3.7 and 3.8 in this chapter.

Ikeme (2003, 200) posits environmental justice to be "a broad overarching concept encompassing all justice issues in environmental decision-making". Yet environmental justice provides only part of what is necessary in environmental decision making: equality among human groups. Environmental justice theory does not directly address equity for future human generations or for ecosystems. Wenz (1988) broadens the scope of environmental justice beyond social justice to include future generations and nonhuman species. But his definition differs from the majority of literature on environmental justice. Definitions that include distributive justice towards the nonhuman world might be better addressed under the label of other terms, such as ecological justice and ecosystem justice, which I discuss next.

3.2.2 Ecological justice

Ecological justice is justice of the relationship between the human world and the nonhuman world; this changes humans' relationship to the environment from an instrumental one (as in environmental justice) to a moral one (Low and Gleeson 1998, 1999). With recognition of ecological interdependence, moral consideration is extended to the nonhuman world (Low and Gleeson 1999). As an example, Stone (1974) tacitly supports ecological justice by advocating legal rights for trees and other natural objects—relying on such precedents as legal rights extending to corporations. Low and Gleeson (1999, 23) argue that public policy, while not amoral, is too restricted in its expression of a moral code to "encompass the concerns people feel for society and the environment". Thus public policy and law must expand its expression of morality to include environmental justice and ecological justice.

Low and Gleeson (1998, 2) consistently discuss environmental justice alongside ecological justice, as the two relational aspects of justice in "the politics of the environment":

Environmental justice is "the justice of the distribution of environments among peoples" and ecological justice is "the justice of the relationship between humans and the rest of the natural world". Thus ecological justice, as Low and Gleeson (1998) discuss it, does not include justice among humans. Yet, the principles they posit subsume relationships among humans (or environmental justice). For example, "The first principle of ecological justice is that every natural entity is entitled to enjoy the fullness of its own form of life" (156). Similar to these more inclusive principles Low and Gleeson (1998) posit for ecological justice, the Canadian Ecumenical Justice Initiative states that ecological justice is "that which respects, seeks to preserve, and advocates for just relationships among all living things. It concerns the future of all life upon this planet, the condition of the natural world and our human impact or footprint upon it" (KAIROS, 2006). However, given the definition Low and Gleeson (1998) conceive, ecological justice does not include justice among humans. Ecosystem justice may offer a more explicitly holistic account of justice. See the next section.

How does ecological justice apply to water ethics? Ecological justice offers the idea that the nonhuman world has moral standing in water allocation and management. Nature may also have legal standing if law expands to legally consider nature's right to water and to freedom from environmental 'bads' such as water pollution.

3.2.3 Ecosystem justice

Ecosystem justice is a framework that extends beyond justice towards nature to justice among all living things in the ecosystem. The concept expands our sense of justice and our sphere of moral consideration to the larger ecosystem and re-conceptualises interactions important in justice considerations. Considering a resource in isolation ignores its place within the ecosystem and the interactions with other components (Brunk and Dunham 2000). Taking a broader ecosystem perspective allows recognition of integration and cumulative impacts and it means taking account of all preferences within the ecosystem, not just the human preferences (Brunk and Dunham 2000). Humans are included as components of the ecosystem. Brunk and Dunham (2000) suggest ecosystem justice as a framework specifically to address common-pool resources. Section 3.6 further discusses water as a common-pool resource.

To characterize the values within the ecosystem, Brunk and Dunham (2000) suggest three aspects to consider: (1) the claims of the human communities in the ecosystem; (2) the claims of the nonhuman biota of the ecosystem; and (3) the values at stake in the ecosystem. The ecosystem justice perspective illuminates normative decision making inherent to the assessment procedure and management of the ecosystem, and it points to what kind of questions should be asked in confronting uncertainty and what assumptions should be questioned

(Brunk and Dunham 2000). Because uncertainty can be assumed as present in almost all eco-system assessments and environmental management decisions, ethical and value-laden dimen-sions of decisions will be necessary to handle uncertainty. Where uncertainty exists, precau-tionary decisions should be made in favour of the long-term "flourishing" of the ecosystem rather than short-term gain (Brunk and Dunham 2000, 23).

With respect to water, ecosystem justice holistically embraces the whole ecosystem and its components. Thus ecosystem justice embraces meeting human needs for water and its ben-efits, and protection from polluted water; and it embraces the complex nonhuman needs for water. Implicitly it considers the longevity of the ecosystem through the idea of flourishing, or maintaining a functional ecosystem. It encourages all values to be considered, implying full participation in decision making and evaluation of possible outcomes. Most strongly, ecosys-tem justice implies a holistic approach to water use management.

3.2.4 Summary of justice frameworks

Ecosystem justice provides the most comprehensive approach to building a water ethic (Table 3.1). All approaches assume scarcity necessitates just distribution. All promote equity among humans and participatory processes. Ecological justice posits justice towards nature. Ecosystem justice adds the holistic ecosystem perspective to reconceptualize human activity and consequences within the ecosystem.

Table 3.1. Summary and comparison of environmental, ecological, and ecosystem justices.

Dimensions	Environmental justice	Ecological justice	Ecosystem justice
Recipients	All humans (esp. marginalised, from local to global scales)	Humans and nature	All living things
Process	Inclusive decision-making processes for all humans to influ-ence process	Inclusive decision-making processes	Inclusive decision-making processes where values of all taken into account
Relationship	Equality among all humans; no humans, regardless of gender, race, class, should endure greater burden or receive greater benefit than any other	Moral relationship between the hu-man and nonhuman worlds	All living and non-liv-ing things are inter-dependent & form an ecosystem & deserve equitable treatment; humans embedded within ecosystems

Because ethics and associated conceptions of justice affect only those who are perceived as interdependent members of a community, Leopold's land ethic was an early radical departure from conventional ethics. Leopold (1970, 239) endeavoured to enlarge the boundaries of what humans generally think of as community to include "soils, water, plants, and animals, or collectively: the land". Of the three justices discussed above, only ecological and ecosystem justice build upon the sensibility of Leopold's land ethic, wherein moral consideration and moral obligation is extended toward nature based on the idea of ecological interdependency. Ecosystem justice most closely follows the land ethic because it more explicitly considers humans as embedded within the community comprising an ecosystem.

What is missing from all of these justice frameworks is an emphasis on the future. Although ensuring ecological integrity may be sufficient to ensure sustaining into the future, the concept of the future deserves explicit attention. Thus sustainability is a second goal of the water ethic.

3.3 SUSTAINABILITY

The *Brundtland Report* (WCED 1987) and Agenda 21 from the United Nations Conference on Environment and Development (UNCED Earth Summit), in Rio de Janeiro, 1992, popularized and lent international legitimacy to the concept of sustainable development. The *Brundtland Report* defined sustainable development as human development that "meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED 1987, 8). Agenda 21 recognized humanity's dependence on the natural environment and thus the necessity to protect it for current and future generations (United Nations 1993). Agenda 21, followed by various other international conventions and agreements, strengthened the commitment to sustainable development and recognised that water and other natural resources must be managed for the benefit of future generations.

Intergenerational equity is important for the shift from short-term thinking to long-term planning. The concept expands moral awareness from individuals and populations currently living on this planet to those who will live after us. Sustainability extends moral consideration to the future. To do so means recognizing ecological interdependence (Langhelle 2000) and protecting ecosystems to a functional level so that future generations can benefit from them and lead healthy lives. Although not the direct intent, ecosystems also benefit from this protection.

While the shift towards intergenerational equity is the most dramatic contribution of sustainability discussion, social justice (or intragenerational equity) is an implicit contribution. Hillman (2004, 28) suggests the "nexus between sustainable development and environ-

mental justice is not surprising, given that the origins of the environmental justice movement lie in an articulation of the lines between economic, social and environmental disadvantage, the 'triple bottom line' of sustainability". The sustainability discussion contributes the idea of balance between social, economic, and environmental values. Sustainability considers three prime systems "interacting, interconnected, and overlapping", each with its "own value-laden imperative" (Paehlke 2004, 44). The ecological imperative is to maintain functional ecosystems. The economic imperative is to ensure adequate and equitable material standards for all people living. The social imperative is to ensure adequate social structures for sustaining the values the people wish to live by. Sustainable development is an attempt to reconcile these three different imperatives.

Although sustainable development has provoked much debate, the term sustainability can move away from explicit reference to development and away from the "imaginative" reconciliation effort that Dryzek (1997, 14) suggests of sustainable development as it "attempts to dissolve conflicts between environmental and economic values that energize discourses of problem-solving and limits". Robinson *et al.* (1990, 39) define sustainability as "the persistence over an apparently indefinite future of certain necessary and desired characteristics of the socio-political system and its natural environment". As Robinson *et al.* (1990) define it, sustainability need not include economic growth, but may merely imply the indefinite continuance of desired characteristics. The concept of sustainability must not assume that "stability is natural and humanly achievable"; instead it must assume change is natural and question stability (Falkenmark 2003, 2042). Seeking sustainability requires the assumption of change rather than the search for an end condition. Mitchell and Shrubsole (1994, 51) argue that sustainable development is not just an end; it represents "an ethic and a process, or a means to an end".

Mitchell and Shrubsole (1994) suggest that sustainable development embodies the following aspects: meeting basic needs; maintaining ecological integrity and diversity; merging environment and economics in decision making; keeping options open for future generations; reducing injustice; and increasing self determination. To achieve sustainable water use, each of these aspects of sustainability should be considered. Each of these aspects incorporates the idea of equity. Fundamental to sustainability is the attempt to reconcile intra- and intergenerational equity (Langhelle 2000). Thus equity and sustainability are mutually reinforcing.

3.4 WATER ETHIC PRINCIPLES: THEORY TO PRACTICE

The following discussion presents and defines seven principles to comprise a water ethic and explores what they may mean in practice. Wenz (1988), Low and Gleeson (1998),

and Dryzek (1997, 2005) discuss threads of philosophical thought that relate to development of similar and diverging perspectives on the human-nonhuman world relationship. The water ethic developed here draws from a number of philosophical traditions. Most consciously the ethic is meant to be ecocentric, where human concerns are addressed as part of the whole eco-system and alongside those of other living being and the integrity of the whole system. Un-derlying this view is the idea that all living beings have intrinsic value and are interdependent. These ecocentric ideas emerge from writings by Leopold (1970), Naess (1989), Fox (1995), and others. Alternative ways of considering consciousness towards the natural environment are ecofeminism and eco-theology (Dryzek 2005); these two approaches did not influence my development of a water ethic. The approach of bioregionalism, which Dryzek (2005) classi-fies as one approach of green consciousness and which seems to draw on communitarianism (Low and Gleeson 1998), is closely related to the watershed approach. Utilitarianism, entitle-ment, and other philosophical traditions also influence ideas of the water ethic (Wenz 1988; Low and Gleeson 1998).

Key literature sources for the discussion were the *Dublin Statement* from the Interna-tional Conference on Water, Dublin 1992; the Bonn Keys from the International Conference on Freshwater, Bonn 2001; Selborne's (2000) *The Ethics of Freshwater Use: A Survey*; and *Water and Ethics: Overview* by Priscoli *et al.* (2004). These sources contributed to the water ethic principles but each on its own was deemed insufficient to fit Hurka's (1993) framework.

The *Dublin Statement* on Water and Sustainable Development (ICWE 1992) offers a set of four principles that emerged from discussion at the International Conference on Water and the Environment, Dublin 1992. This *Statement* was prepared for the participants of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. It, and the complementary *Conference Report*, were intended to bring awareness of immediate and future concerns around water and the environment to world leaders and to guide their future actions in this regard. The principles relate to water's basic role to sustain life and its limited, vulnerable nature; to the importance of participation of policy makers and the general public; to women's pivotal role in water management; and to water's nature as an economic good while recognizing a basic human right to water (ICWE 1992). Although these principles are concise, based on Hurka's framework they are not comprehensive, particularly from a more ecocentric view; and the point about water as an economic good has proven con-tentious (Priscoli *et al.* 2004).

Building on the freshwater-related objectives set out in Chapter 18 of Agenda 21 from the 1992 UNCED conference, the International Conference on Freshwater, Bonn 2001, de-veloped five principles, the Bonn Keys. These principles were offered to guide world leaders at the Rio +10 conference in Johannesburg, South Africa, in 2002, and to the World Water

Forum in Kyoto 2003 (Batz 2001). Poverty reduction, of which water security is a key dimension, was an overarching goal of the conference (Batz 2001). The Bonn Keys point to the key areas of action deemed necessary to achieve this goal. The Keys suggest water security for the poor; decentralisation of governance; partnerships; cooperation in river basins; and better governance arrangements (Batz 2001). The Bonn Keys thus offer important principles for water governance. Like the Dublin principles, however, the Bonn Keys are not comprehensive enough to address an expanded sense of equity and they focus primarily on governance issues rather than ethical ones.

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) produced a series of essays on water ethics through the COMEST (World Commission on the Ethics of Scientific Knowledge and Technology) Sub-Commission of the Ethics of Freshwater Use. Following discussions of the Sub-Commission, *The Ethics of Freshwater Use: A Survey* was presented with the aim to "help lay a foundation of trust, justice and equity in the availability of and access to freshwater resources for the entire community of nations" (Selborne 2000, 3). It is meant to provide "an overview of the practical areas of concern" (Selborne 2000, 3). As such, this document is comprehensive and discusses many substantive and ethical issues and principles related to water. Yet this source does not present the principles cohesively, based on an obvious framework.

Similarly, *Water and Ethics: Overview* by Priscoli *et al.* (2004), which emerged from the same Sub-Commission, presents a comprehensive set of principles but a framework, such as that of Hurka, is not evident. This essay is intended to be an introduction to a series of essays on water and ethics under the International Hydrological Programme of UNESCO—a series which provided input to the World Water Forum in Kyoto 2003 (Priscoli *et al.* 2004). The other essays in the series focus on specific water-related issues, such as a water-related natural disasters, water and ecology, and a historical perspective on water ethics. Some of these were useful to understand the discussion of particular principles of the proposed water ethic.

Overall, water as a resource to be managed carefully, sustainably, and equitably has only emerged as an international topic in the last two decades. The above mentioned documents illustrate how water has moved from becoming a significant topic to becoming a topic worthy of its own genre of ethics. They also illustrate a certain ethical expansion—from conventional anthropocentric ethics to recognition of future generations and dependence on ecological functioning to explicit recognition of ecological rights to water. Other recent literature on water ethics illustrates various perspectives on and approaches to water and our relationship with water and the nonhuman world. Some theorists present an anthropocentric view of water ethics by recognizing only the instrumental value of water and the natural environment for humans and the future generations (Sohail and Cavill 2006). Other theorists propose an

expanded moral sphere of water ethics to include the nonhuman world and ecosystems (Har-remëos 2002; Postel 2002; Armstrong 2006). Some of this literature (Armstrong 2006; Sohail and Cavill 2006) became available towards completion of my research and did not influence the development of the water ethic proposed in this thesis; my work developed independently of these examples of work on water ethics.

While the first four literature sources were essential contributions to develop a concise water ethic, none was sufficient in itself to support a water ethic based on Hurka's discussion of an expanded sense of equity and moral considerbility. The effort of this research has been to collate many of these ideas into a discernible framework that supports a broad view of equity and sustainability. Table 3.2 illustrates the contribution of the key sources of literature to the principles of the proposed water ethic. Where indicated, the literature source contributes one or more characteristics to the principle. The specific characteristics are evident in the fol-lowing discussion.

Table 3.2 Literature sources from where the water ethic principles derive.

Principles	Dublin Principles (1992)	Selborne (2000)	Bonn Keys (2001)	Priscoli *et al.* (2004)
Limited, variable	X	X		X
Common, shared		X		X
Security for all	X	X	X	X
Full participation	X	X	X	X
Future generations		X		X
Environmental equity		X		X
Holistic		X	X	X

Selborne (2000, 37) proposes that water ethics should emphasize "notions of soli-darity, social justice, equity, water as a common good, and ecological stewardship". Fitting with this proposal and Hurka's framework, the following principles aim at equitable balance of needs of current human generations, future human generations, and the nonhuman com-ponents of ecosystems. The first and last principles are not ethical, but they have normative implications and understanding the nature of water is fundamental to how we govern our use of it and find solutions to achieving a sustainable and equitable water future. The following are seven principles of the water ethic:

1. ***Water should be treated as finite and variable in availability*** – Water is limited in its amount on Earth. While this fact is not ethical, its implications are ethical as this un-

derstanding is absolutely fundamental to how we manage our use of water and is thus a principle deserving of specific discussion. Water availability varies over space and time. All locations were not made equal; thus right to water should not ignore geographical variance, but should instead recognize and respect that difference.

2. ***Water should be treated as a shared, common resource*** – Water flows without regard for intangible boundaries such as political jurisdictions. This fact provokes varying governance over shared water.

3. ***Water security should be ensured for all humans*** – Water for all people regardless of their socio-economic conditions, religion, race, gender, and any other distinguishing features is an ethical matter. Without adequate quality and quantity of water, illness and death occur; without adequate sanitation, indignity and disease occur. Meeting basic needs of all and providing equal opportunity to water's benefits requires enough water be assured to sustain life, health, and dignity in life.

4. ***Water management should entail full participation by all those affected*** – Full participation by all those affected by water management decisions is important for procedural justice and to perpetuate democracy and equitable decision making. Full participation will better guarantee acceptance, cooperation, and responsibility in the changes and decisions that result.

5. ***Intergenerational equity should be an essential element in planning water management*** – Considering future generations of humans is another ethical manner that extends our moral consciousness across temporal and generational boundaries. While this idea is not new, it has gained a large presence in international, national, and local circles of policy and political discussions in the last three decades.

6. ***Environment should have standing in water-use management*** – To preserve the intrinsic and instrumental value of ecosystems, water-use management decisions must take into account ecological value and functioning and extend our moral obligation to the nonhuman world.

7. ***Water management should entail a holistic ecosystem approach*** – This final principle is not an ethical principle; but taking account of the implications of ecological

functioning and the hydrological nature of water on water use and users and on water governance is essential to equitable and sustainable water use management.

I intend this compilation of principles for achieving equitable and sustainable water management to be comprehensive and broadly applicable. Hillman (2004, 24) argues that application of universally derived principles of justice requires "the use of situated knowledge based on an understanding of the complexities of particular contexts" because formal and informal rules of fairness are associated with local culture and affect social structure. Thus application of the principles should consider the local context—particularly in the case of emotionally charged or contentious water management debate.

3.5 WATER SHOULD BE TREATED AS FINITE AND VARIABLE IN AVAILABILITY

Factors of population growth, lifestyle affluence, habitat destruction, land use, pollution, and the implications of climate change mean water can no longer be treated as an inexhaustible resource. Due to these factors, together with spatial and temporal variations in water availability, water is becoming relatively scarcer (Rijsberman and Mohammed 2003; United Nations 2003a). The limited but renewable nature of water, its geographic distribution, and its variability in annual and seasonal availability condition water use and human activity.

3.5.1 Limits of water availability

Explicit expression of water's limits is not new. The *Dublin Statement* addresses the essential and finite nature of water as one of its four principles for water management: "Freshwater is a finite and vulnerable resource, essential to sustain life, development, and the environment" (ICWE 1992). According to this *Statement*, recognizing water as finite and vulnerable involves a holistic approach, linking social and economic with ecosystem protection, and should be applied across a whole catchment area or groundwater aquifer. This holistic approach is an important implication of the finite nature of water; this research considers it as a separate principle later in the chapter.

Despite innovation to cope with and extend beyond water limits, biophysical limits persist and the effects of such innovation are apparent (Hunt 2004). Quality of water also limits its availability (Fry 2005). If water is of poor enough quality, it is unusable. Thus measures to avoid water pollution should be taken in recognizing water's limits. The agriculture sector should avoid overuse of water, and runoff pollution from fertilisers and pesticides (Selborne 2000). Industry must consider the available local supply, socio-economic conditions, as well as local ecosystems, and protect quality and quantity of water and include local participation

in decision making (Selborne 2000). Domestic use should take into account wise-use practices and cultivate awareness and attitudes that would reduce water use and minimize pollution.

3.5.2 Geographical variability

Water availability is spatially variable—across continents, countries, and regions. This variability has significant impact on vegetation composition, wildlife subsistence, and human settlement possibilities for the area. Availability depends upon a local area's geography, biophysical characteristics, supply and demand conditions, and culture. Historical use of water in an area changes over time and plays a role in shaping the current conditions of water and its use in a local area. Historically, water availability has had greater influence in determining human settlement (Hassan 2004). Technological innovation, particularly in the last century, has allowed human settlement to be less sensitive to geographic variability. For example, water diversion or groundwater drilling allows humans to cultivate crops or develop urban spaces in semi-arid or arid areas. However, as changes in water availability over time make technology and such places more vulnerable, solutions to water issues must take into account local conditions when addressing water issues.

3.5.3 Seasonal variability

Water availability varies over time and space. Its flow results from a confluence of factors both natural, such as seasonal climate patterns, and anthropogenic, such as water consumption and diversion. Water withdrawals should take into account both seasonal variation and ecological requirements for water, especially during low flow periods.

3.5.4 Inter-annual variability and climate change

Water availability varies by season and year and even by decades or more. Factors of population and economic growth affect this availability over time and are necessary to consider in planning for the future. Climate change has long-term implications and should be taken into consideration in any decision that has long-term consequences. Effects of climate change, particularly for Alberta and western Canada, include overall lower annual rainfall but higher peak rainfall in storm events, reduced river flow, and less groundwater recharge. Prairie droughts will be "more persistent" and flooding will be more severe and intense (Carey quoted in Banks and Cochrane (2005, 3).

3.5.5 Conclusion

For human settlement feasibility and ecosystem health, water's finite and variable nature requires conservation and protection of its sources from overuse and pollution. Recognition of limits underpins all the following water ethic principles. If limits are not recognized, then there would be no perceived need for other "rules" or ethical principles around water use. In times of abundance, distributional justice becomes less relevant; but this is not the case in many parts of the world or for every year, especially as effects of climate change become more apparent.

3.6 WATER SHOULD BE TREATED AS A SHARED, COMMON RESOURCE

Unlike land, water flows, resists political and ownership boundaries, and, as such, is a common-pool resource. The shared need to survive parallels the shared need for water. Because all life is dependent upon access to water and because all life has value, water's availability must be shared under an effective and equitable governance regime. Quality and quantity dimensions are shared between upstream and downstream users; thus management affects everyone. This principle has implications at all scales, from neighbourly to international and from humans to ecosystems. The United Nations World Water Development Report, *Water for People Water for Life*, distinguishes two types of sharing water: sharing water between users (e.g., administrative regions or countries), and sharing between different uses of water (e.g., energy, cities, food, and environment) (United Nations 2003a). This principle addresses sharing between users as general sharing among users and sharing across boundaries. Unlike the UN report, this thesis considers the environment a user of water, not a use—a point which is discussed as natural sharing. Sharing between uses is discussed under best use of water for the community. The overall idea of shared governance addresses both sharing between users and uses.

3.6.1 Shared among users

Water, whether surface water or groundwater, is a common-pool resource, and a common good, and thus shared among many. Ostrom *et al.* (1999, 278) use the term common-pool resources, regardless of property rights, to refer to natural or human-made resources in which exclusion of potential users or beneficiaries is difficult, and use by one user may deplete the resource for others (a concept called "subtractability"). Common-pool resources are "depletable and renewable" (Ostrom *et al.* 1999, 279). Water is often perceived as a common-pool resource to be shared for the community's good. Priscoli *et al.* (2004, 16) define the principle

of the common good as "the social conditions that allow people to reach their full potential. By almost everyone's definition, water is a common good.… [Water] is the vital facilitator to reaching full human potential and realization of human dignity". Water can be perceived as a common good which should be managed for the good of whole community, move beyond market mechanisms, and provide environmental flow allocations (Hillman 2004, 25). Fundamental in these notions is the sharing of water as a commons for the good of the community—the human community or beyond.

Water's common-pool nature conditions the management of our use of it. Because this nature has the potential to create dilemmas, Ostrom and other theorists have recommend governance "rules" to limit access and define rights and duties to avoid "overuse without concern for the negative effects in others and a lack of contributed resources for maintaining and improving the CPR [common-pool resource] itself" (Ostrom *et al.* 1999, 279)—in other words, to prevent "tragedy of the commons" as described by Hardin (1968). Governing common-pool resources involves restricting access and creating incentives. To effectively govern common-pool resources, participants or outside authorities must devise, monitor, and enforce rules to limit the resource's use; specify amount and timing of use; establish formal monitoring arrangements; as well as establish punitive arrangements for non-conformance (Ostrom *et al.* 1999). As well as autonomy to devise and enforce their own rules, users must appreciate the resource's future sustainability to make apparent that benefits will outweigh costs; have a realistic understanding of the resource so that it does not seem more complex than it is; and understand the diverse interests of fellow users to share an image of how the resource system works and recognize how the actions of each affects the others (Ostrom *et al.* 1999). Thus, well-informed local decision making in common-pool resource management is important.

Without a framework for decision-making, based on principles of fairness, conflict is liable to ensue when the resource grows scarce. Both consequential and procedural justice is important in governance of water as a shared common good for peaceful and equitable situations. While all may not receive equal amounts of water in the end, the process to decide and agree upon principles upon which decisions are made is often paramount to achieve perceived equitable solutions: "[c]ommons problems often require distributive solutions based on unequal slices but fair processes" (Stone 2002, 52).

Four characteristics distinguish water from other common-pool resources and make it more difficult to assign efficient property rights. Water is a basic need for all life, thus the basic needs of humans and the environment must be first priority. Water moves, thus rights cannot be assigned to one individual if that person does not own the entire river basin and management by one person or group will affect others who hold rights upstream or downstream. Water is a local issue and can only be traded in a local net or market, such as naturally

occurring rivers, and human-made nets, such as channels, canals, and urban water supply markets. Water has a variable nature, which makes it especially difficult and costly to achieve the necessary certainty in transferable rights (Shen 2003). Thus governance regimes for water-use management must be carefully devised in an equitable, cooperative, decentralised, and adaptive manner.

From imposing governance rules on resource use arises questions of who are the acknowledged community of users, who are excluded from use rights, how are these decisions made, and who makes these decisions (Ostrom *et al.* 1999)? The answers to these questions rely on defining moral considerability and participatory limits in the resource system, as well as criteria with which to make decisions. See sections 3.7, 3.8, 3.9, and 3.10 for more discussion.

3.6.2 Shared across boundaries

Water's nature as a common-pool resource complicates relationships between political jurisdictions—from local to international scale. Administrative boundaries rarely follow those of watersheds (United Nations 2003a). Water's transboundary nature and country borders often demarcated along rivers mean that cooperative, trans-regional management is necessary to avoid conflict for those who share water resources, whether surface or groundwater (Selborne 2000; Batz 2001), and to keep the rivers healthy (Postel and Richter 2003). Because water is shared, data and information sharing between those claiming upstream or downstream rights to water is essential to cooperative management and peaceful relations (Selborne 2000). If upstream neighbours take advantage of their position and the economic imperative overrides consideration of downstream neighbours, conflict over fisheries, pollution, or other issues may ensue.

Helsinki Rules on the Uses of the Waters of International Rivers, 1966, provides some guidance to negotiating transboundary issues between countries (ILA 1967). Equitable use and reasonable use are key principles for international parties, where "Each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin" (Article IV). While equity and reasonability are to characterise use, what such use means in practice is open to interpretation, as is the idea of beneficial use, and is only to be determined on a case by case basis amidst many factors. These Rules also do not explicitly consider future users or the environment.

Adequate response to the challenge of transboundary waters in an equitable and sustainable manner requires "flexible, holistic institutions able to respond to hydrological variations, changes in socio-economic needs, societal values, and, particularly in the case of

international watercourses, political regime changes" (United Nations 2003a, 25). Integrated Water Resource Management (IWRM) is considered the strategic response to this challenge of integrating human and natural system management (United Nations 2003a); IWRM will be further discussed under section 3.11.

3.6.3 Natural sharing

"Natural sharing" is an unconventional redefinition of the community of users. It implies sharing water between natural ecosystems and humans—in other words, considering the environment a water user in allocation schemes and when preventing pollution. Some may envision this natural sharing as competitive, where ecosystem requirements are framed as competing with human uses. Falkenmark (2003) and Selborne (2000) argue against a competitive scenario. Instead, satisfaction of ecosystem requirements for clean water is essential to the continuance of human systems, so this sharing is also to the benefit of human users. See section 3.10 for further discussion.

3.6.4 Common responsibility and accountability = shared governance

Because water flows and is shared among users, all users of water are responsible for their use of the resource and are accountable for their actions to the wider community of users. This shared responsibility and accountability mean water must be commonly governed. The stewardship principle is one expression of accountability and responsibility towards the wider community of ecosystems as a whole. Berry *et al.* (1992, 257) describe stewardship of living and nonliving systems as a way "to maintain their sustainability for present and future, allowing development with forebearance and equity". For this idea, responsibility "in strengthening good management and restraining present actions so that no irreversible damage is done or unacceptable risks imposed on current or future generations" is necessary (Berry *et al.* 1992, 257).

3.6.5 Best use for the community

Beneficial use of water (i.e., what uses are best for the common good) is a significant but subjective and contentious topic. It is fundamental for determining an allocation and management system that is perceived by the particular community as acceptable and equitable. Water has economic, social, religious, cultural, and environmental value, some of which are interdependent (United Nations 2003a). It also has multiple uses—domestic, industrial, agriculture. As a common good, recognizing water's value to and priorities of the public interest

is essential. Authentic participatory methods will best ensure procedural equity in such value-laden decisions (see section 3.8 for further discussion).

Many debate about water's best water use and how it should be managed: as a commons, as a public good, as an economic good, or both a public and an economic good as suggested in Brazilian water policy (Porto 1998). The fourth principle of the *Dublin Statement* states that water is an economic good—a statement which caused much consternation, especially among Islamic countries who opposed the idea that "market forces should act as a strategic determinant rather than their more acceptable function as an implementation mechanism for achieving previously agreed strategic targets" (Priscoli *et al.* 2004, 8). This principle, however, is presented with conditions: water must first be recognized as a basic human right for clean water and sanitation and be provided at an affordable price (ICWE 1992). Meanwhile, managing water as an economic good might avoid wasteful, environmentally damaging water use and encourage efficient, equitable use and conservation and protection of water resources (ICWE 1992).

To ensure equity, prioritizing water to meet basic human needs, especially of vulnerable groups, and then to meet environment needs for water are essential. South Africa's *National Water Act*, for example, privileges these needs as the only two constitutional rights to water (DWAF 2002). Following satisfaction of these needs, economic uses of water can then be determined and allocated, and water can then be treated as an economic good—with some caveats on agriculture. Water rights and economic instruments are two key methods to allocate and protect water resources and can be used to achieve water use for public interest. As water becomes progressively scarcer, government-property regimes may not "adequately address the problems of resource allocation. Therefore, individual or group property rights systems are introduced. Water, then, becomes an economic good as well as a social good" (Shen 2003, 147). Treating water both as an economic good and a common good may be a way to achieve 'best use' of water for the community.

Water rights offer security, empowerment, and encouragement to protect the resource to the rights holders. These rights should be legally supported by natural resource property law and the legal framework to formulate laws and regulations related to water rights (Shen 2003). Water rights should be clear and secure (Shen 2003). However, tools of flexibility to adapt to changing needs and conditions are significant for maintaining best use in the community. For example, ensuring individual-use licenses are reviewable and potentially renewable rather than given in perpetuity better allows such flexibility.

Water markets are also a mechanism of flexibility and offer the opportunity to reallocate water to meet best community use. This economic instrument generally works by trading water rights. Advantages offered by water markets are greater efficiency of water

resource allocation and better management; empowerment of water rights holders through reallocation and compensation; water rights tenure security encouraging investment in water-saving technology; consideration of water's potential cost and its value for alternative uses; accountability for external costs (e.g., water degradation) due to water use; and more flexibility in responding to crop demand and price changes (Shen 2003). Disadvantages to water markets include high transaction costs (such as metering and charging for water (Rijsberman and Mohammed 2003)) that may reduce trading scope; variable water flow that could disrupt certainty of rights; expensive conveyance and metering technology and management investment to better implement the market; institutional capacity building to regulate to market; and externalities imposed on third parties (Rijsberman and Mohammed 2003; Shen 2003). Water markets could favour those with already accumulated wealth and lead to unequal opportunity for economic vitality requiring water. Thus market approaches do not address equity issues well (Rijsberman and Mohammed 2003). As an economic instrument, water markets must function within the broader social and environmental context.

Pricing, another economic instrument, is often viewed as a way to achieve best use of water for the community because those who need it most (and arguably produce the highest value) will be more willing to pay more for it. Where subsidised water and water services lead to excessive use and lack of consciousness about water's limited nature, pricing systems may be imposed to provide for basic needs while preventing excessive, wasteful practices. Pricing water can work in two ways: pay for the service or pay for the resource itself. Kemper (2003) suggests that paying for the resource itself is more effective at reducing water use. For example, rising block tariffs can minimise base water amount prices and progressively increase prices as users increase use beyond that base amount. This method is in direct contrast to bulk water pricing, which decreases price per unit as water usage increases. Pricing structures should support the defined policy direction (Shen 2003), be well-researched and planned, and be appropriate to the water use and social context of implementation so as not to be unduly burdensome to the population. An effective pricing system should reflect and assure "availability to all segments of society and conservation of this finite resource" (Selborne 2000, 8). Which tools are appropriate should be subject to participatory decision making, especially for often contentious topics like pricing.

Economic instruments in water allocation, such as pricing and water markets, should be used as tools to achieve broader goals—such as equity and sustainability—rather than be the goal themselves. Economic tools cannot accurately account for social, cultural, and religious values, environmental and economic externalities, or "intrinsic economic value" because "most current valuation methods are too complex, there is little operational application of valuation methods, and water services are heavily subsidized even in developed countries"

(United Nations 2003a, 27). Domestic and environmental needs must be satisfied prior to div-vying out water on a market or for economic uses (Shen 2003).

Other measures that can assist water re-allocation between uses include policy change on inter-sectoral allocations; tariff disincentives and targeted subsidies; abstraction management; application and enforcement of water-quality objectives; and reservoir compensation flow releases (United Nations 2003a).

3.6.6 Conclusion

Due to water's nature as a common-pool resource, sharing among users and uses must be devised with equity and sustainability in mind. All values in the community of users must be prioritized and balanced through an equitable, participatory, and discursive process.

3.7 WATER SECURITY SHOULD BE ENSURED FOR ALL HUMANS

South Africa's White Paper on water (South African Government 1997) suggests three aspects of equity in water management for people: (1) equity in access to water services; (2) equity in access to water resources; and (3) equity in access to benefits from water resources use. This breakdown of what equity means in this context is useful for guiding delineation of what the parameters should be for "water security for all". Access to water services implies equitable access to drinking water delivery and sanitation. Access to water resources themselves implies drinking water provision and water for agriculture and other direct economic uses. Access to water's benefits implies water for economic and social uses. As the South African document suggests, all types of access should be equitable to ensure water security for all.

3.7.1 Water for basic needs—drinking water, cooking, sanitation

Water security is not a global phenomenon or equitable. The issue of security—be it physical, psychological, economic, or military security—"is one of the enduring sources of passion in policy controversies" and generally revolves around the question of need (Stone 2002, 86). Thus water security is about meeting needs for water. The assertion of meeting basic human needs relies on the "needs principle" wherein all humans have the right to core basic needs (Ikeme 2003, 199). Clean water for drinking and cooking (about 100 litres per day per person (Acreman 2004)) meets basic physical needs and nourishment requirements without causing disease. Water for healthy sanitation systems meets the need for basic dignity, privacy, convenience, and fends off disease through hygiene. Human dignity is an important principle in a water ethic (Priscoli *et al.* 2004, 16). Thus all humans, regardless of gender,

race, nationality, religion, and so on, have a positive right to access sufficient amounts of clean water for drinking, cooking, and hygiene. Ensuring equitable access to supply and sanitation should be a guiding principle of water management (Selborne 2000). Inequitable access particularly affects marginalised segments of society. Thus, one of the Bonn Keys' five principles is ensuring water security of the poor; although the Keys broaden the definition of water security to include attention to livelihoods, health and welfare, production and food security, and reduction of disaster vulnerability (Batz 2001).

To protect drinking water quality, standards must be established and enforced (Selborne 2000; United Nations 2003a). Boyd (2003) describes six important aspects for comprehensive drinking water protection: drinking water source protection; treatment; safe distribution systems; comprehensive testing; public notice and information; and sufficient financial resources for operation, maintenance, and upgrading water treatment systems (Boyd 2003). Barriers to proper sewage treatment (i.e., sanitation) are inadequate laws or regulations, lack of enforcement, lack of sewage treatment facility upgrades, and "the entrenchment of a flawed sewer design that mixes industrial effluent with household waste and combines wastewater sewers with storm sewers" (Boyd 2003, 36). Where there is poor waste management, "urban areas are among the world's most life-threatening environments" (United Nations 2003a, 15). A number of components should be in place for cities to provide adequate water supplies, sanitation, and flood management: competent water utilities subject to effective regulation; sound city planning and zoning regulations to control development, water abstraction, and pollution; good watershed management to minimize ecological damage and use water resources carefully; create an enabling environment for communities and NGOs to provide their own supply and sanitation and not cause problems elsewhere in the system (United Nations 2003a). Weak government and low incomes of urban dwellers are barriers to these actions (United Nations 2003a).

Water is essential for human survival and dignity and to alleviate poverty, but is it a human right? A right indicates entitlement, which cannot be denied without penalty; a need, however, is not guaranteed and can be commoditised (Hunt 2004). Various authors suggest a basic human right to water (ICWE 1992; Selborne 2000). However, how far this right extends—such as to economic uses (Gleick 2000b, 15), or beyond the watershed's limits—is still open to much debate.

3.7.2 Food security

Production of food is the traditional and primary role of agriculture (i.e., crops, livestock, aquaculture, and forestry (United Nations 2003a)). Given the necessity of food for

meeting basic human needs, this role is ethically significant. Water is a central ingredient to agriculture production. Globally, irrigation for agriculture accounts for 70% of all water withdrawals, an amount that is predicted to rise by 14% by 2030 as the amount of irrigated land grows by 20% (United Nations 2003a). This enormous devotion of water to food security conforms to the moral imperative considered important by Selborne (2000) and Priscoli *et al.* (2004).

High water use by agriculture means less water for other uses. Meanwhile, water scarcity can constrain agricultural production and thus impair food security (Selborne 2000). SIWI *et al*. (2005) suggest a number of strategies to combat the growing need for water in agriculture and to better balance agricultural uses with other, such as ecosystem, uses.

At the same time, other uses can threaten agricultural uses (and food security). Industrialisation has pushed agriculture to the outskirts of growing urban space and influence. The high social value of water for municipal uses and the high economic value of industrial uses (Rijsberman and Mohammed 2003) cause farmers to "sell their land to the city developers rather than grow food. This raises the ethical question of taking land out of production for urbanisation" (Priscoli *et al.* 2004). This tension between rural and urban water uses has the potential to affect food security (Rijsberman and Mohammed 2003; Priscoli *et al.* 2004). Selborne (2000) suggests that the demands for water by industry and irrigation should be coordinated to guarantee subsistence farmers have right to water. A balance should be struck to ensure equity between rural and urban populations (Selborne 2000) and food and water security.

3.7.3 Right to healthy natural environment

Do people have a right to a healthy natural environment? If so, many people in the world are denied that right. Yet a healthy natural environment—healthy functioning ecosystems—is ultimately necessary to sustain human life. To alleviate poverty in developing countries, Falkenmark (2003, 2038) states the "most fundamental task is…to clarify humanity's dependence on the planet's life-support system without which we would have no food, no fuelwood and timber, no wildlife, no pollination or our crops and other essential ecosystem services". Ecosystem conservation is essential to alleviating poverty and overcoming inequities (Acreman 2004). This idea is the crux of the concept of sustainability: sustaining ecosystems so that all living beings can continue to flourish in positive ways.

3.7.4 Economic vitality

Economic vitality is part of the "quest for security" in politics (Stone 2002, 86) and is often the dominant issue that drives policy today at every level of government. Economic vitality is an important component of poverty alleviation, dignity, and overall well being. While equitable distribution of water for basic needs is of primary importance, water allocation for economic uses is important for human livelihoods. Both ideas contribute to intragenerational equity. However, "[t]he economic well-being of society has so far exerted the greatest demand on the world's water resources" (United Nations 2003b, 8), creating the tension between demands for economic growth and protection of environmental health and human rights to water.

Primary economic uses of water tend to be agriculture, manufacturing and other similar industrial uses, and power generation. These uses support livelihoods and economic vitality. With this access to water, however, comes responsibility to protect that water and other users. For industrial use of water, Selborne (2000) states socio-economic conditions and water use in relation to available local supply must be considered. Industry must conserve water, protect quality, and prevent downstream effects, as well as monitor impacts on the local area. Weak governance swaying to the economic imperative, industry managers' lack of awareness, and the use of inefficient or inappropriate technology often collude to prevent responsible industry (United Nations 2003a). Governments have the responsibility to create and enforce effective legal and regulatory frameworks of policies, laws, subsidies, taxes, incentives, and generally set standards (Selborne 2000). Given the growing trend of transnational corporations transcending regulations, transnational corporations and industry should be accountable and bound to ethical guidelines, like governments, and should promote those same ethical guidelines to other industry and to the public through education (Selborne 2000).

3.7.5 All groups have equal access to good quality water and opportunity

All groups should have equal access to water to meet basic needs and have equal opportunity to economic and beneficial activities that are determined by water availability. Indigenous groups, women, the poor, rural landowners or dwellers, small municipalities, and so on should not be marginalised in this regard. Equal protection from all from water pollution and its effects, and equal provision of water's benefits to meet needs are requirements to achieve environmental justice.

3.7.6 Conclusion

Intragenerational equity is at the basis of water security—to meet basic water needs for drinking, cooking, sanitation, and basic food security. Once basic human needs and environmental needs have been satisfied, equitable allocation of water and its benefits to meet sustainable livelihoods is an intragenerational equity concern. Environmental racism or classism or any other proxy mechanism should not disrupt equitable distribution of water, its services, or its benefits in meeting basic human needs and providing for economic vitality.

3.8 WATER MANAGEMENT SHOULD ENTAIL FULL PARTICIPATION BY ALL THOSE AFFECTED

A significant aspect of a justice framework is procedural equity. Mitchell (2002) states that empowerment of local people, self-reliance, and social justice are central aspects of sustainability. This statement could not be more relevant than in the case of water management. Because water is essential to all life and is a shared resource, all those affected must be empowered to take part, or somehow represented, in planning, decision making, and implementing action to meet water challenges and arrive at equitable outcomes and to encourage ownership of the chosen path of action. The process of establishing environmental justice can also be important for community building (Hillman 2004).

3.8.1 Inclusion in planning, decision making, implementation

Perceptions and principles of justice will always be contested either implicitly or explicitly (Low and Gleeson 1998; Hillman 2004). Acknowledging this makes apparent the significance of developing "just processes to allow this debate to occur in a transparent and participatory way" and involve "multiple voices, environments and knowledge systems" (Hillman 2004, 32). Based on Dorcey (1991)'s definitions of three types of decision making (authoritative, consultative, and negotiative), negotiative decision making is the most empowering form of public participation because it involves negotiating trade offs among the participants, rather than authorities consulting the public and then imposing a decision. Mitchell (2002) suggests four reasons for authentic (negotiative) public participation: participants can define the problem more effectively; participants can bring information (local knowledge) from outside scientific or government understanding into the discussion; participants can identify socially acceptable alternative solutions; and participants will have a sense of ownership over the solution and be more willing to comply with implementation.

These transparent partnerships can lead to creative solutions, better outreach, and informed citizenry (Batz 2001). Inclusion of local knowledge builds social and human capital

and allows solutions to be more culturally and socially appropriate (Selborne 2000). Dialogue between stakeholders assembles expertise and explores "the room for consensus, compromise, agreement, and concerted action among widely diverging scenarios and futures that are being envisioned by the stakeholders. Dialogue, then, facilitates change processes" (Rijsberman and Mohammed 2003, 55). Overall, the complexity of problems can be better addressed.

The complexity of water issues makes authentic public participation especially important. Thus a water ethic should include the participation principle. Decision making—in the normative, strategic, and operational stages of analysis and planning (Mitchell 2002)—should include all stakeholders and be interdisciplinary (Harremoës 2002; Priscoli *et al.* 2004). All affected, including the poor, women, and all levels of policy makers, should be considered stakeholders (Priscoli *et al*. 2004; ICWE 1992). These partnerships will create "water wisdom", educate citizens who can prevent corruption, clean up watersheds, find innovative solutions, and develop new technologies while involving traditional and indigenous knowledge (Batz 2001).

Yet, not only does the shared nature of water mean full participation is essential, but water can also be a tool for community development, peace building, and preventive diplomacy (Selborne 2000). Although some people fear that "increased citizen participation will lead to polarisation and conflict, at the expense of positive outcomes" (Hillman 2004, 24), cooperation and negotiation over water issues may reduce polarisation and lead to a stronger, more understanding, and even more unified community through "a convergence of interests" (Rijsberman and Mohammed 2003, 57).

Limitations to the participatory process, which can be time intensive, can include the necessity to meet short-term needs, the lack of cultural precedence of participatory approaches to decisions making, or some individuals' self-concept (e.g., lack of confidence) inhibiting participation, or they may not know how to participate meaningfully (Hochachka 2005). Other limitations include availability of resources (section 3.8.6).

3.8.2 Decentralization: local knowledge and decisions

For equitable and sustainable water-use management, the Bonn Keys advocate decentralising water management to the local level, "where national policy meets community needs" (Batz 2001, 22). This idea builds on the *Dublin Statement*'s call to decentralise decisions to the lowest appropriate level (ICWE 1992). This decentralisation brings improved responsiveness to problems, better transparency, and fuller participation (Batz 2001). As part of decentralisation, cooperative governance within watershed boundaries will best build harmonious relationships with nature and neighbours (Batz 2001). (See section 3.11.) Decentral-

ising decision making allows better integration of local knowledge rather than total reliance on imported methods that may be inappropriate for the community (Selborne 2000).

3.8.3 All groups involved and/or represented

All individuals and groups, whether rural or urban residents, rich or poor, empowered or disempowered, should have the opportunity to participate in water-use decision making and management. Mitchell (2002, 189) describes a stakeholder as "a person or group directly affected by or with an interest in a decision, or with legal responsibility and authority relative to a decision". Formally or informally, all who are, or will be, affected by the decisions should be acknowledged as stakeholders and be active in the decision-making process. The most vulnerable groups are especially important to acknowledge and include because they may be most affected by problems (Priscoli *et al.* 2004). As Hillman (2004, 33) states, "exclusion of marginalised or even just 'irrelevant' groups, such as indigenous people, women, young people and trade unions, from decision making runs the real risk of promoting disciple-bound abstractions of environmental decision making removed from its contextualised 'real world' complexity". This inclusion of all groups is a central concern of environmental justice.

Specific groups of concern include women (Priscoli *et al.* 2004)—as in the *Dublin Statement* (ICWE 1992). Participatory mechanisms should address women's specific needs and empower them to participate at all levels (ICWE 1992). Indigenous groups have generally been historically disenfranchised and only in recent decades have reconciliation processes begun to acknowledge this. Rights to water and participation in water-use management decision making is one area of such reconciliation which has not received much attention in the water ethics literature. However, representation and full, meaningful participation of indigenous groups is essential to ensure environmental justice in water-use decision making.

Other "groups" that require representation are future generations and nature. These groups are clearly more problematic to include in decision making given their inability to speak for themselves. Youth participation may represent future generations because they are the next generation. Highlighting the importance of future generations or nature as central explicit principles in water policy and management can effect some degree of 'participation' by future generations or nature. Representation for nature also arises in the form of environmental non-governmental organizations and individuals—champions of altruistically defined environmental interest. Sections 3.9.5 and 3.10.5 discuss this issue. Education and awareness campaigns can also assist with attention to the unvoiced future generations and environment. Rather than only considering the voice of those who can participate in decision making, the ecosystem justice approach more strongly advocates the consequentialist approach where

just outcomes are favoured over just procedure (Brunk and Dunham 2000). This approach is because the moral relationships among all members of the ecosystem (human and nonhuman) can only be defined in terms of the members' state of being (or flourishing) and the state of the system as a whole (Brunk and Dunham 2000).

3.8.4 Education and awareness: creating partnerships and understanding

Education and awareness-raising serve to create knowledge and empowerment that comes with knowledge; this knowledge leads to better, more informed decision making. Knowledge is a key "to development, improved livelihoods, environmental participation and stronger democracies. Generating and disseminating knowledge—to expand education, facilitate research, build capacity and bridge the gap between the rich and the poor—needs political will, investment and international cooperation" (United Nations 2003a, 28). Education and awareness-raising lead to cognition and behavioural change through presenting new information and ethical paradigms (Harremoës 2002). United Nations (2003a, 29) recognize water education as an "entry point to developing a new ethic for water governance". This education need not be formal, but can be informal and come from unexpected sources. Selborne (2000) suggests industry, with government, should help educate the public to adopt practices for water sustainability. Participatory processes themselves are educational, where sharing information and personal perspectives builds understanding and even empathy for other participants.

3.8.5 Accessible information

Public access to all available information improves transparency and accountability from governments and decision makers. All water data should be accessible to the public and be non-partisan so as to facilitate cooperation among stakeholders and minimize risk (such as in natural or anthropogenic disasters) (Selborne 2000). Priscoli *et al.* (2004, 13) further suggest that adequate information is essential but professionals "have a duty" to recognize the "complementary importance of public attitudes and of ethical principles". Having a transparent and participatory process can help integrate and make accessible this professional knowledge and perspectives with those of the public and other stakeholders. Capacity building to gather, analyse, and disseminate information may be required.

3.8.6 Resources available to enable participation

Resources are important to enable people to participate in decision-making processes; and to empower local people and local authorities to act at the local level. Information about the resource—including degrees of uncertainty, spatial and temporal scales, and the complex

interactions among them—improves decision making and governance regimes. Mitchell and Shrubsole (1994, 53) state, "[d]ata, information, knowledge, understanding and education are the pillars around which sound environmental policies are built". Data collection for both physical and human dimensions of the problem is necessary, as is analysis of that data (Mitchell and Shrubsole 1994). The importance of information is particularly apparent for resources like groundwater, where assessment and monitoring of aquifer's "storage capacity, supply, and associated pollution" are difficult but allow more effective management (Ostrom *et al.* 1999, 279). Data collection and analysis should be supported by government and coordinated between levels of government and the private and non-governmental sectors (Mitchell and Shrubsole 1994). The water sector is interdisciplinary and requires a breadth of knowledge and information that embraces "health, agriculture/aquaculture, industry, energy and ecosystem issues" (United Nations 2003a, 28).

Financial resources to support participants are crucial for successful participatory decision making; not all participants are financially able to participate. For example, the voices of industry, which tend to have larger financial resources and thus power, must be balanced with the voices of less affluent public citizens, not-for-profit participants, and local governments. Financial support is also essential for implementation of the decisions and ensures participation in the operational stage of the process. Technical assistance and tools for management are also important resources for improving decision making, particularly involving full participation.

Governments are responsible for provision of clear, well-defined, and sufficiently detailed goals and guidelines for terms of reference, outcomes, and implementation. As one example, Selborne (2000) suggests that government should set clear guidelines for environmental standards for water and ways to achieve those standards and implement the polluter pays principle. Guidelines become especially important as water management becomes more decentralized and moves to watershed and community governance. Some local interests may seek short-term benefits and override those that seek longer-term sustainability.

3.8.7 Conclusion

To provide environmental, ecological, or ecosystem justice, full meaningful participation is central to procedural justice in water-use management. Participation of all groups—at multiple levels—adequate resources, accessible information, and education and awareness to create understanding are all important aspects of procedural justice.

3.9 INTERGENERATIONAL EQUITY SHOULD BE AN ESSENTIAL ELEMENT IN PLANNING DECISIONS AND WATER MANAGEMENT

A basic human (and biotic (Lee 2005)) concern is self- (or species-) generation. Yet human actions and the extension of moral considerability have not always reflected this concern. Future generations (i.e., intergenerational equity) is a key idea, whether implicit or explicit, embedded in literature on freshwater issues. To achieve equity between generations in freshwater use, a number of aspects are necessary to recognize moral standing of future generations in decision making.

3.9.1 Use on a renewable basis

Water use on a renewable basis is an obvious approach to ensure there is the same amount of water for future generations as the present. It also better ensures enough water for ecosystem functioning. Renewable water use means not using more water from water bodies, whether surface or underground, than what is replenished each year through precipitation, or regeneration rate (Selborne 2000). Over-abstraction of groundwater can lead to negative consequences such as land subsidence, salt-water intrusion, changes to surface water dynamics and wetlands, not to mention scarcity for the region. Overuse of surface water can lead to scarcity and have dramatic effects on the surrounding ecosystems. Renewable use also means not making water unusable through pollution and discharging waste at or below the assimilative capacity of the ecological system (Selborne 2000). Good scientific data is crucial to understanding the dynamics and capacities of ecological systems to withstand withdrawal and pollution.

Improving water productivity and efficiency in agriculture, cities, and industry is a central approach to coping with growing relative scarcity (Postel 2002). Methods include conservation of water and minimization of pollution. Many techniques exist to reduce demand (Gleick 2000a; Postel 2002), including pricing and awareness-raising campaigns (both of which aim to change water-consuming behaviour) and water-saving technologies and recycling "waste" water (Mitchell and Shrubsole 1994). Renewable use of water means managing within the limits. It requires choices and setting priorities and delineation of where efficiency and other improvements are feasible. Because people can improve efficiency and productivity of water use, water scarcity is not an absolute constraint but a driving force for societal and economic change (Selborne 2000).

3.9.2 Collecting data for future generations' use

Collecting data and information to build knowledge improves decision making, not only for the present generation but also for those in the future. Selborne (2000)'s commentary on water ethics suggests good data is necessary for ethical water management—hydrological data that is non-partisan, comprehensive, regularly updated, globally available, and benefits everyone. Ensuring ongoing monitoring and longitudinal studies of all aspects of water management, but particularly of hydrological data, allows recognition of significant change and improves the ability to plan and react appropriately.

3.9.3 Adaptive management

Because traditional water management approaches have often been about controlling situations and concrete supply-side solutions (Gleick 2000a; Postel and Richter 2003), growing uncertainty and unpredictability brought on by increased demand, scarcity, and pollution have made such approaches less desirable. Adaptive management has become a more appealing approach (Selborne 2000). Adaptive management can be reactive and the "antithesis of an anticipatory and preventative approach", but more positively it embraces uncertainty, recognizing that "planners and managers have imperfect knowledge and understanding", and surprise is inevitable, as are modifications of policies and activities (Mitchell and Shrubsole 1994, 56). Dynamics, uncertainty, and surprises are adaptive management's underlying ideas (Falkenmark 2003, 2045). Ongoing learning, trial and error, and a consultative approach that legitimates and incorporates local and stakeholder knowledge characterize adaptive management strategies (Mitchell and Shrubsole 1994, 56). Strategy and plan preparation must be ongoing and adjust to change over time (Mitchell 2002). Adaptive water management ideally ensures that decisions allow for flexibility in the future as the situation changes.

3.9.4 Precautionary principle

The precautionary principle, where "lack of knowledge or understanding should not be used as a reason for not taking action" (Mitchell 2002, 354), is fundamental to protecting ecosystems and their services for future generations. A water ethic would involve the precautionary principle to appreciate uncertainties and ignorance, as in the case of climate change (Harremoës 2002) and its impact on water resources. Water sources should not be irreparably damaged through over-withdrawal or pollution. Managers should err on the side of over-allocating water to ecosystems until we know what amount or component can be removed (Postel and Richter 2003).

3.9.5 Representatives for future generations in decision making

As mentioned in section 3.8.3, representing future generations is important but diffi-cult. Youth representation and explicit recognition of needs of future generations as an ethical principle are two approaches to this challenge. The idea of stewardship may also contribute to "caring for" future generations. Stewardship "directs attention not only to the necessity to manage water to meet basic needs for a variety of interests, but also to ensure that water is protected and conserved, and that its uses and values are sustained" (Mitchell and Shrubsole 1994, 52), implicitly for future generations.

3.9.6 Conclusion

Renewable water use, collection of data, adaptive management, application of the pre-cautionary principle, and ensuring representation for future generations in water-use decision making and management extend moral consideration to future generations.

3.10 THE ENVIRONMENT SHOULD HAVE STANDING IN WATER MANAGE-MENT

3.10.1 Environmental value recognized

Recognizing environmental value is consistent with the sustainability perspective, where social, economic, and environmental values are all significant for human species' longevity. This perspective tends to consider environmental value from an anthropocentric, instrumental perspective. Ecosystems provide goods and services—or environmental secu-rity (Acreman 2004). Goods include water, fish and other food, timber, and minerals; while ecosystems mitigate flood and drought, purify water, maintain food webs and soil fertility, and offer recreation opportunities (Postel and Richter 2003). While ecosystem functions are impossible to fully quantify and replace, economic valuation of these goods and services is a tool to take account of ecosystem health in decision making and weigh among trade offs (Pos-tel and Richter 2003; Acreman 2004). However, the economic approach does not account for ethical, political, social, historical, or ecological issues; multi-criteria analysis is far more flex-ible (Acreman 2004) and holistic. As Selborne (2000, 40) states "environmental values should be a fundamental element in decision making with respect to water resources and ecological health seen as a vital factor in production".

Adhering to the stewardship principle is one approach to maintaining environmental value because it entails "respect for creation and moral responsibility to that creation"; it

means "wise use of creation and complete unwillingness to modify nature" (Selborne 2000; Priscoli *et al.* 2004, 16). Under this principle, water management strives to find "an ethical balance among using, changing, and preserving our water resources and land…For what is sustainable development, if not achieving balance among the wise use of resources (the utilitarian approach) and respect for intrinsic value of the resources?" (Selborne 2000; Priscoli *et al.* 2004, 17).

3.10.2 Environment has standing

A new water ethic must move beyond the anthropocentric sphere, respect the intrinsic values of nature, and expand the moral community to include the rights of the environment (Harremoës 2002). This moral expansion means valuing human systems and valuing natural ecosystems. To benefit humans and recognize intrinsic value of the nonhuman world, ecosystems should be treated as legitimate users and receive adequate amounts of water to remain healthy (Selborne 2000; Acreman 2004). Falkenmark (2003, 2037) suggests that "human activities and ecosystems have to be orchestrated for compatibility". Equity between "the managed and the managers" is central (Selborne 2000).

Fundamental to coping with future scarcity is systematic determination of ecosystem flow requirements—"the quantity, the quality, and timing of the flows needed for freshwater ecosystems to sustain their critical functions" (Postel 2002, 7). Without a multi-disciplinary effort to make these assessments, no water 'manager' will be able to state what water use is sustainable to meet social and economic needs, or how to protect ecosystem functions and biodiversity (Postel 2002). A number of methods have been, and are being, developed to assess water needs of other species and ecosystems as a whole (Selborne 2000; Acreman 2004). Approaches to ecosystems must be "process-oriented with adequate stress on the biophysical interactions with water, the bloodstream of the biosphere" (Falkenmark 2003, 2039). These types of assessment should be integral in any decision around water allocation, use, and waste assimilation. Traditional approaches for assessing water availability are misleading because they do not often incorporate ecosystem water requirements, which would give a more accurate picture of water availability. If impacts on ecosystems are considered in such a way as to designate enough water for the ecosystems, water availability may be re-conceptualised (Smakhtin *et al.* 2003).

3.10.3 Quality impacts on ecosystems

Quality and quantity of water are the significant dimensions of water for maintaining healthy functioning of aquatic ecosystems. Many impacts exist which affect either or both

quality and quantity of water. I will discuss them separately where possible; however, because these attributes are interrelated I later advocate addressing these two attributes together as a holistic approach.

Water quality encapsulates the physical and chemical characteristics of water. Physical characteristics include sediment concentration, temperature, and colour of the water. Chemical characteristics are the types of solutes present in the water (Arnell 2002). Point and non-point sources of contaminants, nutrients, sediments, and temperature result from agricultural practices, municipalities, and industry, including thermal power generation. Pollutants disrupt the chemistry and ecology of water bodies (United Nations 2003a). Poor water quality decreases biodiversity, depletes fish stocks, affects livelihoods, and is very expensive to clean up (United Nations 2003a). Methods to combat pollution include pollution standards and regulations for industry, agriculture, and municipalities; shifting responsibility to the polluter based on the polluter pays principle; source water protection measures; or, more radically and fundamentally, changing the way society functions and putting ecosystem health at the centre of decision making rather than at the margins while economic benefits takes centre stage.

3.10.4 Quantity impacts on ecosystems

Recently, water quantity and flow regimes have become a focus with new research exploring quantity impacts and ways to measure and improve upon these impacts (Boyd 2003). Minimum flow requirements are the base amounts rivers can withstand. Natural flow regimes are rivers' variable pattern of high and low volumes over the year (Postel and Richter 2003). It is the flow regime which maintains the functions and processes necessary for the ecological health of rivers (Postel and Richter 2003). Natural flow regimes allow for greater complexity and redundancy in ecosystems and human systems—complexity improves resiliency and self-organization; redundancy improves adaptability and resistance to change or breaks in the system (Boyd 2003). Thus the process to restore or protect aquatic ecosystems is complex and moves beyond providing minimum flows and good water quality to ensuring a natural pattern of flow variability, which is unique to each river.

Research about restoring environment flows, flow regimes, and timing is growing (Arthington and Pusey 2003; Postel and Richter 2003; Acreman 2004). A number of methods exist to determine, protect, and reintroduce flow regimes (Acreman 2004). These methods look at components of the aquatic ecosystem, such as species of fish, the river's channel morphology, flow regime, and its variability (Acreman 2004), as well as water-quality indicators (i.e., biological, physico-chemical), hydrological information, and biological assessment (i.e.,

biodiversity) (United Nations 2003a). Understanding groundwater interactions and contribution to surface water base flow is also important, as is understanding wetlands' role.

Falkenmark (2003) describes a conceptual method where an ecological bottom line for minimum outflow from the mouth of the river is determined; inflow allocations are then determined segment by segment upstream. This bottom line gives the highest priority to ecological functioning while other users can debate use of the remaining water (Falkenmark 2003). Similarly (Postel and Richter 2003, 39) suggest a scientifically based "sustainability boundary", beyond which no more water can be allocated for human use. Water allocations for ecosystem support protect aquatic ecological functions and biodiversity; Postel and Richter (2003, 80) call this an "eco-support allocation". Another common term is "environmental water allocation" (Gardner 2005). Integration of this concept is a "marked departure from current policies and practices in most countries"; but it can "safeguard against ecologically harmful growth" (Postel and Richter 2003, 80).

Other measures to protect ecosystem resiliency include policy initiatives to set standards and targets and to promote approaches like integrated water resources management (United Nations 2003a). Environmental education can build capacity of managers and users and shift behaviour. Research, monitoring, and reporting changes in environmental quality and river flow regime supply ongoing data to aid restoration activities and monitor progress. Site and water source protection and restoration activities are also important (Postel and Richter 2003; United Nations 2003a).

3.10.5 Representatives for environment in decision making

While ecological understanding has significantly advanced the capacity to recognize, provide, and protect environmental flow requirements and correct quality issues, significant improvements at the governance level need to advance in tandem. Environmental representation in decision making is essential for such advancement. Environmental organizations play a significant role here through either direct governance or lobbying and public-awareness campaigns. To incorporate ecological consideration, an expansion of moral awareness is clearly another way for environmental representation.

3.10.6 Ecosystems as functioning systems

"Water blindness" is a term Falkenmark (2003, 2037) uses to refer to the technical conceptualization of water that seeks ways to control and govern water use and waste flows, rather than managing "water's various functions in the landscape". This means addressing water issues at the landscape scale and the systems associated with it, rather than managing

only for particular uses and allocations, or only on a site by site basis. The term "ecosystem" conceptualizes the natural world not as mere individual components but as "the interaction between groups of organisms involved in production, consumption and decomposition, respectively, and their bio-physical environment" (Falkenmark 2003, 2040). This view recognizes the biological, physical, and chemical needs that water provides. Because change is inherent, rather than equilibrium, ecosystems must be have the capacity to accept or absorb change without losing the ability to function and supply ecosystem goods and services (Falkenmark 2003, 2042). Thus water-use management approaches should protect the ecosystem's overall functionality and thereby protect both the intrinsic value of the ecosystem and its instrumental value for human systems.

3.10.7 Conclusion

From anthropocentrically recognizing environmental value for human systems to perceiving nature's moral and legal standing means quality and quantity aspects of water for ecosystems must be understood and integrated into water-use management.

3.11 WATER MANAGEMENT SHOULD ENTAIL A HOLISTIC APPROACH

3.11.1 Holistic approaches

The diverse and complex nature of water issues insists on a holistic approach. Ecosystem-based management and integrated water resources management are intended to encompass this complexity. United Nations (2003a, 13) states that "sustainability of water resources requires participatory, ecosystem-based management". Acreman (2004, 12) describes the ecosystem management approach as aiming "to integrate all the important physical, chemical and biological components and processes which interact with social, economic and institutional factors". It emphasizes "system elements and relationships which link people, societies, economies and environment" (Mitchell and Shrubsole 1994, 52). Inherent in the ecosystem approach is its consistency with the ecosystem approach to justice, where all living beings and nonliving entities are valued as members of a functioning ecosystem (Brunk and Dunham 2000). Themes relevant to the ecosystem approach include working in a hierarchy or a systems context, management along ecological boundaries, seeking ecological integrity, using research and data collection to answer questions, monitoring, adaptive management, and promotion of interagency cooperation and organizational change (Mitchell 2002).

Arguably the ecosystem-based approach is more holistic than integrated water resource management. The ecosystem approach is meant to be comprehensive, or all inclusive, imply-

ing that the manager must understand and address all components and their relationships in the system (Mitchell 2002). An integrated approach, by contrast, does not examine all components and relationships but focuses on key components and relationships while keeping a holistic attitude. This approach is more realistic with respect to expectations, time, and human resources and thus has greater operational value than the ecosystem approach, which has great conceptual value (Mitchell 2002).

United Nations (2003a) describes integrated water resources management (IWRM) as integrating both within and between the natural system and the human system while taking account of temporal and spatial variability. The watershed is the unit of management, where surface and groundwater are inextricably linked and land use and management is related to water use and management (United Nations 2003a). Within this unit multiple stakeholders are involved (Mitchell 2002) and an adaptive management approach is taken to anticipate change and variability (Falkenmark 2003). Understanding the interaction between systems—such as watersheds and "airsheds" (Boyd 2003)—and the interaction across watersheds (Arnell 2002) is crucial to fully understand and anticipate changing water dynamics.

3.11.2 Land use and water interaction

One of the key substantive issues of water-use management is land use. Conventional approaches to water management address land and water issues separately (Falkenmark 2003) and ignore the inherent interaction between them in acute events and over long periods of time. Land cover changes, from mining, agriculture, urbanisation, afforestation, and deforestation (Arnell 2002), affect both quality and quantity dimensions of water. Land cover changes influence soil permeability and rainwater partitioning, where rainwater reaching the land either becomes green water flow—water in soil or evapotranspiration from plants' stomata—or blue water flow—water in rivers, lakes, wetlands, and aquifers (Falkenmark 2003). Both green and blue water are important sources. This partitioning also affects the amount and location of runoff (Falkenmark 2003). Meanwhile, water's movement and content dramatically affect land formation and composition; for example, flooding events pick up and deposit sediment, re-shape stream beds and edges, and contribute to lifecycle stages of plants and animals (Postel and Richter 2003; Hunt 2004). Choices regarding residential, industrial, and agricultural development and resource extraction must consider water sources in the area and downstream effects. Both immediate and cumulative effects must be examined. Any holistic approach to water-use management must integrate land-use decision making.

3.11.3 Surface and groundwater interactions

Hydrologically surface water and groundwater are inextricably linked (Karvinen and McAllister 1994). Both are important sources of water for humans and ecosystems. Groundwater is recharged directly as rainwater infiltrates into saturated soil, which may take up to several years to reach the water table, or indirectly by surface water as streamflow or runoff (Arnell 2002). Groundwater also discharges water to surface water bodies. Wetlands are an important transition point for recharging and discharging. Groundwater discharge provides base flows for rivers and streams that are essential for habitat and ecological processes during summer low flows. Because surface and groundwater are often so closely linked, over-abstraction of groundwater can severely impair aquatic ecosystems particularly at critical times of the year (i.e., low-flow periods) (Falkenmark 2003). Monitoring and measurement, coupled with reduction in use and recharge, are necessary to prevent overdrawn aquifers and associated problems (Shiklomanov and Rodda 2003).

Because groundwater is an "unseen resource" policy and legislation have often neglected groundwater and not recognized the intrinsic relationship between it and surface water (Karvinen and McAllister 1994; Mitchell and Shrubsole 1994, 48). Policies and legislation are beginning to recognize the value of groundwater, as opposed to viewing it as a free resource (Karvinen and McAllister 1994). The connection between surface and groundwater is becoming better recognized. The watershed tends to be the most appropriate unit on which to manage water use and associated issues. Yet, groundwater is affected by hydraulic gradients, while surface water is affected by topographical gradients; thus the surface-water watershed may not encapsulate their different flows (Arnell 2002; Acreman 2004). Thus a holistic approach will require cooperation among watershed and other agencies.

3.11.4 Quality and quantity together

While quality and quantity are two different dimensions of water, addressing them together in policy, legislation, and management allows for a more holistic approach. Many activities affect both dimensions. Over-abstraction directly reduces surface water quantity and indirectly reduces the waste assimilation capacity of the water body. Conversely, polluted water reduces the quantity that can be used for human or ecological purposes without negative consequences or significant treatment. Therefore, water-use and land-use activities should take into account both quality and quantity dimensions.

3.11.5 All types of water as one resource

All water is somewhere within the hydrological cycle; thus all of it can be treated as one resource. Much of it is inaccessible as water vapour, saltwater, glaciers, or difficult to access groundwater and surface water (Hunt 2004). This inaccessibility insists on the point that we should value and use all water that is available to us with wisdom. Rainwater, stormwater, wastewater, or greywater, blue water and green water, should be used as one resource and contribute to methods to reduce human impact on the rest of the ecosystem and its processes and leave water for the future. Collecting rainwater, using greywater in gardens and lawns, and treating "waste" water to be reused for appropriate purposes are all methods that contribute to water conservation and efficiency and indicate a more holistic view of water and the way we use it. Significant barriers exists in the form of infrastructure systems; treatment plants without the sophistication to recycle water; concerns about public health and appropriate use; and public (and religious) perceptions of greywater and water recycling. Internationally positive initiatives have been implemented but generally by areas with acute water pressure (e.g., Israel (United Nations 2003a), Australia (Department of Sustainability and the Environment 2004)).

3.11.5 Watershed unit

Rijsberman and Mohammed (2003, 60) conclude "that the debate on water, food and environment should be brought down from the abstract to a level where the real problems are and where solutions can be found". Decentralisation to the local level—declared important by both the Bonn Keys and the *Dublin Statement*—is where "national policy meets community needs" (Batz 2001, 22). But what scale of decentralisation is appropriate? Much of the literature on water management agrees that the watershed, or catchment, is the most appropriate scale to manage water-use issues. This scale "demarcates a hydrological system, in which components and processes are linked by water movement" (Acreman 2004, 13).Yet underlying groundwater flow may not match the surface watershed; thus "where groundwater plays a significant role, a group of basins overlying the aquifer may constitute the appropriate unit of water resource management" (Acreman 2004, 13).

Watershed management holistically strives to balance social, economic, and ecological interests; to incorporate input from all stakeholders including government agencies, non-government organizations, industries, and the public who might be affected by decisions; to clearly identify roles, responsibilities, and accountability; and to use an adaptive management approach (Hillman 2004). The watershed is a "socio-ecohydrological system" within which tradeoffs must be identified and choices made with regard to social, ecological, and hydro-

logical factors and needs (Falkenmark 2003, 2046). This means merging water, land-use, and terrestrial and aquatic ecosystem management within that unit (Falkenmark 2003). The watershed hydrologically links natural ecosystem components and human systems, and allows upstream and downstream effects to be considered together. Therefore, the watershed should take into account all actors—including nonhuman actors—within it. It also means merging "full awareness of the different ethical dilemmas involved" (Falkenmark 2003, 2046). By functioning at a watershed level, local issues—historical, current, and geographical—can be more easily recognized than from a more distant centralized approach. Institutional barriers are likely the most difficult challenge of reforming to a watershed approach. See section 3.11.6.

3.11.6 Nested and collaborative governance

To effectively implement a holistic perspective, involvement of all stakeholders and inter-agency cooperation at all scales is necessary. The Bonn Keys stress the importance of "stronger better performing government arrangements" and the importance of cooperative arrangements at the watershed level for "long-term harmony with nature and neighbours" (Batz 2001, 22). Collaborating with neighbouring water users is consistent with the principle of solidarity, which Priscoli *et al.* (2004) consider important for a water ethic. The principle of solidarity suggests a shared connection among all because "water continually confronts humans with their upstream and downstream interdependency and calls humanity to greater solidarity"; integrated water management is "a direct subsidiary teaching of this principle" (Priscoli *et al.* 2004, 16). Because Falkenmark (2003, 2038) extends this solidarity to nonhumans who share "the same water, and that water moves within the modules of catchments", she sees integrated catchment management as an appropriate way for "joint management of water and ecosystems".

Institutional arrangements are typically at the local, regional, and national levels, depending on the size of the country; rarely do their jurisdictional boundaries follow watershed lines. Instead watersheds have often been managed in a fragmented fashion for flood control, irrigation, or navigation, and generally they extend across political boundaries and economic sectors (Revenga *et al.* 1998). Thus some degree of jurisdictional reform might be necessary. Inter-agency approaches will help deconstruct governance "silos" and encourage departments to work together to align planning, policies, and management. Inter-agency approaches and stakeholder participation allows multi-disciplinary approaches and broader knowledge bases to contribute to improved outcomes. Revenga *et al.* (1998, 1-3) acknowledge that such reform and collaboration is difficult; however, "cross-sectoral and regional approaches to manage-

ment are likely to be essential, if the ability of watersheds to continue to provide ecological, hydrological, and economic services is to be sustained".

Collaboration across scales is also significant in a holistic approach. An implication of sustainable development on water management is spatial boundaries must expand to encompass the interconnectedness of broader systems (Dorcey 1991). While the watershed is considered the most appropriate unit for water-use management, the watershed is part of a nesting pattern between local, regional, continental, and global boundaries and influences. The "wider boundaries of associated biophysical and socioeconomic-political systems" create "important interdependencies with other river basins" (Dorcey 1991, 23). As the Bonn Keys and the *Dublin Statement* suggest, decisions regarding water-use management should be decentralised to the lowest appropriate level—thus place-based governance. However, that level fits within the scope of broader jurisdictional issues and guiding frameworks that envision the broader implications of local actions. While this multi-scalar nature of water governance multiplies the complexity of water issues, it is essential to create balance in water-use management.

3.11.7 Conclusion

Principles that would normally apply to management of land and other natural resources are not sufficient for freshwater management because water resists political boundaries, interacts with other systems, and has life-giving significance. Land and water dynamics are interdependent and their management should be integrated rather than isolated. Surface and groundwater bodies should be seen as interacting systems. Quantity and quality issues should be dealt with in tandem. All "types" of water can be considered sources of water. Collaborative, nested governance is important for coping with the interdisciplinarity and multi-scalar nature of water issues. A watershed approach encourages both collaboration and a nested approach to water governance. A holistic approach is essential to deal with the interface between natural and human systems.

3.12 CHAPTER SUMMARY

This chapter has built the argument for explicit address of water ethics and an expanded sense of moral consideration in decision making. The water ethic principles proposed are meant to support this expansion. The following chapters discuss the application of these principles as criteria in an ethical assessment of two selected water policy statements.

4. ALBERTA'S *WATER FOR LIFE*: A CASE STUDY OF CANADIAN WATER POLICY

4.1 INTRODUCTION

In countries such as Canada, water is perceived to be plentiful and of good quality. However, even in such "water-rich" nations, problems of both water quantity and quality can occur. Alberta is an area of concern in Canada. The combination of intensive irrigated agriculture, economic development, and growing urban communities complicate southern Alberta's natural aridity and put pressure on its water supply and affect water quality (Banks and Cochrane 2005). Recent years of drought and forecasts of deleterious climate change are additional pressures. Thus the ethics of freshwater use is an important topic in Alberta.

To understand the conditions of Alberta;s water issues, this chapter will first outline Alberta's situational and intertextual contexts. The analysis of *Water for Life: Alberta's Strategy for Sustainability*, bolstered by interview responses, examines how the document fits within these contexts and measures up to the water ethic principles outlined in chapter 3. These principles act as criteria with which to evaluate the province's strategy to address freshwater issues.

4.1.1 Alberta situational context

Alberta is biophysically diverse, with terrain from boreal forest to mountains to foothills to grassland prairie, leading to dramatic differences between water availability around the province. Northern Alberta is lusher with large wetlands, while southern Alberta is semi arid. The key sources of water exist in glaciers, lakes, rivers, and groundwater. Annual precipitation accumulation is approximately 40 to 45 cm in northern Alberta, 55 to 60 cm in the foothills, and 30 cm southeastern Alberta (Government of Alberta 2006a). While Alberta has about 10% of Canada's population (January 2006 estimated population 3,306,359 (Alberta Finance 2006)), only 2% of Canada's water is in Alberta. Much of that water flows in northern rivers, where, like the rest of Canada, only a small percentage of the population resides (Alberta Environment 2005b). Population growth over the last 150 years has increased demand for water significantly in southern Alberta for domestic use, agricultural use, and economic development.

Hydrologically, Alberta is not isolated, a fact which various intergovernmental agreements recognize. The *1909 Boundary Waters Treaty* between Canada and the United States apportions the St Mary and Milk Rivers (Government of Alberta 2004a). The *Master Agreement on Apportionment*, signed in 1969 by Alberta, Saskatchewan, Manitoba, and Canada, determines natural flow across provincial boundaries (Mitchell and De Loë 1997). In 1997, governments of Canada, British Columbia, Alberta, Saskatchewan, the Northwest Territories, and Yukon committed to the *Mackenzie River Basin Transboundary Master Agreement* (Government of Alberta 2004d). There seems to be no question of the Alberta government's commitment to these agreements.

Tension over water use is a growing concern within Alberta, particularly southern Alberta. Striving for balance between municipal and domestic, industrial, and agriculture uses and protecting Alberta's natural environment is the central focus of *Water for Life: Alberta's Strategy for Sustainability*. Population growth and affluence increase demand for domestic uses, particularly in cities. Economic uses affect the types of water use and magnitude of demand on Alberta's water sources. The oil and gas industry, mining, and pulp and paper mills—many located in the northern landscape—affect water quality and quantity (Alberta Environmental Protection 1996; Griffiths *et al*. 2006). Irrigation stresses southern water supplies and is widespread in the South Saskatchewan River Basin (Alberta Environmental Protection 1996; Wenig 2005b). Alberta holds seventy percent of Canada's irrigated lands.

Southern Alberta has historically driven water policy in Alberta. Both the sparse and variable precipitation of the area and the consequent need to allocate water between competing demands have been and continue to be significant factors shaping Alberta water policy and legislation development. Northern Alberta has not historically had water issues; but water quality and quantity, due natural resources extraction and processing, are growing concerns (Griffiths *et al*. 2006).

Until the late 1880s, the population of southern Alberta thought the climate was well suited to agriculture and that irrigation was not necessary. Those advocating irrigation were viewed as "pessimists and lunatics" (Mitchell and De Loë 1997, 7). Successive years of drought in early 1890s led to enactment of the *North-west Irrigation Act* of 1894 by the Dominion Government of Canada (Mitchell and De Loë 1997). This *Act* was intended as a framework for water management in southern Alberta, to facilitate irrigation development, and to regulate water use (De Loë 1994; Karvinen and McAllister 1994). This legislation vested the right of water use in the Crown and government regulated diversions. A modified system of prior appropriation replaced the common law doctrine of riparian rights, which were only retained for domestic purposes (De Loë 1994). All other users of water were required to

apply for a license. All domestic uses had priority over licensed uses. Priority of licensed uses was determined by date of filing application for a water licence (De Loë 1994).

Alberta became a province in 1905. Yet, transfer to the province of control over natural resources was held back until 1930 (De Loë 1994). Alberta's *Water Resources Act*, passed in 1931, enshrined the provisions of the federal government's *Northwest Irrigation Act*. The *Irrigation District Act* was passed by the Alberta legislature in 1915. This *Act* provided for the creation of farmer-owned and operated irrigation projects. The *Irrigation District Act* and the *Water Resources Act* were key to water management in southern Alberta (De Loë 1994). These documents did not recognize environmental requirements for water. Nor were water management objectives integrated with land-use planning (Karvinen and McAllister 1994).

4.1.2 Alberta intertextual context

A number of federal and provincial documents provide the current intertextual context for the *Water for Life* strategy, the focal document of this thesis. Knowledge of these documents is important to understand the context within which the strategy is functioning, as well as the overall scope of water management planning in Alberta.

Power and responsibilities over natural resources (water, land, minerals, and wildlife) are split between the federal and provincial governments. Federal jurisdiction over water extends to federally administered lands (parks and First Nations reserves) including coastal and inland fisheries, navigation, harbours, defence, international and transboundary affairs, as well as affairs associated with "peace, order and good government", such as when water pollution beyond provincial or national boundaries creates national concerns (Dorcey 1991; Mitchell and De Loë 1997; Boyd 2003). The provinces legislate over domestic and industrial water supply, pollution control, non-nuclear thermal and hydro-electric power development, irrigation, and recreation (Mitchell and De Loë 1997). Ownership, including the right of management and sale, of natural resources is vested in the provinces on behalf of the public and allows them to issue licences to individuals or corporations for water use (Dorcey 1991). Jurisdiction and responsibilities of municipalities and regional bodies are delegated by the province. Normally they are empowered to provide supply and sewerage services as well as zoning control of land (Dorcey 1991).

Several pieces of federal legislation address water. *The Fisheries Act 1985* applies to all inland and territorial coastal fisheries. It has the power to order dam operators to ensure sufficient protection of and water downstream for fish; but it is a power seldom used (Boyd 2003; Department of Justice Canada 2006b). The *Canadian Environmental Protection Act 1999* seeks to prevent pollution and protect environmental and public health to contribute

to sustainable development (Boyd 2003; Department of Justice Canada 2006a). The Federal Water Policy of 1987 "represented an important step in the evolution of water management in Canada" (Mitchell and De Loë 1997, 122). It outlined two goals—improvement of water quality, and promotion of wise, efficient water management and use—and a series of strategies to support these goals: water pricing, science leadership, integrated planning, legislation, and public awareness (Environment Canada 2003). Through acting within its jurisdiction and cooperation with provincial and territorial governments, the federal government planned to implement its policy directions; however, little concrete action emerged from this policy initiative (Environment Canada 2003; Mitchell and De Loë 1997). Some call for greater involvement in water management issues at the federal level (Banks and Cochrane 2005; Brandes *et al*. 2005).

Canadian statutory water law developed along three lines: laws addressing allocation, laws dealing with water quality, and laws dealing with "indirect uses of water" such as fishing and navigation (Dorcey 1991, 27). More recent trends in Canadian water legislation include fixed time periods instead of indefinite water rights; reformed water use priorities; transferability and divisibility of water rights; provision of minimum flow requirements for ecosystem needs and other in-stream flow needs; connection of effluent and ambient standards; emphasis on conservation and use of pricing; and permission for users to "negotiate reallocations and compensation" (Dorcey 1991, 27). The Alberta *Water Act*, which came into effect January 1, 1999 (Alberta Environment 2005a), integrates some of these trends. This *Act* replaces the 60-year-old *Water Resources Act*. That earlier *Act* was primarily a tool to allocate water; the newer *Act* is intended to manage and protect Alberta's water as well as to reform administrative processes (Government of Alberta 2006d).

The *Water Act* provides legislative law for dealing with water disputes, rights, and allocations; it is intended to protect water quality and manage its distribution and "regulates all developments and activities that might affect rivers, lakes and groundwater" (Government of Alberta 2003, 29-30). Under the *Water Act*, household users have statutory priority over other types of users. Traditional stock and pesticide application uses were recognized and registered (prior to December 31, 2001) with priority relative to first historical use under the *Water Act*. Other uses are licensed and hold priority based on their application date. These water licences are now transferable. Licences now have fixed time periods; older licences in good standing, however, retain their 'in perpetuity' status. Licence holders retain their seniority; thus the Albertan government has not revised priorities. There is no mention of the environment in the implied hierarchy of water use priorities. However, the *Act* promotes aquatic ecosystem protection and environmental assessment and "goes a long way towards incorporating ecological values or a holistic environmental ethic" (Wenig, personal communication

(p.c.)). [Please note: A sentence which cites an interview respondent but which does not have quotation marks indicates the credit for the idea or the information belongs to the interview respondent.] Government research is moving towards providing minimum environmental flow requirements. Economic instruments are being integrated cautiously into Alberta's water management practice; municipalities are beginning to meter water use and to move towards full-cost pricing. Water conservation is a central focus of the government (Government of Alberta 2003).

Effluent and ambient standards for water fall under the *Environmental Protection and Enhancement Act*. The *Act* "takes an integrated approach to the protection of Alberta's air, land and water" by integrating environmental and economic concerns at the earliest stage of decision making (Government of Alberta 2003, 28; 2006b). The *Act* attempts to guarantee "public participation in decisions affecting the environment", including better "access to information, participation in the Environmental Assessment and Approval Processes and the right, when directly affected, to appeal certain decisions" (Government of Alberta 2003, 28). It addresses assessment, enforcement, and appeals processes and administrative issues; it addresses conservation and reclamation of Alberta's environment, contaminated sites and remediation, effluent and waste management. Specific to water it sets out legislation for waterworks operations which supply potable water (Government of Alberta 2006b).

As the *Water Act* directed, Alberta's *Framework for Water Management Planning* was to be developed by December 31, 2001 (Government of Alberta 1996). It outlines the process for development of and the necessary components of a water management plan (Government of Alberta 2003; Alberta Environment n.d.-b). It intends to embrace environmental complexity, use an integrated resources management approach, address the challenges of the future, and build on past successes (Alberta Environment n.d.-b). All water bodies, including wetlands, aquifers, streams, rivers, and lakes, are embraced in this water management planning (Government of Alberta 2003). A central part of this *Framework* is the *Strategy for the Protection of the Aquatic Environment*, also required by the *Water Act*. It applies to all decision making and activities that may affect water quantity, water quality, habitat, and aquatic species—collectively the aquatic environment (Alberta Environment n.d.-b). It explicitly recognizes Albertans dependence on water and the natural environment. This strategy for aquatic environment "confirms the government's commitment to maintaining, restoring, or enhancing current conditions of the aquatic environment throughout the province" (Alberta Environment n.d.-b, 25). To reflect changes introduced by *Water for Life*, an updated *Framework* is to be completed in 2006 (Alberta Environment 2005a).

The Government of Alberta released *Water for Life* in November 2003. It gained significant momentum and support in its development and has propelled development of com-

plementary documents. The *Enabling Partnerships* document is meant to support the *Water for Life* strategy by describing the new partnership framework, each group's mandate, and implementation guidelines (Alberta Environment n.d.-a). Watershed management plans are slowly being developed. A drinking water strategy and a wetland policy will be developed. This information will be discussed in greater detail below.

4.2 *WATER FOR LIFE*: OVERALL ANALYSIS

Water for Life: Alberta's Strategy for Sustainability represents part of the provincial government's overall approach to water policy and management. Unlike the *Framework* and the *Strategy for the Protection of the Aquatic Environment* mentioned above, *Water for Life* (referred to as "the strategy" or "the water strategy" in this thesis) is not a result of legislative direction. Thus it is not legally binding in any way nor is the Minister of Environment or the Director obliged to consider it in decisions, as they would the other two documents. As such the strategy has "a funny status" (Kwasniak, p.c.). It is a guiding statement to direct water management practices in Alberta, a strategy "to address the province's current water challenges and proactively deal with water-related issues we may face in the future" (Government of Alberta 2005b). This document is the Government of Alberta's response "to develop a new water management approach and outline specific strategies and actions to address the province's water issues" (Government of Alberta 2006e).

It is consistent with the *Water Act* but is arguably more holistic and, as a policy statement, offers a principled vision for addressing water issues. *Water for Life*, while reflecting changes in the *Water Act*, represents a number of overall shifts from previous policy. These include: moving from water management planning to watershed management planning; protection of aquatic ecosystems; addressing shortages of water; moving from an engineering mentality of supply-side solutions to focus on water conservation and quality; taking a more comprehensive, broader picture approach; recognizing ecosystems and ecological boundaries not just political boundaries; and shifting to citizen empowerment and involvement for successful management of water (Yee, p.c.; Taylor, p.c.). The *Water for Life* strategy is a significant step in moving Alberta forward in more progressive water management.

4.2.1 Strategy development process

Three stages comprised the development process of *Water for Life*. Over the fall of 2001, "a small, diverse group of Albertans" were asked to generate ideas and provide advice, as well as identify challenges and opportunities, for water management in Alberta (Government of Alberta 2003, 5). In March and April 2002, a comprehensive outreach and consulta-

tion process across the province asked key stakeholders and Albertans in general to respond to initial directions proposed by the ideas generation group. A Minister's Forum on Water, held in Red Deer in June 2002, involved 108 experts and invited Albertans (Government of Alberta 2003), and accommodated high demand for participation (Yee p.c.). From this Forum emerged a final report (Government of Alberta 2003, 5). A "cross-government working group" then compiled the ideas and feedback and developed a series of recommendations and a framework to serve as the provincial water strategy (Government of Alberta 2003, 6). A draft version of *Water for Life* was released for public comment and included online access. This online access brought more hits to the website than previously experienced (Taylor p.c.). During March 2003 workshops occurred with participants of the Minister's Water Forum. The final version of the strategy was released in November 2003 and action to implement it has been occurring since then.

4.2.2 Purpose and rationale

Understanding the purpose and rationale of *Water for Life* illuminates the motivation behind its production and the goals it aims to achieve. The pressures on Alberta's water resources indicate the strategy's rationale: population growth; droughts; demands by agricultural and industrial development on water supplies; and risk to Albertan's well-being, economy, and aquatic ecosystems (Government of Alberta 2003). Recognition of a "fluctuating and unpredictable water supply in recent years" and that water is a "renewable, but finite, resource" has also emphasised the need for change (Government of Alberta 2003, 5). These pressures indicate the necessity for shifts in approach to water management.

The document's purpose is to respond to these increasing pressures on water by developing a new approach to water management and outlining specific strategies and actions to address ongoing and emerging issues (Government of Alberta 2003). The Government of Alberta has committed to "the wise management of Alberta's water quantity and quality for the benefit of Albertans now and in the future" (Government of Alberta 2003, 5). Yet nowhere in the strategy is there a definition for wise water use, leaving one to assume the whole of the document implies the meaning of wise water use. The introduction states what is important to the text's producers: quality of life, which depends on water supply for environment, community, and economy; and wise water management for current and future generations of Albertans (Government of Alberta 2003, 5).

The strategy enunciates three goals to secure quality of life: safe, secure drinking water supply; healthy aquatic ecosystems; and reliable, quality water supplies for a sustainable economy (Government of Alberta 2003). These goals are reflected as *three commitments to*

Albertans: (1) "Albertans will be assured their *drinking water is safe*"; (2) "Albertans will be assured that *the province's aquatic ecosystems are maintained and protected*"; and (3) "Albertans will be assured that *water is managed effectively to support sustainable economic development*" (Government of Alberta 2003, 7, emphasis added). These goals form the organizing structure around which the outcomes, key directions, and specific actions are discussed. The strategy, however, does not explicitly indicate an order of priority or importance in achieving these goals; order of importance may only be inferred from order of mention.

Understanding the global order of a document gives insight into how the producers conceptualised the topic at hand. Because the document is outcome-based—built around goals, outcomes, and actions to achieve those goals—the issue of water management is conceptualized as a problem to be solved. The introduction describes the strategy's rationale, the process of its development, a set of principles, and a brief discussion of the strategy's three goals. The set of principles emerged from the public consultation process and provided building blocks for the draft version of the strategy (Government of Alberta 2003). The strategy illustrates the producers' vision of the situation once solved through description of the goals and anticipated outcomes. The specific outcomes serve the dual purpose of guiding the strategy to meet the three goals and providing measures of success in achieving those goals (Government of Alberta 2003). The outcomes illustrate what is envisioned for Alberta's future in the short (2004/5 to 2006/7), medium (2007/8 to 2009/10), and long (2010/11 to 2013/14) term for each of the three goals.

Three key directions—knowledge/research, partnerships, and water conservation—and associated specific actions outline how the producers anticipate achieving the solution to the problem of water management. The specific actions are listed on short, medium, and long-term timelines, like the outcomes, indicating a chronological priority and commitment to timely completion. Each action is designated to meet at least one of the three goals. While the actions are specific and state what will happen and when, questions of who will complete each task and how and with what resources remain unanswered. The strategy describes how success will be measured with specific performance measures. The list is very short, however, but will be lengthened in partnership with the Provincial Water Advisory Council (Government of Alberta 2003).

A glossary in the appendix defines terms of the document; yet it could include far more definitions to indicate Alberta-specific meanings for such words as efficiency, productivity, wise management, sustainable economic development, long-term sustainability, protection, leadership, or watershed management, or indicate with which it is being consistent. The appendix also compiles the goals, core action areas, outcomes, actions, and timelines of the pre-

ceding sections in tabular format, providing an alternative organizational pattern for outcomes and action items.

No financial commitment is evident to support the strategy. If the bottom line is always economic and commitment is judged by money, then there is no indication of tangible financial commitment to this strategy. Financial support for the strategy was questioned by some of the key interview informants; but the *Report on Implementation Progress of Water for Life*, 2004-2005 indicates financial commitment upon the first year of implementation: CAD$5 million for "new" operational initiatives and CAD$14 million for capital initiatives (Alberta Environment 2005a, 5). This commitment leaves little doubt that implementation is moving ahead. However, the *Report* gives no indication of what future funding will be.

4.3 ANALYSIS BY PRINCIPLE

The following discussion presents the analysis results of the *Water for Life* strategy based on the seven principles described in chapter 3.

4.3.1 Water should be treated as finite and variable in availability

Does Alberta's *Water for Life* recognize limits and variability in freshwater availability? Does the policy state actions to cope with these limits and with variability?

Limits

Recent years of fluctuating supplies combined with population and economic growth increasing demand encourage active recognition of water's limits and a shift in the approach to managing water use and allocation (Government of Alberta 2003).

Water for Life explicitly recognizes limits in the principle in two statements: "All Albertans must recognize there are limits to the available water supply"; and, "there is a limited amount of water that can be withdrawn and still maintain a healthy aquatic ecosystem, and once this amount of water is being used there is no further water available within that watershed" (Government of Alberta 2003, 6, 21). Water as limited, though renewable, is a central premise of the strategy (Kelly p.c.; Taylor p.c.). The strategy recognizes that those limits have already been reached in some watersheds in Alberta and will be reached in other watersheds as growth continues (Government of Alberta 2003).

By recognizing water availability limits in watersheds, the strategy takes into account ecosystems' capacity to provide water. Information about actual water use in watersheds is very limited; for example, the government knows how much water has been allocated but has often not had good records of the actual amount used (Griffiths p.c.; Wilkie 2005). Informa-

tion for water is not nearly so detailed as it is for other resources such as natural gas—where it is, how much, who has license to extract it, how much is being extracted—but such information would improve understanding of the exact limits of water (Hahn p.c.). The government considers its knowledge about water to be strong but realizes more research and knowledge is necessary; thus one of the strategy's key directions is research and knowledge (Government of Alberta 2003).

Transfers of unused portions of water licences (i.e., water transfers), water capture, and water conservation are mechanisms the strategy offers to cope with Alberta's water limits. The *Water Act* has attempted to reconcile water's limited nature with the rigid priority use system through water transfers (Government of Alberta 1996). Transferability integrates some flexibility into the system, allowing for the limited water source to be more broadly shared among users (Wenig p.c.). *Water for Life* suggests further water capture as an approach to securing future water supplies. Inter-basin transfers from north to south is one debated solution to increasing water supply in the south; but the *Water Act* prohibits this unless through a special act of legislature (Government of Alberta 1996). Finite water supply is a notion which is "reflected most strongly in our conservation direction" (Yee p.c.). Specific outcomes to conserve water include improving overall water-use efficiency and productivity by 30% from 2005 by 2015 (Government of Alberta 2003). Monitoring and reporting actual water use and developing economic instruments to meet water conservation and productivity objectives are two examples of water conservation initiatives (Government of Alberta 2003).

Water is a key economic input in Alberta (Wilkie 2005). Yet it has been treated as free and limitless and has not been as closely studied, monitored, and controlled as have natural gas and other resources. To address this issue, the government has begun to examine protocols for the oil and gas industry to reduce freshwater user (Alberta Environment 2005a). Water conservation plans are being developed by all water-using sectors (Alberta Environment 2005a). The government is enhancing monitoring and reporting programs (Alberta Environment 2005a, 5). The government intends to study the value of water to the economy (Government of Alberta 2003; Alberta Environment 2005a). These actions engender performance measures for water-use efficiency and productivity by comparing the amount of water used with the level of productivity and comparing the amount of water used with population and economic growth (Government of Alberta 2003).

The main barrier to treating water as a limited resource is the regulated allocation system based on the first-in-time first-in-right principle. Although meant to allocate a limited resource, this system is inflexible in extreme water scarcity situations because it cannot adequately embrace such limits while maintaining equitable distribution of water and its benefits (see section 4.3.3). The first water licences had no fixed time limit, had set allocated volumes,

and maintain priority over more junior licences. Once there is no more water to allocate, no new users can be introduced in the system. If water supply runs short in fully allocated regions, those who have licences might no longer have access to their full allocation of water. The water allocation system is a "hundred-year-old management system" based on an assumption that water is essentially unlimited (Wenig p.c.). Because the Alberta government, in the *Water Act* and reiterated by *Water for Life*, refused to change this system (Government of Alberta 1996, 2003) it has not adequately embraced the idea of limits.

Temporal variability and climate change

Alberta receives enough water for human uses, but it does not all arrive at the right time (Hill p.c.). This significant challenge of temporal variability often brings about technological solutions to capture and store water, or changes in behaviour. Faced with the enhanced challenge of increasing "fluctuations and unpredictability" in water supply, the strategy suggests a combination approach "of both improving our ability to capture and store water during high flow seasons or periods where possible and feasible, as well as improving water use practices through significant conservation efforts" (Government of Alberta 2003, 21).

The strategy recognizes that "fluctuating and unpredictable water supply in recent years" necessitates changes in use and allocation (Government of Alberta 2003, 21). The "unpredictability of water supply due to climate variability" rationalizes the strategy's research and knowledge-seeking actions (Government of Alberta 2003, 11). This statement is the strategy's only recognition of the idea of climate change. Southern Alberta is likely to be negatively affected by climate change; while northern Alberta, which is not currently water short—except in limited areas such as Cold Lake where there have been shortages during times of drought—may be in the future (Griffiths p.c). Except where there are monitoring wells, the government does not know if use of groundwater is at a faster rate than the recharge rate (Griffiths p.c.). Climate change may result in melting glaciers leading to depletion of summer flows in southern Alberta, partly because reservoir capacity is relatively small (Kelly p.c.). The pressures of population growth and climate change mean adoption of the precautionary principle is necessary (Griffiths p.c.). Yee (p.c.) claims natural variability and uncertainty, the increase of drought and the potential of climate change, "really is the premise" for the strategy. Research might lead to more specific understanding and actions to address climate change.

Geographic variance

The strategy explicitly recognizes regional differences in water management issues and the "need for regionally based solutions developed in collaboration with stakeholders and the public" (Government of Alberta 2003, 19). The partnership approach on a watershed scale is meant to address these differences. The discussion of participation and watershed-scale management in sections 4.3.4 and 4.3.7 further explore this idea.

Place-based governance allows local solutions that recognize local supply and demand conditions (Thomson p.c.) and region-specific solutions to shortages, quality issues, and different industrial use (Wuite p.c.). Northern and southern Alberta have different supply, quality, and management issues (Griffiths p.c.). Full- or over-allocation in some watersheds challenge southern Alberta; whereas northern Alberta's issues tend to be around quality. For example, oil and gas activities and pulp mills affect water quality on the Athabasca River and logging in the northern region reduces infiltration and groundwater recharge (Wilkie p.c.). Oil sands operations, on the Athabasca River near Fort McMurray, may threaten quantity of water in the Athabasca as the operations expand (Kelly p.c.). Climate change will also have different and localised impacts, potentially shifting biomes (Griffiths p.c.). Due to different issues and industries in southern and northern Alberta, the government should engage the public in the north and south with a "completely different message, goal, and target" (Wilkie p.c.). The watershed approach will allow these differences to be addressed.

Creation of and emphasis on the watershed-scale Watershed Planning and Advisory Councils (WPACs) and the community-scale Watershed Stewardship Groups (WSGs) directly addresses geographic variability as place-based governance (Thompson p.c.; Griffiths p.c.). These groups are fundamental to the province's effort towards water governance on watershed and local scales (Wilkie p.c.). Action to support this approach include developing watershed plans to address local quantity and quality issues (Government of Alberta 2003). These plans also recognize limits because they must work within the limits of the watersheds. Water conservation initiatives will be applied at the watershed level to address diversity from south to north (Yee p.c.).

Conclusion

Water for Life explicitly recognizes limits in water availability and temporal and spatial variability in its language, its premise and principles, and its actions of conservation and research. It does not recognize seasonality, except through potential capture and storage of water. Retaining the first-in-time first-in-right principle is a barrier to fully embracing the limited nature of the resource, especially as climate change makes water less consistently

available. The strategy recognizes geographic variability through its place-based watershed approach manifest in the WPACs and local WSGs and watershed management plans. Overall the strategy has improved public awareness of Alberta's water limits; but, as one respondent said, the government has "to go the next step with it and create more awareness of the critical issues we're facing in order to get buy-in from the general public. I think many of us who are involved in water issues in Alberta are concerned that some big decisions have to be made in the near future" (Shyba p.c.).

4.3.2 Water should be treated as a shared, common resource

Does the policy regard water as a common, shared resource? Does the policy state action to approach water as a common, shared good?

Shared among users

The *Water Act* in Section 3 (2) vests all property, diversion, and use rights to water in the Government of Alberta (Government of Alberta 1996). The strategy reiterates the provincial government's ownership with possessive phrases like the "province's water resources" and "our water supply" (Government of Alberta 2003, 7, 5). The *Water Act*, these types of phrases, and consistent use of the pronoun 'our' imply that water is commonly owned and held in trust by the government for all Albertans. As the holder of water rights, the Alberta government is responsible for designating rights and priorities and allocating water; the government acts as the facilitator of sharing water, as a common-pool resource, among users.

To facilitate this sharing, the *Water Act* defines priority of use (Government of Alberta 1996). Household users—residing on or beside groundwater or surface water body and able to divert water—have priority over all other types of users (Government of Alberta 1996, Sec. 21, 27). The strategy defines "household purposes" as "human consumption, sanitation, fire prevention and watering animals, gardens, lawns and trees" (Government of Alberta 2003, 28). Traditional agricultural users—for pesticide application or raising livestock—hold the next priority if registered, and first known date of diversion determines priority among these users (Government of Alberta 1996, Sec. 24, 28). All other uses are subject to licences. These licences have the lowest priority but have priority among themselves based on the first-in-time first-in-right principle, or date of application (Government of Alberta 1996, Sec. 29). This hierarchy of uses implies basic human needs is first priority, followed by food security, and then all economically based uses—the latter two being based on a historical conception of justice.

Yet water as a common resource "is a purely philosophical view" in Alberta "because water is not always a public good. Some people and companies have been given water allocations in perpetuity" (Griffiths p.c.). While the Crown ultimately holds all water rights, the Alberta system is effectively based on individual property rights where people hold rights in priority of historical claims (Thompson p.c.; Wuite p.c.). Licenses in perpetuity—generally those granted under the old *Water Resources Act*—are not in the best interest of the public because the government does not have the opportunity to end licenses for new human needs or environmental needs and change (Wenig p.c.). Instead license holders without fixed time periods effectively own that allocation of water; "[t]his view doesn't treat water as a public resource" (Wenig p.c.).

Full allocation in some southern Alberta water bodies led the government to introduce transferability of water rights in the *Water Act*. Transferability of unused portions of licenses adds flexibility and is a good adaptation of the regulatory system (Kelly p.c.; Wenig p.c.; Wilkie p.c.; Hill p.c.). These transfers can allow "adaptations during water shortages" (Griffiths p.c.) and movement between various uses within basins (Hill p.c.). Aside from transfers, the system remains relatively unchanged from its inception over a century ago. Population growth and industrial and agricultural development has changed significantly in Alberta since then. Only if the government chooses to change the system, or utilise certain conditions in the licences, will 'ownership' change.

Despite the rigid allocation system, informal mechanisms and relationships help mitigate water short situations. Cooperation amongst local people during a very dry period in 2001 in southern Alberta prevented significant hardship for a number of people. If everyone in the Oldman River Basin had fulfilled their entitlements under the licensing system, downstream municipalities would have been without enough water and farmers would have lost high value crops (Hahn p.c.; Hill p.c.). Meetings amongst the agriculture and irrigation communities, instead, led to agreements to share water regardless of seniority (Hill p.c.). People informally transferred their allocations among each other, for example, from those with pasture land, and less to lose, to those with higher value crops (Wuite p.c.). Wuite suggests this situation is "evidence of a value system rather than a first-in-time system, although it's on an ad hoc basis. It's a sign of things to come."

In summary, the licensing system offers security to licence holders. Transfers of unused portions of licenses add flexibility to the system. Although water is under the Government of Alberta's ownership, in effect it is not because water has been permanently allocated to many license holders. This system prevents water being treated as a common, shared resource.

Shared across boundaries

Sharing water across boundaries is an important aspect of water management in Alberta. Water passes across inter-provincial and international borders and across intra-provincial boundaries, such as property, municipal, and county lines. Political jurisdictions do not often follow watershed boundaries: "We have provincial jurisdiction and watersheds that are transboundary in nature. We have city and municipal governments, none of which are configured in a watershed" (Hill p.c.).

To share water equitably, inter-provincial and international transboundary water are explicit issues and have generally been resolved amicably with apportionment agreements, such as the *1969 Master Agreement on Apportionment* with Saskatchewan and Manitoba and the *1909 Boundary Waters Treaty* with the United States. These agreements designate the percentage of water that must flow across the respective boundaries each year. Although these agreements have significant relevance for water consumed within Alberta, the Government of Alberta does not question its water commitments (Wilkie p.c.). It understands "what we take out and what we put back in and the quality of water and the amount of water directly affects the livelihoods and quality of life in Saskatchewan" (Wilkie p.c.). The Americans are less satisfied with the international sharing of St Mary and Milk Rivers (Wilkie p.c.), while the Government of Alberta posits that all disagreements can be resolved within the framework of the *Boundary Waters Treaty* (Government of Alberta 2004c).

In the short-term to support a sustainable economy, the strategy intends to "develop and implement transboundary agreements in cooperation with neighbouring jurisdictions" (Government of Alberta 2003, 18) and will administer and operate "Alberta's water management system to meet transboundary agreements" (Government of Alberta 2003, 19). The reference to transboundary agreements within *Water for Life* does not declare which set of transboundary issues its actions address—international, inter-provincial, or intra-provincial.

Water issues across intra-provincial boundaries—municipal, county, and irrigation district boundaries—is more complex than inter-provincial or international water issues. Intra-provincial jurisdictions will have to work to "figure out how they behave in the watershed they live in" (Hill p.c.). The City of Calgary is an example of a municipality functioning within a watershed and sharing water with upstream and downstream users. It is upstream of irrigation (a consumptive user) and downstream of TransAlta hydropower works (a non-consumptive user), it has a big population, and it has money and thus could buy licenses from irrigation to meet its needs (Kelly p.c.). It is, however, surrounded by municipal districts (MD) of Rockyview and Foothills. Along the Elbow River, housing construction with septic tanks in the MD of Rockyview is a potential threat to Calgary's drinking water because the river flows

into the Glenmore Reservoir. This situation, mingled with others, causes a "toffee pull" between the municipalities (Hahn p.c.). Conflicting priorities result in conflict among upstream and downstream users: "One group is trying to use the land for as much economic use as possible and downstream users need it for a source of recharging the water. So you can definitely see some misalignment in […] policy that is really starting to come into focus" (Fesko p.c.).

The Calgary Chamber of Commerce [in a letter to the provincial government] suggested "regional planning that would either supply wastewater, sewer pipes out to those houses or limit development" would be helpful in the context of broader areas (Hahn p.c.). The WPACs will be valuable forums for negotiating agreement on intra-provincial transboundary water issues.

Natural sharing

Wilkie (p.c.) suggested the concept of natural sharing: "[W]hen you do start talking about a common resource, a shared resource, there's also the ecosystem, which fundamentally services all of our needs. So we need to better manage that and incorporate it into this idea that it's not just industry and agriculture sharing this resource, it's a natural sharing as well". Healthy aquatic ecosystems are important in *Water for Life* as one of three goals to support Albertans' quality of life. The outcome that water will be managed and allocated to sustain healthy aquatic ecosystems suggests that water will be shared with aquatic ecosystems (Government of Alberta 2003). Aside from research about aquatic ecosystems, however, the most specific action to achieve this outcome is completing watershed management plans for all major watersheds and meeting objectives for aquatic ecosystems set with those plans (Government of Alberta 2003). Under the *Water Act*, up to 10% of water transfers may be allotted to in-stream flow needs; these are called conservation holdbacks. Section 4.3.6 more directly addresses this idea.

Best use for community

While we all recognize that water is valuable, "the real challenge is making the kind of choices about how water is used that allows us to get the most benefit from it" (Hill p.c.) and ranking "the best and highest use of water" (Hahn p.c.). Water's value to the community drives how water is priced and what is considered its best use. How does the strategy indicate water's value and its best use?

The strategy indicates indirect value of water for quality of life and direct value of water for environmental, community, and economic well being (Government of Alberta 2003). The *Water Act* and the strategy better support environmental well being now than in the past (see

section 4.3.6). The *Water Act* supports social water uses by household and traditional agriculture priorities (see section 4.3.3). The value of water for economic uses is most explicit in the strategy in connection with the outcome "Albertans understand the value of water to the economy and quality of life", under the goal of reliable, quality water supplies for a sustainable economy (Government of Alberta 2003, 8). Currently the government is conducting a study about the value of water (Yee p.c.). Shyba (p.c.) suggests, "one of the tough decisions of [*Water for Life*'s] implementation will be to place a value on it, particularly use in industrial and agricultural applications". Mechanisms to achieve best community use include water allocation systems, water markets, and pricing.

Water allocation is not a central theme to the strategy, but it is fundamental to distributive justice in the province and to achieving best use of water for the community. The historical priority of first-in-time first-in-right principle may not be the best way of achieving best use for the overall and growing community. As one respondent stated, "just because a person is first in time doesn't mean they have the best use of a resource" (Smith p.c.).

To allow water movement within the licensing system—in fully or over-allocated watersheds—transferable water allocations are intended to "ensure societal demands and needs can be met" (i.e., the common good) in Alberta's "sustainable economy" (Government of Alberta 2003, 6). These transferable water allocations introduce a water market in Alberta. Transfers will incorporate greater flexibility, but whether they will ensure equitable sharing of water resources and "best use" of the water to meet broad societal needs remains to be seen.

Pricing is a common mechanism to explicitly value water. While water is "a public good", one respondent suggests not "everybody has an equal right to it if they're going to waste it […] the government has to start looking at pricing water so that it doesn't get wasted" (Smith p.c.). Water should be metered and paid per unit to promote conservation (Griffiths p.c.). It should be affordable for domestic use; but industry should be charged for water because at the moment there is no incentive to conserve—industry only needs to pay for a license (Griffiths p.c.). A royalty on water like on other finite natural resources could be a feasible way of recognizing water as a common resource (Hahn p.c.). The Alberta government and the Alberta Water Council (AWC) have initiated an evaluation of economic instruments to meet water conservation and productivity objectives (Government of Alberta 2003; Alberta Environment 2005a). Economic instruments could be a good direction to ensure best use for the community. But, first, more detailed information about its location, availability, and use is necessary to monitor and charge for its use. Municipal water use and pricing is under municipal jurisdiction. The City of Calgary recognizes that water has value and that the City adds value to it through the service of treatment and delivery. It has a financial policy of full-cost pricing—called cost-of-service pricing—which is broken down by customer groups. The City

is also moving towards universal metering of household use, with a sunset clause on flat rates for 2014 (Fesko p.c.). The City is "trying to create a culture of valuing water and [we] design our programs to get people thinking about it and we're way ahead of them in terms of trying to lead by example and push development in the direction so that we can achieve sustainable water" (Fesko p.c.).

To truly determine best use of water, full participation of Albertans is necessary. The strategy attempts to integrate the general Albertan public into decision making through its "network of partnerships"—a topic section 4.3.4 discusses in more detail.

Shared responsibility and accountability = common governance

Water as a common shared resource "is very consistent with our water strategy" states Yee (p.c.): "It is a shared resource. How we've responded to that is there's shared responsibility to managing it". Echoed by a number of respondents, Thompson (p.c.) suggested "the common approach to it all only comes in the mechanisms that we have to collectively make some decisions". If common governance can be characterised as shared responsibility and accountability, then the Government of Alberta is implementing a common governance approach through its "network of partnerships". While the Government of Alberta, with Alberta Environment as the lead agency, will oversee and remain accountable for water and watershed management activities in the province, all Albertans share responsibility for their use of water (Government of Alberta 2003). All Albertans require water and use and affect water quality and quantity through their activities; therefore "citizens, communities, industries and governments all share responsibility for the wise use and sustainability of their watersheds" (Government of Alberta 2003, 15). This conception of responsibility is part of "achieving stewardship" of this shared resource (Government of Alberta 2003, 15). The strategy encourages all Albertans to "work together to set objectives for the watershed, identify issues, monitor the condition of the watershed and continuously adjust their use of water and activities on the landscape that affect the water" (Government of Alberta 2003, 15).

Everyone shares responsibility through participation in the "network of partnerships", through using an outcome-based approach, and through collaborating on service delivery (Government of Alberta 2003, 15). Because water is vital to all Albertans, all Albertans were invited to offer opinions and ideas while developing the water strategy (Government of Alberta 2003). Through the partnership network, reinforced by the *Enabling Partnerships* document, all Albertans will continue to have a voice in creating watershed management plans for each of the major watersheds. (See section 4.3.4 for further discussion.) Thus the strategy supports collectively managing water "as a common resource at a watershed level" (Wilkie p.c.).

Conclusion

While the Government of Alberta holds ownership of water, the prior appropriation licensing system is a significant barrier to treating water as a common shared resource within the province. Transboundary water sharing is well established beyond the provincial borders, but is far more complex within them. Sharing with nature is not an explicit aspect of the strategy although it moves toward such sharing. Determining best use of this shared resource in the Albertan community is an ongoing process. The new partnership framework facilitates common governance of this common-pool resource.

4.3.3 Water security should be ensured for all humans

Does the policy support water security for all human users' needs? Does the policy state action items to ensure water security for all?

Water for basic needs—drinking water, cooking, sanitation

"[S]afe, secure drinking water supply" is one of three central goals in *Water for Life* to support quality of life (Government of Alberta 2003, 7). The strategy defines drinking water as "[w]ater that has been treated to provincial standards and is fit for human consumption" (Government of Alberta 2003, 28). The word "safe" implies good quality water; 'secure' implies water in sufficient quantity to meet needs. Meeting this goal for all Albertans would satisfy water security for basic needs in Alberta. For the AWC, drinking water is "our highest priority" (Kelly p.c.). The government aspires to maintain its position as "a leader in drinking water quality and standards to ensure Albertans have safe, secure drinking water" (Government of Alberta 2003, 6).

Meeting basic human needs for water quantity seems not to be a problem in Alberta. Everyone has the right to access water, whether an irrigator or in a small community (Taylor p.c.). Household purposes with riparian or groundwater access have priority under the *Water Act* (Government of Alberta 1996, Sect. 21, 23, 27). They include water "for human consumption, sanitation, fire prevention and watering animals, gardens, lawns and trees" (Government of Alberta 2003, 28). More general domestic water use (e.g., urban home water use) is considered separately from household purposes and is defined as "[w]ater used for drinking, cooking, washing and yard use" (Government of Alberta 2003, 28). This use is not mentioned in the *Water Act* and thus has no explicit guarantee. Municipal governments hold licences to divert water for urban use. These licences, however, are often more junior than those held by nearby irrigators. If conditions are very dry, the basin is fully or over-allocated, and the mu-

nicipality lies downstream of the irrigators, the irrigators are entitled to fulfill their allocation first and municipalities might not be left with enough water to meet urban domestic needs.

Neither the *Water Act* nor the strategy recognises a human right to water. Household users have first priority to water; but this priority to water cannot be constituted as a right. If it were a right, the government would be legally obligated to provide water even when there is none to give; whereas a priority indicates who has priority when there is water. Some interview respondents suggested the right for domestic use should only be a right while supplies are sufficient. Water for industrial use should have an escalating charge to encourage conservation (Griffiths p.c.). Fesko (p.c.) stated "they have right to water for their basic needs but we [the City of Calgary] do have to recover the costs for the value we add on the way".

Water quality is a different issue—especially for residents on private systems, for small community treatment plants, and for aboriginal communities. Some quality issues are addressed by the strategy's drinking water outcomes and actions. Key outcomes to achieve the drinking water goal include: developing a drinking water strategy; improving knowledge of drinking water issues; ensuring real-time access to water quality information; maintaining leading-edge and sustainable drinking water infrastructure; and ensuring Albertans have knowledge, tools, and motivation to maintain and improve water resources (Government of Alberta 2003). The first two and the last outcomes imply the need for research. Real-time access implies the importance of transparent access to information—see section 4.3.4.

Assessment of drinking water facilities is one of the short-term actions of the strategy. Evaluation of those facilities has been one of the implementation priorities over the last year (Yee p.c; Wuite p.c. Kelly p.c.), resulting in the *Drinking Water Facility Assessment Report* (Alberta Environment 2005a). Calgary seems to be ahead with infrastructure by constructing new water treatment facilities in anticipation of changing regulations (Fesko p.c.). Drinking water facility improvement, including in parks and recreation areas, to meet new drinking water standards is an objective of the strategy which has been initiated (Government of Alberta 2003; Alberta Environment 2005a). To ensure a more comprehensive approach to drinking water, the strategy is adopting "a multi-barrier, source-to-tap approach at all drinking water facilities" (Government of Alberta 2003, 19), which is leading to enhanced operational and laboratory capacity and development of emergency protocols and a better public health surveillance system (Alberta Environment 2005a). The government will also support WSGs to improve the condition of local watersheds (Government of Alberta 2003), which will assist with source protection.

The absence of sanitation strategies in the strategy may imply sanitation is not a problem in Alberta. Nor did interviewees address this topic. Sanitation may be part of the overall

waterworks evaluation and actions, or sanitation might not be under the provincial jurisdiction but delegated to municipalities and rural residents on private systems.

Food security

Little change in the water allocation system means irrigators producing food or other products have security in Alberta. This security may point to the importance of food security to the province; but more likely reveals the importance of the agricultural sector to the economy and politics of the province.

Right to a healthy environment

Quality of life is dependent upon having a healthy sustainable water supply for three things: environment, community, and economy (Government of Alberta 2003). Thus, indirectly a healthy environment provides for higher quality of life. To ensure high quality of life for Albertans, the environment around them must be healthy. Wenig (p.c.) suggested, "To the extent that all of our needs are dependent on a healthy ecosystem, then I don't think that the *Water for Life* strategy is doing that". See section 4.3.6 for further discussion.

Economic vitality

Both a purpose of the *Water Act* and a goal of *Water for Life* is economic vitality. The *Water Act* aims "to support and promote the conservation and management of water, including wise allocation and use of water, while recognizing…the need for Alberta's economic growth and prosperity" (Government of Alberta 1996, Sec. 2). The strategy strives for "reliable, quality water supplies for a sustainable economy" (Government of Alberta 2003, 7). In Alberta contention over water for basic needs is not a widespread issue; although the next section addresses groups who might not have water security. Allocation among economic uses is an issue—how much water and when for which economic sector? This was a frequent topic in the interview responses. Does the strategy address fair economic vitality with respect to water?

The strategy recognizes the value water has to the Alberta economy and the economy to quality of life (Government of Alberta 2003). Although one of its three goals, the strategy does not describe what a sustainable economy looks like or how equitable that economy would be to all parties. The idea of fair use might be one of the key challenges for the strategy's implementation (Hahn p.c.). Somehow the government needs to find a way to rank the various uses of water (Hahn p.c.).

The allocation system is meant to support economic vitality. However, it is not "amenable to micromanaging water resources on equality issues" (Thompson p.c.) and "it doesn't

address fairness of use" (Wilkie p.c.). Agriculture, particularly in semi-arid southern Alberta, relies heavily on irrigation water. Because irrigation districts tend to hold the most senior licences, changing the first-in-time first-in-right system to, for example, an entirely market-based system might damage this sector's economic vitality. "[I]f we created an open market system to water rights and water sharing", industry has "deep pockets" and is better able to buy water (Wilkie p.c.). "Individual irrigators, on the other hand, don't have deep pockets at all. Their land is their wealth. Right now the system favours [the irrigators]" (Wilkie p.c.). Changing the allocation system may promote better use of water, but it may shift the dynamic of power and wealth in the province.

Yet the allocation system does not necessarily support sustainable livelihoods in agriculture and may in fact better support industrial agriculture: "If you said, 'our goal is to ensure the viability of small family farms and to maximise employment from agriculture', you would come up with a completely different agricultural system, including a completely different water-use system" (Wenig p.c.). Despite new mechanisms to open up the system, such as water transfers, "It doesn't guarantee equality because equality was never a priority, historically" (Thompson p.c.). While the prior appropriation system provides security for those who hold licences, it is a significant barrier to fair use of water for economic or productive uses, particularly in areas where water supplies are almost or already fully allocated. To ensure the transfer system is effective in supporting a sustainable economy, monitoring and evaluation of the system is being implemented (Government of Alberta 2003; Alberta Environment 2005a).

Study of the water's value to the economy (Government of Alberta 2003) might contribute to defining fair use in Alberta. Establishing water management objectives, priorities, allocations, and watershed management plans to support sustainable economic development will further contribute to defining fair use (Government of Alberta 2003). The government aims for all sectors to demonstrate best management practices and 30% improvement in efficiency and productivity by 2015 (Government of Alberta 2003) through developing conservation plans and implementing economic instruments (Alberta Environment 2005a). Implementation parity among sectors is unlikely, however (Wuite p.c.). Despite focus on the economy's interaction with water, the strategy does not describe the current economy, its needs, or its current use of water. Based on the planned actions, and interview data, knowledge of actual water use in Alberta is slim—knowledge that would help define equitable water use within the economy.

All groups have equal access to good quality water and opportunity

Water quality and quantity access for rural residents on private systems, small communities, and First Nations communities make the issue of meeting basic needs in Alberta worthy

of attention. Differences in licence priority between municipal and rural residents may cause tension in water short situations and as urban population and economic growth continues.

Some people living in rural Alberta are "not connected to some kind of municipal water treatment system; they're handling issues of water supply and quality on their own, whether it's groundwater or surface water" (Hill p.c.). The people themselves and the regional health authority are responsible for ensuring adequate water quality (Wuite p.c.). A large number of people (estimated at 400 000 to 600 000) in rural communities are on private water systems and continue to "get water from rivers, dugouts, wells" without "the assurance you get with a municipal water system" (Kelly p.c.). The government's concern over "Albertans that get their drinking water supply from a private supply, one that isn't regulated by us" (Yee p.c.), has led to actions to improve information accessibility to those on private water systems (Government of Alberta 2003).

Evaluation of treatment facilities will particularly benefit "small town Alberta". The provincial government "is spending a lot of money [to ensure] that small rural communities have an integral water supply; because the groundwater is really quite unreliable and it's not really good anywhere in the province" (Yee p.c.). These communities are challenged in being able to upgrade their drinking water facilities to meet standards; and they have trouble "keeping well-trained, well-educated operators in the community" (Yee p.c.). The government is enhancing operational capacity, upgrading facilities, and implementing "an action to build regional drinking water systems to ensure that all Albertans are getting access to good clean safe water, adequate supplies" (Yee p.c.; Alberta Environment 2005a). Municipal grant criteria will support regional water systems development (Government of Alberta 2003; Alberta Environment 2005a). Regionalisation can also be a good way to improve small water treatment systems and cope with extreme events such as the flooding in June 2005 (Smith p.c.).

Confusion over federal and provincial jurisdiction in First Nations communities is a problem in Alberta and can lead to compromised water provision. First Nations' land and water are under federal jurisdiction, while water resource management in the rest of the province is under provincial jurisdiction with some responsibilities delegated to municipalities or regional bodies (Dorcey 1991). As a result, a gap has developed in providing access to high quality water in sufficient quantities. One interview respondent commented, "First Nations perhaps [don't] have the same access to reliable quality water supplies as other communities do. That won't be common in every case" (Hill p.c.). This might be the "weakest link" in Alberta's water management, and indeed in Canada (Kelly p.c.). As of early 2006, 76 First Nations communities were on "boil water advisories" due to inadequate quality of drinking water; this represents about 10% of all First Nations reserves (Canadian Broadcasting Corporation 2006). The Walkerton Inquiry recommended that provinces take over responsibility for

drinking water in First Nations communities (Canadian Broadcasting Corporation 2005). A number of writers acknowledge water problems in First Nations communities and the significance of First Nations and the federal and provincial governments in water management (Mitchell and Shrubsole 1994; Boyd 2003). *Water for Life* does not acknowledge the issue of First Nations and water.

Conclusion

While Alberta is not generally characterised as being water insecure for meeting basic human needs, some groups are adversely affected by the current state of water quality. The government is taking action to rectify some of these issues. The government is also moving towards protecting aquatic ecosystems through research; but time will reveal whether this will be enough to ensure a healthy environment for all Albertans. The first-in-time first-in-right allocation system is a barrier to fair economic use of water.

3.3.4 Water management should entail full participation by all those affected

Does the policy recognise full participation of all affected as important in planning, decision making, and implementing action to meet water challenges? Does the policy indicate action items to this regard?

Inclusion in policy development

The strategy describes the policy development process to be inclusive and consultative with both experts and regular citizens of Alberta. The public's inclusion in the policy development process is rationalised by the statement, "Because water is vital to all Albertans, their opinions and ideas play a vital role in the development of a provincial water strategy" (Government of Alberta 2003, 5). Lorne Taylor (p.c.), the Environment Minister who led the strategy's production, stated participation was central to the development process. This process was generally recognized as inclusive by the interview respondents (Hill p.c.; Hahn p.c.; Yee p.c.). Wuite (p.c.) stated, "From day one, through the ideas generation process, through the drafting of the water strategy, through the public consultation phase, considerable effort was made to make sure that everybody who might possibly have input was given that opportunity. […] From my experience this was one of the most inclusive processes that I've ever been part of in terms of allowing input into government policy, from interested public members, interested sectors, interested industries, companies, municipalities, across the board". Thousands completed online surveys in response to the draft strategy; invitation-only meetings with specialists and open houses around the province contributed to public input (Fesko p.c.). The

government extensively advertised the strategy, "so I think the province did quite a good job" (Fesko p.c.).

Inclusion in planning, decision making, implementation

Participation is a central focus of *Water for Life*. One of three key directions is building a network of partnerships with Albertans—citizens, communities, industry, and governments, both individual and collective entities—at the provincial, watershed, and community scales. Building a "partnership approach to watershed management" is the government's answer to "growing demand for public involvement in planning and decision making" (Government of Alberta 2003, 19). This approach supports the principle of shared responsibility: "Citizens, communities, industry and government must share responsibility for water management in Alberta, and work together to improve conditions within their local watershed" (Government of Alberta 2003, 6). Based on the idea of shared responsibility and shared use, all citizens can take part in planning, decision making, and implementation. All Albertans are agents of change as users, they affect their watersheds, and they are responsible for wise use and sustainability of their watersheds (Government of Alberta 2003). As a result, all are considered actors in water management decision making and should have the opportunity to participate at the provincial, watershed, or community level (Government of Alberta 2003). In Alberta, full participation evolves out of recognition of shared responsibility.

Like shared responsibility, leadership is a theme that motivates action in the strategy. The strategy states that Albertans will become or continue to be leaders in various ways: in conservation by using water efficiently and effectively (Government of Alberta 2003); in drinking water standards (Government of Alberta 2003); and in watershed management (Government of Alberta 2003). Leadership at the provincial scale breeds pride at the individual and collective level. The strategy's use of this idea positively encourages Albertans to take an ownership stance of provincial past and future accomplishments in water management. Similar to the idea of shared responsibility, shared leadership provides motivation to be aware of and become involved in water management issues and connect them to individual behaviour.

Use of the pronoun "our" throughout the strategy stylistically supports the idea of shared responsibility. From the introduction on, "our quality of life . . . for our communities and for our economic well-being" (Government of Alberta 2003, 5) and similar phrases engender a sense of solidarity and a necessity for cooperation and togetherness in creating high quality of life in communities and the economy. With this ambiance successfully constructed, the explicit mention of shared responsibility is easy to step into and supports the development of the partnership network described in the strategy and later in the report *Enabling Partner-*

ships (Alberta Environment 2005a). These two documents outline three types of partnerships "that are integral to achieving stewardship of our water resources" and the "different but compatible" roles of each nested group (Government of Alberta 2003, 15, 17). Responsibilities include working together to make recommendations to the government, stakeholders, and the public for improving water management throughout Alberta's watersheds; set watershed objectives; identify issues; monitor watershed conditions; and continuously adjust use of water and activities on the landscapes (Government of Alberta 2003).

The Alberta government modelled this partnership network on the collaborative watershed approach being taken in the South Saskatchewan River Basin (SSRB) (Yee p.c.). Consequently, this basin is furthest along amongst the watersheds in developing a watershed management plan, which strives for the best balance between water consumption and environmental protection to meet economic and social objectives and ecological requirements (Government of Alberta 2006c).

The government's first step is to transition from water management planning to watershed management planning, which involves "all of the water users associated with a particular watershed" (Yee p.c.). Watershed councils will lead watershed planning. These WPACs evolve from the Basin Advisory Committees (BACs) and are more inclusive of non-technical stakeholders (Wuite p.c.). The multi-stakeholder nature of the councils "reinforces the idea that government can't do it alone, and shouldn't be doing it alone, because we share the use of the resource" (Yee p.c.). Inclusivity rather than exclusivity is the idea behind these groups because "you don't have to be in the basin, you don't have to be within a certain buffer distance of an allocation or withdrawal point, which is the way it works for the very narrow appeals process. You just have to have an 'interest' in that resource" (Wuite p.c.).

With so many involved with different interests in water the challenge becomes finding common ground. Too much time may be required to reach common ground and there may not be the luxury to allow people to fully engage in the process (Shyba p.c.). The Alberta Water Council (i.e., Provincial Water Advisory Council), established in 2004 as the provincial-level stakeholder group, has taken a year and a half "to find some common ground and […] an action plan" (Shyba p.c.). The AWC is overseeing overall implementation of *Water for Life*, provides advice to the government, sets research priorities, and consults with Albertans on emerging water issues (Alberta Environment 2005a).

The WPACs are also multi-stakeholder. The government has formalised partnerships with three watershed councils: the North Saskatchewan, the Bow, and the Oldman watersheds—two of which have released state of the basin reports (Yee p.c.; Alberta Environment 2005a). Government funding is supporting council formation in the Red Deer, Battle, Cold Lake-Beaver River, and Lesser Slave Lake watersheds; and, discussions for the Athabasca and

Milk watershed councils have begun (Alberta Environment 2005a). These groups will lead watershed management plan development. Discussion have not yet begun for the Peace and Hay watersheds.

Supporting local-level involvement to protect local rivers, streams, and lakes, over 60 community-based WSGs have formed in the province by volunteer citizens (Alberta Environment 2005a). Government, local municipalities, businesses, industries, and non-governmental organizations support the WSGs in various ways to do on-the-ground activities and work with land managers to protect local river reaches (Government of Alberta 2003; Alberta Environment 2005a).

The strategy assumes that a sufficient number of Albertans are going to want, and be able, to participate in these groups. The more participatory governance there is, the more sapped is the pool of people with the time and personal resources necessary to participate (Griffiths p.c.). There is also the assumption that those involved will represent all interests in Alberta and will be heard equally to find the best solutions. "[S]ome groups, although invited to the table to discuss water issues, elect not to attend", which has been a problem in past processes (Shyba p.c.; Mitchell and Shrubsole 1994). The legitimacy of the process is then compromised. The strategy makes no mention of measures to prevent certain powerful interests (i.e., industry concerns) from trumping the less powerful (i.e., environmental concerns).

While participation is central to the government's approach, the Government of Alberta (led by Alberta Environment) "will remain *accountable* and will continue to oversee water and watershed management activities in the province" (Government of Alberta 2003, 15, emphasis added). All watershed management plans from WPACs, and recommendations from WSGs and the AWC, are just recommendations and are subject to vetting by Alberta Environment (Yee p.c.).

Decentralisation: local knowledge and decisions

Due to regional differences, growing demand for public participation in decision making, and the idea of shared responsibility, the government acknowledges local knowledge is necessary to include and decentralisation is appropriate (Government of Alberta 2003). The strategy states, "Because the people who are immediately affected by specific water issues can also more directly and effectively find solutions to address them, the focus of the *Water for Life* is to adopt a watershed approach to management. This allows the focus to be placed on a geographic region" (Government of Alberta 2003, 15). The watershed approach is "place-based […] relying on local people in local areas to make decisions that have a huge local component to them" (Wenig p.c.). This approach "gives the local watershed community a

comprehensive understanding of local management needs, and encourages locally led management decisions" (Government of Alberta 2003, 31). This new approach, for Alberta, is highly regarded and considered one of the better attributes of the strategy.

The partnership structure means specific water issues can be addressed at the appropriate scale. The provincial council can "focus on different issues […] such as guiding principles"; while "local groups can focus on more local issues […] that impact them directly" (Wilkie p.c.). Because water issues are local "in one way or another", the AWC is "a small player relative to the water basin groups.[…] [T]he rubber hits the road there. The provincial Water Council […] is really trying to be the umbrella for consistency around the real work which is done by those water basin councils" (Kelly p.c.). The AWC will look at "provincial policy things, like economic instruments. […] We're trying to get that balance of staying out of their business but at the same time ensuring that the quality standard of work that they do meets our take on what should be done in the province. That will be another ongoing tension between the watersheds and the Water Council" (Kelly p.c.).

To foster community leadership, the strategy outlines a number of anticipated actions: establish WPACs; complete watershed management plans; and support WSGs to improve conditions of local watersheds (Government of Alberta 2003). The strategy's success will depend on the WPACs and WSGs and on how people choose to engage themselves (Hill p.c). The process allows for people to self elect if they have a direct interest, or find the discussion important to them "in the way they live as Albertans" (Hill p.c). The multiple levels of public participation means "anybody who deems themselves to be affected or interested can have input, either provincially or at a regional level, through their representation in those bodies" (Wuite p.c.), as well as representation at the local level (Smith p.c.). This new governance structure is "a great opportunity to exercise citizenship" (Hill p.c.) and provides "a mechanism whereby people can voice their concerns"; although, "it's still sort of squeaky wheel management" (Thompson p.c.). Overall, the watershed councils' "success is dependent on that broad involvement by all water users. […] I don't think that's going to be anything that will be a stretch for us in Alberta" (Yee p.c.).

The fact that watershed councils have no jurisdiction over allocation decisions can be a significant barrier to developing constructive or creative watershed management plans (Wenig p.c.). During the "very narrow" appeals process, only those directly affected by the decision can have a say about a water allocation's approval (Wuite p.c.; Kwasniak p.c.). By not altering the first-in-time first-in-right system, the government limits the scope of the management plans. The plans can decide to allow or not allow license transfers and holdbacks on transfers for in-stream flows needs and can set water conservation objectives. The government advocates that "everybody needs to pitch in, everybody needs to make sacrifices. But in reality,

they're not asking all those licensees to do that because they're not touching those old licens-es" (Wenig p.c.). Thus, effective decisions at the local level are limited.

Yet, the watershed councils can make recommendations about the water allocation sys-tem in their watersheds. The SSRB plan, for example, recommends that no new applications for water allocations be accepted in the Bow, Oldman, and South Saskatchewan sub-basins until the Minister of Environment establishes how to use water not currently allocated, such as by creating a Crown Reservation on water (Alberta Environment n.d.-c). Yee stated that the government will support the watershed councils' recommendations: "They might choose to make some trade-offs. Maybe supporting economic growth is going to be important for a particular community and that might mean giving on the ecological side a little bit."

All groups involved and represented

"[A] water decision becomes not just 'is there enough water to give to this applicant?' but also 'how does that affect other applicants?', 'how does it affect in-stream flow needs?'. Those types of things are accounted for in the allocation process. Then other things, such as 'culturally what does this do?', 'does it affect First Nations' rights?', 'if we give it to this in-dustry how does it affect another industry?'[…]I would go back to the WPACs and the [pro-vincial] water council. Everybody who could possibly have an interest is represented in one way or another" (Wuite p.c.). This description describes the complexity of water management decision making and the consequent necessity of an inclusive participatory process to address this complexity. The *Water for Life*'s partnership framework establishes a participatory proc-ess inclusive of multiple interests and values not included in the water allocation process.

The AWC includes industry, government, and non-governmental representatives and thus provides a broad perspective to help ensure outcomes are achieved across the province (Government of Alberta 2003). The WPACs are established to involve communities and stakeholders in watershed management and can foster stewardship activities within the water-shed and educate the users of the water resource (Government of Alberta 2003). At the com-munity level WSGs have the opportunity to include whoever would like to participate at the local, grassroots level. Although it is impossible to identify a "pure public" without individual interests (Griffiths p.c.), each group is meant to be inclusive of different interests, concerns, and representatives.

The partnership structure is representative of the various interests in Alberta, including First Nations, "which complicates matters because it's a federal jurisdiction", agriculture and irrigators, forestry companies, oil and gas companies, academics, and environmental organi-zations (Wilkie p.c.; Shyba p.c.). The 25-member AWC is meant to not leave anybody out;

but it is the responsibility of "the members who got selected […] to communicate out to their constituents. So that's how we involve everybody" (Yee p.c.).

Aboriginal communication of their issues in the basins is a challenge, especially to do it in such a way "that they're part of the overall community" (Hill p.c.). They have had the opportunity to participate, but "I think the record will show that they haven't" (Hill p.c.). They were invited but "elected to not be involved, were too busy, felt they had other more pressing issues to deal with" (Shyba p.c.). The aboriginal groups may be asserting that the interaction should be "government to government", rather than First Nations as merely a stakeholder in Alberta (Hill p.c.). They may be seeking money, technical assistance, and "their time frames are different in terms of what non-aboriginals have for priorities" (Hill p.c.). Difficult to engage, the aboriginal groups "have a different view of water. […] They have historical rights to water and I don't think they represented themselves maybe as well as they could" (Fesko p.c.). Yee (p.c.), on the other hand, stated "we consulted with First Nations. We had identified a process that suited their needs and had involved them there. In the Water Council, we've got […] aboriginal representation on the Water Council as well. In the watershed councils that are basin based, I know those councils are trying their best to get First Nations' involvement. Some of it comes down to capacity issue, especially if we're talking about, at the end of the day, how many councils might we have across the province". Apparently the Alberta government has "just adopted an aboriginal policy" for First Nations consultation by all ministries dealing with natural resources issues (Yee p.c.).

Education and awareness: creating partnerships and understanding

The partnership network sets up a forum for participation, education, and debate. The AWC and WPACs "are advisory in nature and they are a very good forum for people to exchange ideas and for them to figure out what they can do to address new and changing needs" (Hill p.c.). Through this forum people can participate and be part of the discussion and "hopefully part of the solution" (Hill p.c.). The forum has useful educational value, where "[i]f you can convince those people to take the message back to the broader constituency, then you wind up with better overall decisions. It's the process that will allow the people to get information out and information in" (Thompson p.c.). The educational value emerges from sharing ideas and perspectives among participants. The direct educational value of the partnership framework will contribute to the government's public awareness and education program, established "to ensure Albertans have easy access to water resource information and services" (Government of Alberta 2003, 1). Through this educational vehicle the government aims for Albertans to understand water's value to the economy (Government of Alberta 2003) and to

have the knowledge and tools to implement actions to maintain and improve water resources (Government of Alberta 2003). To give people a reason to participate and to create "buy-in", accessibility and outreach will be central (Wilkie p.c.). To create support and buy-in at the municipal level, the City of Calgary carefully designs their social marketing programs to maintain the support of the city council and the public (Fesko p.c.).

Public education is an important next step in the provincial process to promote understanding among different groups: "I think that we have a growing urban community in Alberta that doesn't understand the needs of irrigators, for example" (Shyba p.c.). Hill (p.c.) advocated building a partnership "between people who live in urban areas and people who live in rural areas, to where people in the city understand there's something they can do to improve the environmental sustainability of rural Canada, rural Alberta. That will lead to increased understanding between those communities and a more direct feeling of partnership and outcome". Exchange of ideas and openness to different perspectives are necessary to create understanding (e.g., between Alberta's rural and urban populations) in order to prevent potential future conflict.

Accessible information

Access to sufficient information is important in *Water for Life*. Through its research and knowledge initiatives, the government aims to overcome the explicitly stated challenge: the growing public demand for information (Government of Alberta 2003). The strategy aims for Albertans to have the "knowledge needed to achieve safe drinking water, efficient water use, and healthy watersheds" and ensure that "all Albertans are aware of water issues and have the knowledge and tools necessary to make effective management decisions" (Government of Alberta 2003, 10). As outcomes, the strategy aims for full and complete knowledge of drinking water issues, real-time access to information about drinking water quality, and Albertans with the knowledge and motivation to improve water resources (Government of Alberta 2003).

To improve information accessibility, the strategy anticipates a number of actions. The Alberta Ingenuity Centre for Water Research will make provincial-wide research available to stakeholders, help establish research priorities, direct funding, and coordinate a research plan (Shyba p.c.; Alberta Environment 2005a). A separate information centre will bring together private and public information (Government of Alberta 2003) and will offer information about quantity, quality, licensed commitments, and actual use of water (i.e., the Water Use Reporting Project), as well as online reporting of all drinking water facility test sample results (Government of Alberta 2003; Alberta Environment 2005a). Information accessibility to Albertans on private water systems is important (Government of Alberta 2003). The flood-risk mapping

program continues (Alberta Environment 2005a) the goal to complete maps and warning systems for communities at risk (Government of Alberta 2003). Establishment of a waterborne health surveillance and reporting system will develop (Government of Alberta 2003; Alberta Environment 2005a). While the strategy does not identify drought-risk management as an action item, the Alberta Drought Risk Management Plan enhanced the meteorological network, launched a web-based drought-related information viewer, and distributed soil moisture maps in 2004-2005 (Alberta Environment 2005a).

Resources to enable participation

While Yee (p.c.) suggests the government will accept recommendations—because the watershed councils include government representation—will the government provide adequate resources to enable full participation? Do the watershed councils have sufficient latitude to make appropriate recommendations?

One of the strategy's principles states, "Knowledge of Alberta's water supply and quality is the foundation for effective decision-making" (Government of Alberta 2003, 6). Information encourages understanding and willingness to be involved. "If you want the individual who isn't involved in any organization, I think there's going to have to be a lot of effort and dissemination of information and where you're going and how they can be involved and how their voice is important because in public policy that's a very hard thing to do" (Wilkie p.c.). The preceding section illustrates that the government has begun to set up this information "vehicle" in the form of the information centre and plans. A Water Education Framework will assist the public awareness and education program action item (Government of Alberta 2003) to improve awareness of land-use activities' impacts and educate Alberta educators through a professional development program (Alberta Environment 2005a).

Prior to accessible information for decision making, gathering of information is essential. The government claims to have "a fairly strong, general understanding of its water resources" (Government of Alberta 2003, 11). But the unpredictability of water availability (due to climate variability) and the growing understanding of land-use activities effects on water prove that more knowledge and research is required. In addition to education and training, the knowledge and research key direction has two key outcomes: understanding of Alberta's water resource and of emerging issues and opportunities (Government of Alberta 2003, 11). This key direction is meant to address the outcome, "Albertans will have the knowledge needed to achieve safe drinking water, efficient water use, and healthy watersheds" (Government of Alberta 2003, 10). Short-term (2006), medium-term (2010), and long-term (2014) actions to improve knowledge are many, from developing a monitoring and assessment program for

aquatic ecosystems to establishing a waterborne health surveillance and reporting system (Government of Alberta 2003). Because the lack of information is not isolated to Alberta, ample opportunity exists to collaborate on collecting and sharing data with other provincial and particularly the federal government (Banks and Cochrane 2005).

Other important resources include time, money, technical expertise, administrative support, appropriate tools, and guidance, such as expectations or guiding principles from the broader provincial level. In the strategy, the Alberta government commits to a timely response to all AWC recommendations; review and approval of water management plans from WPACs; and technical and administrative support for its partners—in other words, these are some of the resources offered by government (Government of Alberta 2003). The strategy itself does not indicate financial resources for implementation. Interviewees expressed concern over adequate financial resources to support implementation, public involvement (Griffiths p.c.), quality advice from watershed councils (Hahn p.c.), and the effectiveness of the whole process (Smith p.c.). Both Kelly and Yee (p.c.) indicated the government's intentions are to provide adequate funding and support to the watershed councils. Such support, including technical assessment, for example, will ensure the watershed plans are approved (Yee p.c.). Over the last year, 2004-2005, the government has assigned CAD$5 million to "new" operational initiatives and CAD$14 million to capital initiatives (Alberta Environment 2005a). The *Report on Implementation Progress of Water for Life* did not indicate future years' commitments, however (Alberta Environment 2005a).

The strategy and the provincial government give little guidance to the councils regarding aquatic ecosystem protection: "The province has given very little direction to the watershed councils in developing their water conservation objectives, except they have to honour all existing allocations" (Wenig p.c.). If sufficient guidelines are not given to meet ecosystem requirements, ecosystems may suffer from local decisions that may be driven by short-term gains. Yee (p.c.) stated that the government is working "on a guidance document for what we want to see in a watershed plan […] In terms of the actual targets, obviously things have to be consistent with the overall direction of the water strategy has set out". This document will likely be the updated *Framework for Water Management Planning*. The AWC is also coming up with "guidelines for setting up and managing these basin groups to help ensure that they're inviting the right people to the table" (Kelly p.c.).

Conclusion

Overall, the participatory approach described in *Water for Life* is the most specific and strongest aspect of the strategy. The strategy's production was inclusive and broad; the part-

nership network allows for broad inclusion in planning, decision making, and implementation; decision making—or recommendation making—has been decentralised to the level most appropriate to the decision; the councils act as an educational and awareness-raising mechanism; most groups are represented on the councils, or at least have the opportunity to be so; information accessibility is being addressed; and the government seems to be making moves to gather and provide necessary resources to ensure effective decision making. Challenges are addressed in chapters 6 and 7.

4.3.5 Intergenerational equity should be an essential element in planning decisions and water management

Does the policy recognise future human generations? Does it state actions that could ensure the viability of future generations?

Future generations are not a central theme in *Water for Life*. Only once does the strategy make explicit reference to future generations, where the Government of Alberta is committed to "the wise management of Alberta's water quantity and quality for the benefit of Albertans now and *in the future*" (Government of Alberta 2003, 5, emphasis added). Interview respondents suggested consideration of future generations was a central reason for the strategy's production but was an assumed concept in the producers' minds. The fact that there is a strategy is "in and of itself an example of forward thinking" (Hahn, p.c.). Future generations are the ultimate goal of the strategy and "will be one of the strengths because it seems to be one of the guiding underlying themes" (Wilkie p.c.). While the concept has presence, consideration of future generations is implicit rather than explicit (Wilkie p.c.; Kelly p.c.).

Ideas in the strategy imply consideration of future generations. The strategy assumes Alberta's population and economy will grow and demand more water. It assumes that uncertainty and variability will affect the future water supply: "water required for current and future economic growth + water required for growing population . . . + uncertainty and variability in future water supply" are three challenges the strategy aims to address through water conservation measures (Government of Alberta 2003, 22). During the production of the strategy, Yee (p.c.) states the Minister of Environment, then Lorne Taylor, directed them "that this has to be a strategy that looks out into the future". Taylor (p.c.) himself felt that long-term planning for future generations, 30 to 50 years from now, are what the strategy is all abouts.

Ideally implementation will lead to protecting future generations, particularly through protection and improvement of aquatic ecosystems and other environmental wealth in the province. To do this, those sitting around the table will have to keep "in the back of our minds that we can't be just considering our own one-year, five-year plans. There has to be a 50-year plan, a 100-year plan for what we're going to do" (Wuite p.c.). People around that table un-

derstand the obligation and take it seriously (Kelly p.c.). One respondent felt that the strategy was not sufficiently "forward looking", which "might be a shortcoming of the strategy" (Shyba p.c.). With long-term outcomes and actions set to be completed by 2014, the strategy only provided a 10-year plan. How the government plans to arrive at full understanding of aquatic ecosystems, among other initiatives, within 10 years requires greater detailed planning and significant resources. Implementation effectiveness and future action "will really tell the tale of how absolutely committed the Alberta government is to living up to the platitudes, or the objectives that are in the *Water for Life* strategy" (Hahn p.c.).

Work to determine how to account for future generations include "looking at how to model water use, water demand, future scenarios of economic development, water availability changes" and "[u]ltimately I think they're working towards creating opportunities for Alberta in the future without having water as the limiting resource" (Wilkie p.c.). Conservation initiatives address future generations; but development in sensitive areas does not support future generations (Smith p.c.). Yee (p.c) observed during public consultations, "people want their immediate water issues resolved. It was very hard sometimes to lift them up out of that and help us think about the future. I think we've done that successfully."

At the municipal level, the strategy pushes the City of Calgary further towards sustainability to benefit future generations (Fesko p.c.). In a city experiencing rapid economic and population growth, growth creates a paradox. Growth creates greater demand for water and water services and challenges the city to reduce its overall water consumption; yet growth also brings wealth and greater opportunity to invest in initiatives to better the environmental condition of the municipality and surrounding areas. "It's a funny loop, but growth allows us to become sustainable. If you were a zero-growth city, you couldn't afford these extra things like additional levels of treatment in our plants in advance of them being required by regulation" (Fesko p.c.). On a province-wide scale, with an estimated surplus for 2005-06 of CAD$7.4 billion (BDO 2006), the province has an incredible opportunity to invest in the health of its natural environment and, by extension, in that of future generations. As Hahn states, "There's no denying the significant economic benefits that resource production in this province has afforded this province. […] it probably affords the province to have a very detailed look at its water resources. […] On the other hand, the prosperity of the province is probably, as a result of oil, driving the need to look at rationalization of water."

Use on renewable basis

The strategy states water is a renewable finite resource (Government of Alberta 2003) but only implies using it on a renewable basis through its focus on water conservation initia-

tives. Water conservation is one of the three key directions to meet the three goals of drinking water, aquatic ecosystems, and the economy; and it addresses limits of water availability now and in the future. In the past, "a relatively abundant, clean supply [of water was available] to meet the needs of communities and the economy" while "maintaining a healthy aquatic environment" (Government of Alberta 2003, 21). The "looming problem" of limits and growth (Government of Alberta 2003, 21) are anticipated challenges—economic and population growth, changes to the future water supply, and water required for healthy aquatic ecosystems—that change the water abundance situation for Albertans. The strategy sees water conservation as the answer (Government of Alberta 2003). "[W]ithout conservation we're not going to be able to ensure supplies for the future", states Yee.

Conservation is "the planned protection, improvement and wise use of natural resources. It includes controlling, protecting and managing water" (Government of Alberta 2003, 30). Consistent with this definition, the strategy states that it will use a combination approach of capturing water where feasible—therefore, using a supply-side approach—and conserving water—a demand-side approach (Government of Alberta 2003). This latter approach recognizes the overwhelming support for conservation strategies expressed during public consultation (Government of Alberta 2003). Supply-side versus demand-side approaches are further addressed under adaptive management below.

To encourage action towards conservation, the strategy appeals to Albertans' shared responsibility: "Because citizens, communities, industries and governments all share responsibility for the wise use and sustainability of water, and building on the partnership approach all Albertans will need to take responsibility and take actions in the area of water conservation" (Government of Alberta 2003, 21). The short-term action to establish a public awareness and education program on water conservation supports this sentiment of responsibility and action (Government of Alberta 2003).

The strategy does not distinguish between water using sectors; instead all water using sectors are to conserve water. Specific urban and domestic water use may be left to the attention of municipalities. The City of Calgary wants to reduce per capita consumption so that they can accommodate growth but "flatline" their water use (Fesko p.c.). Already the City has reduced per capita consumption (calculated as the total production divided by the population, thus it includes industrial demand) by one half from about 800 litres per capita per day (l/c/d) in the 1980s to about 400 l/c/d in 2004 (Fesko p.c.). While there is ample room for conservation through technology, resistance remains and provincial level legislation has yet to support that technology (Smith p.c.). Technology battles, which might reduce household water consumption, might also be left to the municipal level. Over a year of consultation with the pub-

lic, industry, and government was needed to adopt low-flow toilets and fixtures into Calgary's building code (Fesko p.c.).

To achieve water conservation in water using sectors, the strategy sets a 30% improvement target in overall efficiency and productivity by 2015 as one of the long-term outcomes of the strategy. This number is not the final figure (Thompson p.c.). The AWC will determine "firm targets" with the government as part of the Provincial Water Conservation Plan (Government of Alberta 2003, 8; Alberta Environment 2005a; Alberta Environment 2005). Griffiths (p.c.) is concerned whether the conservation target will be sufficient for three reasons: its usefulness will depend on the final figure; it will depend on how well the target is implemented; and the figure is only an "efficiency target. And if we grow by 30% in Alberta, we will still be using as much water as before. An efficiency target is a beginning. Really we have to have a finite target not an efficiency target, especially in the water short areas". Thompson (p.c.) questions where the conservation cuts will come from in southern Alberta. Irrigation is already very efficient and likely will not be able to become 30% more efficient (Thompson p.c; Wuite p.c.). Thus, the target will not be implemented equally across the province and across sectors. The government is setting "a water conservation target on a watershed basis because we have such diversity in the province from the south to the north that to arbitrarily set one target for the whole province doesn't make a lot of sense" (Yee p.c.).

Other actions that complement the conservation target include a monitoring system and ongoing program to monitor actual use by all sectors, and water conservation and productivity plans for water using sectors (Government of Alberta 2003). The oil and gas industry's use of freshwater was the first focus of developing the conservation and productivity plans. An Advisory Committee on Water Use Policy and Practice was established in September 2003 to address this concern and produced a final report in August 2004 (Alberta Environment 2005a), which recommended using a "decision-tree" process as the basis for future water allocations for enhanced oil recovery, with the most stringent requirements for the allocation of water in water-short areas (Alberta Environment 2005a; Griffiths p.c.). The *Water Conservation and Allocation Policy for Oilfield Injection* was based on these recommendations and introduced early 2006. However, the Pembina Institute recommends a comprehensive policy framework for water use by the oil and gas industry that includes oil sands mining operations (Griffiths *et al.* 2006).

The government is cautiously embracing the idea of economic tools, such as pricing. Research and assessment of such tools, as well as full-cost accounting of water management infrastructure and the "true value" of water to the economy, are the government's first steps (Government of Alberta 2003; Alberta Environment 2005a; BDO 2006). Full-cost accounting of water management and drinking water infrastructure will enable "some sustainable plan-

ning for infrastructure" and asset management for municipalities (Yee p.c.). The initiative to determine water's true value to the economy will identify where it might be a limiting factor to economic growth (Alberta Environment 2005a).

A problem for water conservation and renewable water use is lack of information about actual water use. Without this information, how can the reduced rate of use be distinguished from the current rate? This is particularly important for groundwater. Users may be unknowingly depleting aquifers, especially in drought years, due to the lack of baseline data (Griffiths p.c.). One example where there is insufficient knowledge relates to the very deep (up to 180 m) narrow buried water channels, which were filled with glacial deposit thousands of years ago. Industry in northern Alberta sometimes uses this groundwater for the *in situ* recovery of bitumen. Little is known about these channels—such as their withdrawal and recharge rates— although studies are beginning (Griffiths p.c.). Current oil sands mining operations do not use water on a renewable basis, returning less than 10% to the Athabasca river, despite recycling (Griffiths *et al.* 2006). Extraction processes that inject water into oil and gas wells can affect groundwater quality and removes water from the hydrologic cycle for hundreds of years—a practice which is the opposite of renewable water use.

Will the conserved water accommodate growth—economic and population—or benefit ecosystems? Thompson suggested that in southern Alberta water conservation will allow for growth. Smith suggested that conserved water will be dedicated both to economic growth and to maintain flows for healthy fish populations. Citing the Canadian Council of Ministers of the Environment's definition for water conservation and efficiency, the *Report on Implementation* implies the outcomes of water conservation and efficiency are to reduce demand, increase water-use productivity, conserve resources for healthy aquatic ecosystem, and maintain or improve water quality (Alberta Environment 2005a). This definition implies the government's direction in water conservation. To evaluate the effectiveness of the strategy's implementation, specific performance measures of water-use efficiency and productivity include comparing the amount of water used versus the amount of productivity, and comparing the amount of water used versus population and economic growth (Government of Alberta 2003).

Collecting public data for future generations' use

The research and knowledge initiatives promoted in the strategy are valuable for future generations. One of the current problems is inadequate baseline information, especially for groundwater resources (Griffiths p.c.). Without comprehensive reporting and a database "to tell us what's being wasted and what isn't being wasted", decision making becomes very difficult (Smith p.c.). The lack of information leads to arbitrary numbers such as the conservation

target which may or may not be adequate to achieve the anticipated goals. Research initiatives outlined in the strategy should contribute to filling information gaps over the next ten years and ideally lead to renewable water use.

The water research centre and the research plan will help fill information gaps (Alberta Environment 2005a). The research plan will help address emerging issues (Yee p.c.). For example, groundwater will likely become an important source of water in the future; there-fore, "we're going to do all the inventory work to have an understanding of the sustainability of the aquifers. That's a huge area that has been targeted for work under the water strategy" (Yee p.c.). The AWC is considering future generations in determining monitoring information sources so that "people can actually manage better than we can today tomorrow" (Kelly p.c.). The monitoring program will assist this idea, as will collation of information sources. Educa-tion, outreach, and awareness initiatives under *Water for Life* will embed knowledge in the general population. These initiatives will build the information base and encourage conserva-tion principles and productivity requirements "so the next generation, when they have to make these kinds of decisions, are in better shape than we were" (Kelly p.c.).

Adaptive management

"What do we define as 'future generations'? Is it our kids? Is it the exponential growth between our kids and their kids?" (Wuite p.c.). Or is it the population 1000 years from now? Unable to define the boundary for future generations and unable to make decisions based on an undefined future, ongoing readjustment of water-use management over time is necessary to serve people's values at the time. The best thing we can do is ensure "the resource remains biologically viable, regardless of what decisions are made. That way, future generations at least have a resource to make their own decisions about" (Wuite p.c.).

To account for future generations, the planning process must be ongoing, repeated "on a regular basis to decide whether the macro-level decisions are appropriate for the time" and circumstances (Thompson p.c.). This repetitious process can embrace the changing values of people "sitting around the table" and changing culture and society (Wuite p.c.). One way to integrate change in decision making and factor in future needs is "by creating these relation-ships and flexible working conditions that allow people to adapt quickly", such as through the watershed councils (Hill p.c.). Nothing is "overt in the strategy about future considerations. But there are mechanisms in the strategy that will allow people to do different things depend-ing on the circumstances at a particular time" (Hill p.c.). Because recommendations can be made at the local level on an ongoing basis, the strategy allows for flexibility and openness to quick and different choices (Hill p.c.). Shared responsibility drives this planning and adaptive

process, because those living within the watersheds have the responsibility to "work together to set objectives for the watershed, identify issues, monitor the condition of the watershed and continuously adjust their use of water and activities on the landscape that affect the water" (Government of Alberta 2003, 15).

Actions that explicitly embrace an adaptive management approach in the strategy include an adaptive management system to identify issues, gather information, develop and implement action plans, and evaluate management actions (Government of Alberta 2003); and a system to monitor and report actual water use on an ongoing basis. Monitoring will allow the government and other actors to adjust water-use behaviours as new information arises. Improving Alberta's drinking water infrastructure to meet emerging standards and for long-term sustainability implies that the government will adapt its infrastructure so that it will last and be relevant in the long-term.

The prior appropriation system limits adaptive management in Alberta. The first-in-time first-in-right principle makes water access more difficult for people who come later and causes hardship in times of shortage (Griffiths p.c.). The system is "problematic because, once you run out of water, no new licenses are being handed out; then you've got an issue. That's why water transfers were put in place in the new legislation" (Thompson p.c.). Introduction of water transfers is an adaptation of the current regulatory system that allows licence holders and those coveting senior licences the opportunity to buy in and, to some degree, adapt with changing water circumstances. It is "a way of accommodating new users in a system that's already over-allocated, which is basically the South Saskatchewan" (Wenig p.c.). Because the new trading system is "a market-driven system, it doesn't take the public interest or future generations expressly in mind" (Wenig p.c.). Concern for future generations is constrained by the limited amount of water and by those willing to transfer all or some of their water entitlement.

The strategy suggests a compromise between the non-adaptive supply-side approach and the more flexible demand-side approach. In addition to water conservation, the government anticipates "improving our ability to capture and store water during high flow seasons or periods where possible and feasible" to deal with limits being reached in watersheds (Government of Alberta 2003, 21). Capturing and storing water with dams have "potential for better utilisation of the water we've got because we get the spring runoff and 80% of it goes downstream and then for the balance of the summer we get low flow" (Smith p.c.). Despite the advantages of water capture through dams, most ideal sites are already in use, there is potential environmental damage, and the concrete nature of dams does not lend itself to adaptive management.

Like dams, inter-basin transfers are an adaptive mechanism to changing water availability and demand. Implementation of such a mechanism, however, diminishes future flexibility and adaptive capacity. For much of Alberta's population the Bow River, part of the South Saskatchewan River Basin, is the main source of water (Shiklomanov and Rodda 2003). Given the current demand and anticipated pressure of population and economic growth in the region, inter-basin transfer discussion arises periodically. Although under the current *Water Act* inter-basin transfers are not permitted, a special Act of legislature can permit them on a case by case basis. Because northern Alberta is relatively water rich, some people see inter-basin transfers as a legitimate way of addressing water shortages in southern Alberta. Federal funding strongly supported water diversions until the 1960s; but criticism in the 1970s halted this support. Awareness of socio-economic and, in the 1980s, environmental problems raised questions about inter-basin and some intra-basin projects (Shiklomanov and Rodda 2003). Inter-basin transfers go against the watershed management approach the government is now embracing for all environmental issues (Government of Alberta 2005a). Large volume diversions from one river system to another affect the runoff regime, river morphology, water chemistry, and the life dependant on the water, leading to changes in number and diversity of aquatic and coastal fauna; and they have potential to exacerbate "climatic change at the local and larger scales" (Shiklomanov and Rodda 2003, 275). Because the legislature can decide to pass a bill that will allow a transfer, "you've still got that tool in the toolbox. […] I'm sure the demand for inter-basin transfers will be back" (Thompson p.c.).

Precautionary principle

An important element of an adaptive approach is embracing the precautionary principle. Historically, southern Albertan climate has been capricious with drought and floods, a fickleness that climate change may exacerbate. Thus "[e]ven if you ignore climate change, but just look back historically, it is clear we need to adopt the precautionary principle with regard to water" (Griffiths p.c.). Northern Alberta, "where we think we have enough", should also be concerned with climate change predictions "because climate change is likely to shift the zones. What is now boreal forest could be parkland in the future. We might want more agriculture there and we might want to use the water resource for non-industrial uses" (Griffiths p.c.). With glaciers disappearing and population growing, precautionary planning is paramount. As Griffith (p.c.) states, "The very worst thing is thinking we have enough of something. We may have enough now, but we may not have enough in the future."

Water for Life does not explicitly address the precautionary approach. Only by mentioning Albertans "now and in the future" does the strategy imply precaution (Government

of Alberta 2003, 5). Actions, such as water allocations, should be protectionist and err on the side of caution in favour of ecosystems, especially in the "absence of real information when it comes to an allocation decision" (Wuite p.c.). In the south, the government is "freezing" some watersheds, such as the Bow River Basin, so that no new allocations can occur and transfers are allowed only from already allocated licenses (Taylor p.c.). Watershed management plans will recommend whether water allocation transfers and new allocations should be granted. As an example, the approved Phase One of the South Saskatchewan River Basin watershed plan recommended allocation transfers, and the Phase Two draft recommends no further allocations be allowed until water conservation objectives to meet aquatic ecosystem requirements are determined (Government of Alberta 2006c). Overall, the strategy's existence illustrates some degree of precaution, and actions such as "freezing" certain basins—an action which the strategy does not discuss—offers some recognition of the precautionary principle.

Representatives for future generations in decision making

The voice of future generations is missing from the Alberta process, unlike some where youth involvement "is explicitly built into this kind of process" (Kelly p.c.). Yet, with future generations at the back of everyone's mind and with future generations as a strong premise for the strategy, future generations may be indirectly represented by everyone sitting at the decision-making table.

Conclusion

Despite little recognition, future generations are a central reason for the strategy. Water conservation initiatives are a strong area of focus in the strategy, yet are they sufficient to ensure renewable water use? Knowledge-generation initiatives will benefit future generations. Potential further damming, the ability to use the inter-basin transfer tool when necessary, and the maintenance of a prior appropriation regulatory system inhibit adaptive management. Water transfers and the participatory governance structure introduce flexibility. The precautionary principle is not explicit but is embraced in the prohibition of further water allocation grants prior to more knowledge about ecosystem requirements in the SSRB. Aside from the decision makers' internalised obligation to future human generations, there is no representation for future generations.

4.3.6 The environment should have standing in water use management

Does the environment have standing with regards to water quality and quantity? Do stated actions ensure that ecosystem needs are met alongside those of current and future human generations?

Alberta's 1996 *Water Act* represents a gradual shift from previous related legislation to recognition of environmental issues in Alberta (Yee p.c.). It expands its purpose from water use and allocation to "support and promote conservation and management of water, including wise allocation and use of water, while recognizing the need to manage and conserve water resources to sustain our environment and to ensure a healthy environment and high quality of life in the present and future" (Government of Alberta 1996, Sec. 2). *Water for Life* reflects this shift and is "one of the first places where it's written on paper, where […] there was anything province-wide, cross-sector mention that ecosystems and aquatic ecosystems are important" (Wilkie p.c.).

Recognition of environmental value

Water for Life frames the environment—along with communities and economic well being—as having value for Albertans' quality of life (Government of Alberta 2003). It promotes a balance between environmental, community, and economic values. We cannot ignore the environment, "[b]ut we also have to factor in the social and economic needs that people have within the basin and how water fits into that" without picking "winners and losers" (Hill p.c.).

Determining the balance of values—environmental, community, and economic—in Alberta will depend on location, where regions with environmentally sensitive areas will place more emphasis on environmental protection and other areas will protect development (Hill p.c.). This balance will be decided at the local level, with government support (Yee p.c.), where each community and watershed council will decide its own set of trade offs. While community-based environmental management is highly touted, without adequate guidelines from a broader perspective—such as the provincial government—environmental value may diminish as alluring short-term interests take precedence. Smith (p.c.) suggested that "[w]ithout some clear priority it is almost certain that development pressures will be such that developments will continue to take place to the detriment of the environment". However, Kelly (p.c.) suggests Alberta has not arrived at a "direct win-lose conflict" situation between humans and ecosystems and "the strategy is intended to prevent that from happening".

The outcome to sustain aquatic ecosystems to "ensure their contribution to Alberta's natural capital and quality of life" suggests the natural environment holds instrumental value for Albertans (Government of Alberta 2003, 7). "Natural capital" is an economically derived

term that places the natural environment into a human context. The term 'natural capital' makes environmental protection more justifiable and quantifiable to the broader public who tend to be economically motivated—it allows natural systems to gain more value in human systems. The term also carries with it the idea of better accounting for human use of natural capital, "from clean water and soil to forests and the biodiversity of species in the world", which has often been seen "as a free good" (Daly 2003, 210). As resources become scarce and "human population threatens to overwhelm natural resources," counting natural capital as a free good is "anti-economic" (Daly 2003, 210). The Alberta government seems to be embracing the idea that ecosystems provide services and goods to human systems and should no longer be considered free.

Because ecosystem functions are "enormous" and "far outweigh the economy in many instances", the AWC is moving towards quantifying water's value for ecosystem services and attempting to give a basic argument to the basic ecosystem functioning of water bodies" in two ways: (1) having the right stakeholders at the table; and (2) finding some way to figure out their value in defence against industry (Kelly p.c.). The study on the "true value of water" to the economy may contribute to this quantification of ecosystem services (Government of Alberta 2003, 21).

The strategy does not define the government's vision for aquatic ecosystem health. In general, there is an overall lack of detail about how the provincial government plans to achieve healthy aquatic ecosystems (Kwasniak p.c.). The strategy seems "to have potential bearing on the environment and how business interacts with the environment"; but the strategy does not lay out the path "in a very detailed way" (Hahn p.c.). The strategy gives little detail about water use and current environmental conditions across the province.

Actions to support healthy aquatic ecosystems are research, policy, or education oriented. The strategy states plans to "understand" the quality and quantity of Alberta's surface water and groundwater and the state of Alberta's aquatic ecosystems (Government of Alberta 2003, 12). Initiatives to support this action are a system to assess and monitor aquatic ecosystems (Government of Alberta 2003), wetland mapping, and database development (Alberta Environment 2005a). A wetland policy and supporting action plan (Government of Alberta 2003) will replace the 1993 *Interim Wetland Policy* (Alberta Environment 2005a). Already the City of Calgary, led by Calgary Parks, has developed a municipal *Wetlands Conservation Plan* (Alberta Environment 2005a; Fesko p.c.). Also the City of Calgary protects environmental value by "lead by example" initiatives: developing a building to "use 60% less water per person than a normal office building"; upgrading a treatment plant as part of their residuals management and to move towards zero discharge; developing a stormwater strategy to "assimilate pre-development hydrographs on the land"; building an extra treatment process prior

to new regulation requiring the City to do so; and incorporating wetlands in new subdivisions for "stormwater retention and treatment on site before discharging back into the river" (Fesko p.c.). Watershed management plans will establish how to protect Alberta's environmental value (Government of Alberta 2003). Community-based watershed stewardship groups will work to improve local watershed conditions and "maintain and enhance aquatic ecosystems to ensure they meet the established objectives" (Government of Alberta 2003, 19). A public awareness and education program will further support protecting environmental value (Government of Alberta 2003).

Environment has standing

The introductory statement, "all living things need water to survive" (Government of Alberta 2003, 4), suggests the survival of all living things is the premise for the strategy and implies an ecocentric focus, where all living things have intrinsic value. The Environmental Law Centre, however, criticised the draft strategy for failing to recognize the intrinsic value of Alberta's ecosystems and only recognizing their instrumental value to Albertans (Mallet 2003). The final version of the strategy suggests aquatic ecosystems have both intrinsic value, where "risk to health and well-being of … our aquatic ecosystems" is to be averted, and instrumental value, where these ecosystems are "vital" to human quality of life (Government of Alberta 2003, 5, 6). Because aquatic ecosystems are absent as a beneficiary of "wise management" (Government of Alberta 2003, 5), the strategy most prevalently frames environmental protection in instrumental terms.

Ecosystems have no legal standing in Alberta—neither in right nor in priority under the *Water Act*. The *Water Act* introduces some mechanisms, which the strategy mentions, that provide for some legal protection, however weak. Water conservation objectives (WCOs) refer to the amount and quality of water necessary for protection of a natural water body or aquatic environment, protection of tourism, recreation, transportation, or waste assimilation uses, protection of fish and wildlife (Government of Alberta 1996, Sec. 1), and they may define water flow rate and level requirements (Government of Alberta 2003). *The Strategy for the Protection of the Aquatic Environment,* which is part of Alberta's *Framework for Water Management Planning*, is intended to include guidelines for establishing WCOs (Government of Alberta 1996, Sec 8). The Director may establish these objectives, but must first consult the public (Government of Alberta 1996, Sec 15). The South Saskatchewan River Basin Plan will establish WCOs (Government of Alberta 1996). Watershed management plans will recommend aquatic ecosystem objectives (Government of Alberta 2003). The difference between aquatic ecosystem objectives and water conservation objectives is not clear, except water

conservation objectives have legal weight unlike aquatic ecosystem objectives. WCOs will work in areas that are not already overcommitted; watershed councils will decide those cut-off points (Thompson p.c.).

Another mechanism to allocate water to ecosystems is the water conservation hold-backs on water transfers. If withholding water is in the public interest or the interest of aquatic environment protection and if such a holdback has been authorized under an approved water management plan or by the Lieutenant Governor in Council, the Director may permanently withhold up to 10% of a water allocation transfer (Government of Alberta 1996, Sec. 83(1), (4)). Thus holdbacks on transfers are not obligatory and are only *up to* 10%. The withheld water can remain in the natural water body, can become a new Crown reservation or be added to an existing one, or can be allocated to divert water through altered or enlarged works if the Director deems necessary (Government of Alberta 1996, Sec. 83(3), 51(2)). Thus they are not guaranteed for environmental purposes. Crown reservations of water can allocate water to in-stream flow needs (IFN). The Minister may reserve water, which is not currently allocated, for any purpose; this Crown reservation may only have a priority status when the reservation was made and cannot override more senior licences (Government of Alberta 1996, Sec. 35). These reservations offer potential opportunity for environmental protection but such protection is discretionary.

The strategy itself is primarily research based, offering few concrete tools to protect aquatic ecosystems. Ideally, this research will lead to higher status for environmental require-ments in practice. At this point it is "a work in progress" (Hahn p.c.).

Quality impacts on ecosystems

In committing to "wise management of Alberta's water quantity and quality for the benefit of Albertans now and in the future" (Government of Alberta 2003, 5), the Govern-ment of Alberta recognizes the importance of water quality—at least to Albertans. The strat-egy's principles relate water quality as important in decision making, important for drinking water—and, by extension, public health—and an important consideration in economic and community development (Government of Alberta 2003). Mention of impacts on aquatic ecosystems is scarce. However, *Water for Life* recognizes community and economic uses of water affect water quality "and in many cases [it is] returned [i.e., to the environment] with its quality degraded" (Government of Alberta 2003, 15).

As a solution, Albertans must collaborate on all scales to identify issues, set watershed objectives, monitor the watersheds' condition, and adjust water use and land use accord-ingly (Government of Alberta 2003). Actions in the strategy to combat the negative dynamic

between land use and water quality include: development of a wetland policy and an action plan; establishment and maintenance of objectives for aquatic ecosystems as part of watershed management plans; and development of a source-to-tap approach (Government of Alberta 2003). A provincial wetland policy, given wetlands' capacity to purify water and remove up to 95% of pollution from stormwater, could significantly enhance overall provincial and municipal water quality (Fesko). The strategy mentions no specific plans to address pollution from industry, resource extraction, municipal development, or other point and non-point pollution that would degrade water quality. Nor does the strategy explicitly mention protecting riparian areas, "which help purify water as it flows down" (Smith p.c.). To protect riparian areas, the City of Calgary has an erosion and sediment control policy for development (Fesko p.c.). Overall, however, Wenig (p.c.) states the "province hasn't really taken the next step to integrating land-use planning with water management, pollution control, and land uses that cumulatively affect the environment".

The government aims to protect aquatic ecosystems through setting objectives for ecosystems in watershed plans, surface water quality assessment to help with effective decision making, and overall assessment of aquatic ecosystems (Government of Alberta 2003). Updating water quality programs will "support watershed protection and planning" (Government of Alberta 2003, 12). In the long term, the government hopes to understand the state of the quality and quantity of surface and groundwater supply—and thus understand the source it may be trying to protect (Government of Alberta 2003). Currently, the government is developing decision support tools that "integrate hydrology, water quality, riparian health, channel dynamics, and land use processes" (Alberta Environment 2005a, 20).

Achieving the goal of safe drinking water, and supporting outcomes and actions, might indirectly promote high water quality in the natural environment through source protection. A comprehensive drinking water policy and adopting "a multi-barrier; source-to-tap approach at all drinking water facilities" indicates a source protection approach and may indirectly support aquatic ecosystem health (Government of Alberta 2003, 19). The *Report on Implementation* indicates little action towards true source protection. Only one of three specific performance measures in the strategy directly addresses water quality impacts on aquatic ecosystems: The River Water Quality Index is "based on total loading on a river reach or basin basis for point source discharges" (Government of Alberta 2003, 23) and illustrates relative differences between rivers, between sites on the same river, and over time (Alberta Environment 2005a).

Quantity impacts on ecosystems

For much of the last one hundred years, the idea that aquatic ecosystems are "water users" was beyond the notice of Canadian lawmakers (Boyd 2003). Recently environmental considerations have become more relevant for water licensing decisions in some provinces. These considerations are constrained by the fact that most water rights in southern Canada have already been allocated without considering ecosystem needs or conservation. Boyd (2003) considers Alberta a leader in allowing water license trading of surplus water because it encourages conservation. However, Alberta has yet to allocate water to ecosystems.

Lack of information about how much water humans use and what in-stream flow needs are for ecosystems is a barrier to protecting ecosystems (Wilkie p.c.). The strategy does not address minimum flow requirements or flow regimes, but it recognizes the necessity to identify what is required to preserve ecosystem health in rivers (Shyba p.c.). The strategy recognizes that knowledge of supply, and its quality, is "the foundation for effective decision-making" (Government of Alberta 2003, 6). Thus knowledge generation about aquatic ecosystems is significant in *Water for Life*.

The strategy's outcomes that benefit quantity needs of ecosystems are watershed management plans, which establish objectives and priorities for sustaining aquatic ecosystems, and allocation of water to sustain aquatic ecosystems. Science-based methods to determine ecological requirements (Government of Alberta 2003), such as defining protection and distinguishing river health and its flow regime (Yee p.c.), are fundamental to ensuring quantity and timing requirements for aquatic ecosystems. Recent progress in developing flow-based tools includes a fisheries assessment tool and hydrology-based IFN methods (Alberta Environment 2005a). This methodology, in combination with monitoring and assessment, will be fundamental to future allocations to protect aquatic ecosystem functioning (Government of Alberta 2003). Understanding the state of all surface water and groundwater supply (Government of Alberta 2003) will be important for "decisions ahead as we run out of water to meet everyone's needs" (Shyba p.c.). The Alberta Ingenuity Centre for Water Research will be central in understanding and maintaining ecosystem health (Shyba p.c.; Alberta Environment 2005a). In the interim, granting any new water allocation licences in watersheds which are fully or over-allocated has stopped until the situation is better understood (Taylor p.c.).

A major barrier for meeting IFN is the first-in-time first-in-right water allocation system. This system does not allow for aquatic ecosystem allocations in fully or over-allocated watersheds. Honouring all existing allocations makes it difficult to maintain ecosystem flow needs (Wenig p.c.; Wilkie p.c.). If you could go back in time, you would probably "figure out how much you need to keep in the river, lake, or aquifer, then you'd allocate everything else.

Unfortunately those questions didn't pop up until we were at least fully allocated in the south" (Thompson p.c.). To compensate, the *Water Act* promotes tools to condition licenses and allow new users into an over-allocated system—such as the South Saskatchewan River Basin— by introducing a water trading system. Newer licenses are no longer given unlimited terms; but conditioned "licences in the South Saskatchewan are just the tip of the iceberg. Most of the water allocations in the South Saskatchewan are through licenses that came before the *Water Act*" (Wenig p.c.). Water transfers are an attempt to modify the system and accommodate new users on an over-allocated system. The transfers can encourage water-use efficiency. But transferring unused portions of allocations to consumptive users removes water from the natural flow and makes it more difficult to meet IFN for ecosystems in over-allocated systems. This situation emphasises the importance of determining ecosystem needs and setting and enforcing water conservation objectives based on those needs.

The science-based tools being developed will be necessary to determine WCOs (Yee p.c.). Due to seasonal and annual variability, WCOs must be adjustable for the benefit of aquatic ecosystems. There must be "provisions for meeting those needs at all times, even if that means withdrawing some licenses or reducing the volumes used on those licenses in years of shortage. […] There may be different cut-off levels, such as a precautionary level […] But there should definitely be a process to protect in-stream flows" (Griffiths p.c.). Developing an adaptive management system to collect data, monitor, and implement and evaluate management actions will ideally allow for adjustments to meet aquatic ecosystem needs in dynamic change over the long term (Government of Alberta 2003).

Integrating conservation holdbacks on water allocation transfers is another mechanism to supply additional water to aquatic ecosystems (Taylor p.c.). These holdbacks are limited, however, by their discretionary nature. The government should hold back "more than 10% if this water is required to protect the aquatic environment or meet water conservation objectives" (Griffiths p.c.). Thompson (p.c.) characterises the holdbacks as similar to "having a sales tax in addition to all the regulatory problems" which may inhibit trading. The government could also "actively go back and take water licences away" in over-allocated areas where more water might be wanted in the river (Thompson p.c.). Or the government could participate in the water market and buy back unused portions of allocations for IFN rather than transferring water to a consumptive user (Wilkie p.c.). But the government would have "to come up with the money to buy the licences back" (Thompson p.c.). In-stream licences are another tool to protect IFN. They can be acquired if attached to a particular piece of land. Some advocate water licences tied to a particular stretch of the river rather than to land for in-stream licences; currently only the Crown, not individuals, can hold free-floating in-stream licences (Kwasniak p.c.).

Wetland policy development and implementation will contribute to quantity benefits for aquatic ecosystems, as wetlands help protect water storage capacity of the land and facilitate movement of water between surface and groundwater. Water conservation may contribute significantly to aquatic ecosystem requirements for water supply. Along with economic and population growth and variability in water supply, the strategy aims to address "water required for healthy rivers and lakes" (Government of Alberta 2003, 22). The 30% water conservation target is a positive initiative, "provided that that water goes back to meet in-stream flow needs" (Kwasniak p.c.). The performance measures for water use and productivity, however, are entirely anthropocentric, comparing water use with productivity and water use with population and economic growth. With growing relative scarcity, Alberta must pay closer attention to a fundamental idea that could shape how we protect aquatic ecosystems in the future: "Ecosystem needs need to come first; and then we have the rest of the pie to divvy up." Right now "we divvy up the pie and then leave the rest of it and hope that it meets ecosystem needs" (Wilkie p.c.).

Representatives for environment in decision making

The AWC and WPACs include environmental representation; for example, "one of the people on the [Alberta Water] Council is there to represent fish, you might say, and aquatic life. So he's saddled with the responsibility to make sure that ecosystem health is preserved" (Shyba p.c.). Yet, "human demand is likely to have a much stronger voice than the relatively small groups on the watershed management groups representing what I call the natural interests, the in-stream flows and even water for recreational purposes" (Griffiths p.c.). Of the 25 member provincial Alberta Water Council, five non-governmental organizations represent environmental interests (Alberta Environment 2006). Thus human interests outweigh environmental interests, which means strong environmental principles and guidelines must be in place to adequately balance environmental considerations with other values and interests in decision making. The stewardship concept, prevalent in the strategy's rationale, implies humans are protectors of the natural world and helps shift moral awareness, behaviour, and activities to protect aquatic ecosystems.

Ecosystems as functioning systems

Use of the term "aquatic ecosystem" and its definition suggest the strategy recognizes aquatic ecosystems as functioning systems. An aquatic ecosystem is "[a]n aquatic area where living and non-living elements of the environment interact. These include rivers, lakes and wetlands, and the variety of plants and animals associated with them" (Government of Alberta

2003, 28). The living and non-living are thus interdependent members of a system. The goal of healthy aquatic ecosystems implies the realization of interdependency of humans in functioning ecosystems.

Conclusion

Water for Life attempts to balance environmental value with other values that water supports; but it does not recognize the environment as having legal standing, although the government might move in that direction. The strategy addresses quality impacts on ecosystems vaguely but poses few actions to address them. Quantity impacts on ecosystems receive more specific attention in the implementation report; but the prior appropriation system challenges achieving ecosystem needs in fully or over-allocated systems and tools to compensate may be inadequate. The councils have environmental representatives but human interests may outweigh them. Ecosystems are recognized as functioning systems.

4.3.7 Water management should entail a holistic approach

Does the policy treat water issues holistically? Does it state action plans that address water issues holistically?

Holistic approach

Water for Life is meant to represent a systems approach to water issues (Yee p.c.). However, a holistic systems approach can be elusive and requires putting "a lot of pieces of the jigsaw puzzle together and until you have more of them in place you don't really see the picture to the point where you can analyse that from a systems approach" (Kelly p.c.). The strategy represents "a stepping stone going towards" a holistic approach, including recognition of ecosystem needs (Wilkie p.c.).

Linguistically, *Water for Life* embraces the systems perspective using systems metaphors. The concept of aquatic ecosystems is consistent as one of the basic entities recognized in the strategy. Its definition implies diversity, differing components that interact and make up ecosystems, and the importance of water to these interactions. The term, "aquatic ecosystems", unlike "water resources", emerges from the ecosystem approach because aquatic ecosystems are "more broadly based" and explicitly link "water to other land and environmental resources as well as to societies and their economies" (Mitchell and Shrubsole 1994, 52). The strategy also uses the term "water resources". Using both terms reflects its stance: Simultaneously *Water for Life* embraces water's value for functioning ecosystems and for human uses.

Other systems metaphors in the strategy are human-constructed 'water systems', such as private water systems and regional water systems (Government of Alberta 2003). Less tangible systems are the water transfer allocation system, warning systems for floods, a health surveillance and reporting system, a system to monitor and assess aquatic ecosystems, and a system to monitor and report on actual water use (Government of Alberta 2003). The systems metaphor has strong resonance in a central theme of the strategy: a network of partnerships. Each level of participation is nested by scale and together as a network they imply a systems approach to governance and public participation. This system disperses responsibility through the network, while the government maintains accountability.

With only "one set of water" from glaciers and the sky, "somehow we have to manage this [water] in the interest of a whole lot of competing demands" (Kelly p.c.). To integrate feedback loops and take an overall systems approach, substantial baseline data, monitoring systems, criteria with which to measure and evaluate information, and flexible and adaptive management practices are necessary. Ideally the research activities initiated in the strategy will move Alberta in this direction. Yee suggests the "water strategy has set the bar for managing on a systems basis because it starts with establishing what the outcomes are that we want relative to water", developing objectives, strategies, and targets, and then establishing performance measures. At the municipal scale *Water for Life* pushes the City of Calgary in the direction of holistic approach to water management (Fesko p.c.).

Educating people about the water issues and the critical decision making necessary "when push comes to shove" is essential to a holistic approach (Shyba p.c.). "In that sense it's a good document; it's better than nothing. It's better than no *Water for Life* strategy. I think it's starting to address the issues" (Shyba p.c.). More and better science-based information is necessary for understanding "what we're facing in the way of flows and the weather in southern Alberta in particular" (Shyba p.c.). Understanding weather and ecosystem dynamics is essential for long-term management practices. Because glaciers are melting, ultimately depleting summer flows, and climate change may move biomes, a precautionary or long-term approach and holistic and adaptive approach need to be integral to water planning (Griffiths p.c.; Kelly p.c.). Research and education will be central to this and are key initiatives in *Water for Life*. The strategy supports a holistic approach in theory, but implementation may be difficult (Griffiths p.c.), where "the devil is in the details" (Hahn p.c.). Without a holistic approach, where water is regulated with other resources and land use, where development is regulated with water and land use, where quality is regulated together with quantity, the result is a continuously compromised watershed (Kwasniak p.c.).

Land use and water interaction

Water for Life recognizes the interaction between land use and water but offers few initiatives that directly address the interaction. A "growing base of knowledge about the effects of land use activities on water quality" is part of the strategy's rationale for research (Government of Alberta 2003, 11). The strategy encourages Albertans to recognize these effects and act collaboratively towards adjusting "their use of water and activities on the landscape that affect the water" (Government of Alberta 2003, 15). The strategy implies land development decisions should consider surface and groundwater sources (Government of Alberta 2003).

While water decisions cannot be made without considering land practices, "land management or land development decisions have not been formally included in the *Water for Life* strategy" (Wuite p.c.). The strategy has created a process and momentum to look at water "in a different way"; but a lot of work is required including the "water-land link" (Wilkie p.c.). Wenig (p.c.) suggested that water management is "really a land-use issue by another name", but he does not see the province making that connection or taking the next step to "integrating land-use planning with water management". Hill (p.c.) suggests that land issues need to be one of the first questions studied. "[P]rovince-wide" people understand the idea of linking land and water; but awareness raising and education need to support the connection that "water management is really a land issue as well" (Wilkie p.c.).

Outcomes for the local-level WSGs include "on-the-ground" actions, promotion of best management practises, collaboration with land-use managers, and state of the sub-basin reports—all activities that have the potential to integrate land-use activities and water at the local level (Government of Alberta 2003, 17). Councils at the watershed scale will report on the state of the watershed and develop watershed management plans, both activities which will contribute to understanding land-use effects on water sources (Government of Alberta 2003; Wilkie p.c.; Kelly p.c.). A provincial-level wetland policy may help protect wetlands from land-use activities, such as urban development or resource extraction, and protect water purification, water cycling, and wildlife habitat functions (Government of Alberta 2003). A "source-to-tap" approach will potentially contribute to better land-use management by protecting water sources (Government of Alberta 2003, 19). The long-term action to "[c]omplete flood risk maps and warning systems for all communities where a flood risk exists" (Government of Alberta 2003, 12) illustrates a concern about natural disasters, extreme weather, and the interaction between human settlement and river flow regimes. Growing concern over climate change impacts and June 2005 flooding events in southern Alberta make this issue highly relevant for land-use decisions—from forestry on slopes to residential or economic de-

velopment in floodplains. At any scale diverse land uses create complexity in managing land use and water together (Kelly p.c.).

Watershed management plans and regional planning initiatives, especially to protect riparian areas and to share water systems between municipalities (Hahn p.c.), could contribute to better land-water management. In the next phase of *Water for Life*'s implementation, the government is shifting to watershed management, which means "looking at interaction with land and water" (Yee p.c.). Should he have been re-elected as an Member of Legislature Assembly, Taylor (p.c.) would have initiated land management strategy development, "more than just policy", to address effects of land-use activities on water.

Within the watershed and in the municipal sphere, regional planning is complicated by "so many different agencies and groups that are decision makers and influencers over the land base that the water flows over and through before it gets to the rivers" (Kelly p.c.). Land management under so many jurisdictions makes integrating land-use and water management difficult (Smith p.c.). To recognize the land-water connection means the "*Municipal Government Act* needs to be changed to deal with land use to protect water resources" because "[o]ne group is trying to use the land for as much economic use as possible and downstream users need it for a source of recharging the water" (Fesko p.c.). The area around the City of Calgary is an area where land use and water might be disconnected as a product of conflict between municipalities (Hahn p.c.). Collaborative governance is central to aligning water and land-use policies and management.

Surface and groundwater interactions

Water for Life's principle, "Groundwater and surface water quality must be preserved in pursuing economic and community development" (Government of Alberta 2003, 6), implies surface and ground water are important and must be protected. The strategy's definition of a watershed approach, where "efforts within watersheds" will take "into consideration both ground and surface water flow" (Government of Alberta 2003, 31), means the strategy considers both groundwater and surface water within the hydrological unit of the watershed. However, the strategy fails to provide a framework to link surface and groundwater (Thompson p.c.) and does not explore the interaction between surface water, wetlands, and groundwater.

Both groundwater and surface water quantity and quality are to be studied in all basins (Government of Alberta 2003). Their quantity, quality, and location should be the first physical questions answered by *Water for Life* research initiatives, according to Hill (p.c.), and would provide a stronger foundation of knowledge for decision making (Hahn, p.c.). With groundwater "out of sight", there are "a lot of unknowns with groundwater…. [W]e need to

create this information in order to effectively manage it" (Wilkie p.c.) and link its management to surface water. Managing them as linked is difficult because "recharge is a very complicated mechanism and not much is known about how it works and where it flows and where it comes from and what happens to it and how it's affected by geological issues" (Kelly p.c.). Trew, the Water Section Manager of the Environmental Policy Branch, Government of Alberta, considers understanding "aquifer delineation and depth of useable groundwater [a] number one priority" for gathering data (Banks and Cochrane 2005, 9). This link will be especially important for addressing issues like the oil and gas industry's use of saline versus non-saline water. Only around Milk River and Hinton is groundwater well researched and understood; the rest of the province is not well studied and research is needed (Taylor p.c.).

Development of a wetland policy and action plan will contribute to protecting the surface-groundwater link (Wuite p.c.). The Alberta Water Council supports wetland policy development and research to understand the interconnectivity of wetlands, "whether it's recharging or discharging groundwater, which in turn may be discharging or recharging from surface water" (Kelly p.c.), and groundwater-surface water interaction (Shyba p.c.). Wuite felt they are "considered together better now than they were before; although I wouldn't consider them completely integrated yet". At the watershed level, he has seen "pretty good integration of groundwater and surface water in the Cold Lake-Beaver River State of the Basin Reporting." He questions, however, what that integration would look like and even whether it would be appropriate ultimately—especially as surface water and groundwater flow differs.

Quantity and quality considered together

The strategy defines conservation as "the planned protection, improvement and wise use of natural resources. It includes controlling, protecting and managing water" (Government of Alberta 2003, 30). Although conservation tends to focus on quantity aspects of water management, according to Yee, this definition, though vague, includes both the quantity and quality aspects of water management. The Alberta government promotes "wise management of Alberta's water quantity and quality" (Government of Alberta 2003, 5), thus the whole strategy revolves around water quality and quantity—for drinking water, aquatic ecosystems, and community and economic needs. "Emerging issues affecting water quality and quantity" are an explicit challenge the research and knowledge key direction addresses (Government of Alberta 2003, 13). Based on the concept of shared responsibility, one assumes all Albertans are responsible for quality and quantity of water in the province.

But does the strategy effectively connect the two attributes of water? The strategy misses a quantity-quality linkage: "in terms of providing a framework for linking all those

items? It's not there" (Thompson p.c.). Water quality is "basically regulated separately from quantity" (Kwasniak p.c.). The constraint evolves from Alberta's legislation. The *Water Act* seems to focus on water quantity issues, including water use and allocation (Government of Alberta 1996, Sec. 2). Only the *Environmental Protection and Enhancement Act* (*EPEA*), which includes potable water and pollution issues, seems to have legislative jurisdiction over land-use activities that might affect land, air, or water quality. Thus "the *Water Act*, the statues and legislation need more work to bring it together" (Fesko p.c.). Yee (p.c.) pointed to watershed management as a means to looking at quality and quantity together. A collaborative approach is essential to make this approach work, such as for the City of Calgary, which has areas of concern upstream in its 8000 km² watershed (Fesko p.c.).

All types of water as one resource

The idea that all types of water—whether rainwater, river water, or grey water—are one resource is not hinted at in the strategy. Unlike other countries, Canadian laws ensure that wastewater is treated as a "bad" substance which requires disposal, rather than as a valuable resource (Boyd 2003). Yet, there is only "one set of water that we get, from the glaciers and the sky, that's all there is" (Kelly p.c.). All sources of water grow more valuable as scarcity increases. The principle, "Albertans must become leaders at using water more effectively and efficiently, and will use and *reuse* water wisely and responsibly" (Government of Alberta 2003, 6, emphasis added), suggests water will be reused. Yet no actions, such as water recycling initiatives, follow to support this aspect of the principle.

Managing all types of water together is an idea only addressed at the municipal level. In Calgary, "[s]tormwater has come a long way" and has become a priority issue. Stormwater ponds are being integrated into new neighbourhoods and have become "a desired feature" (Wilkie p.c.; Fesko p.c.). The City of Calgary is beginning to look at wastewater as a resource (Fesko p.c.). The strategy, probably through its water conservation goals, pushed the City of Calgary to "look at all forms of water in the city as one resource. If we're going to achieve sustainability, the direction we're going to have to go is that stormwater, rainwater, groundwater, and the water passing through the city all has to be coming into our long-range planning" (Fesko p.c.).

Watershed unit

By adopting a watershed approach to water issues, *Water for Life* is a progressive example of water policy (Hill p.c.; Wenig p.c.). Embracing this hydrological unit as boundaries in water governance, rather than political boundaries, "is a more holistic approach" because

it takes into account all uses, drainage patterns, resources, and development (Kwasniak p.c.). The area of a watershed "catches precipitation and drains into a larger body of water such as a marsh, stream, river or lake" (Government of Alberta 2003, 30), thereby connecting precipitation, water bodies, and the flow between these bodies in an area. As stated by the principle, "Alberta's water resources must be managed within the capacity of individual watersheds" (Government of Alberta 2003, 6). The Government of Alberta is transitioning "from water management planning to watershed management planning", where water management refers to allocation of water and watershed management "means looking at quality and quantity and looking at interaction with land and water. If you're going to take that approach, you're going to have to involve all of the water users associated with a particular watershed" (Yee p.c.). The watershed concept is fundamental to the strategy and the Government's new water management approach. It allows local management solutions to address local problems and needs (Government of Alberta 2003). The multi-stakeholder nature of watershed councils can ideally better address ecological, cultural, economic, and community concerns within the watershed than a provincial top-down model. The watershed approach is holistic, accounting for interaction between "land, waters, plants, animals and people" (Government of Alberta 2003, 31).

Creating watershed councils means the government seeks to connect all those who live within watersheds and insists on cooperation between those residents. The watershed councils will support a more holistic approach—if they have enough authority and impact on water management decisions (Kwasniak p.c.). The shift to watershed planning moves governance from being government led, as in the South Saskatchewan River Basin, to building capacity and incorporating each WPAC as an official society "with a mandate for effective water management in its watershed" (Alberta Environment 2005a, 44). These WPACs will develop watershed management plans for their respective areas (Government of Alberta 2003). These plans will address water allocation transfers and objectives for aquatic ecosystems (Government of Alberta 2003) and will integrate quantity, quality, ecosystem health, source protection, and land-use impacts (Alberta Environment 2005a).

The watershed approach is not a perfect solution but is better than fragmented top-down approaches (Wenig 2004). There is a risk that local interests may outweigh broader interests—interests which may better support public interest not just local interest (Griffiths p.c.). Conversely, broader factors, such as long-range pollution, may affect the local watershed (Wenig 2004). Good provincial, even national, guidelines will assist protection of the broader public interest and perhaps protect the local system. Edge effects and institutional and legal complexities are inevitable (Mitchell and Shrubsole 1994; Wenig 2004). Boundary definition may be difficult (Wenig 2004). As with any participatory approach, gridlock may result between

vested interests rather than finding common ground; this problem arises "While the partici-patory approach is desirable, sometimes planning from above is better able to take a holistic view rather than having all the different groups fighting it out" (Griffiths p.c.).

Cumulative impacts

By moving to a watershed approach, the province can address cumulative impacts over time in each watershed. The watershed approach offers the opportunity for all uses to "come together and be managed collectively" (Wilkie p.c.). The multi-stakeholder approach allows the actions of each interest group or user to be better understood, shared, and more easily modified to reduce cumulative impacts in each watershed. For example, the strategy as a whole and watershed councils on a regional scale are addressing the cumulative demand for water—from growing municipalities, industries, and agriculture, and now from in-stream flow needs—that pressures current availability of water within the water allocation system devel-oped over one hundred years ago.

Nested and collaborative governance

As part of shared responsibility, the strategy views all Albertans as obligated to col-lectively address water issues. To facilitate this collective action the strategy sets up its "net-work of partnerships" in addition to its government levels. The Alberta Water Council and the coordinating position of Alberta Environment provide broader level guidelines and can take a bigger view of water issues. The watershed stewardship groups and local governments can address the local scale. These groups and individuals can take broader concerns to the water-shed level and negotiate solutions with other local representatives. Thus Alberta has created a nested system of participatory governance to deal with issues at their appropriate level and with multiple stakeholders.

The partnership approach with the public seems to be the beginning of Alberta Envi-ronment's new approach. The Alberta government's *Environment Business Plan 2005-08* is "Alberta Environment's new vision for how they're going to conduct business" (Wuite p.c.). Its mission statement supports *Water for Life*'s overall goals: "Steward and protect Alberta's environment to sustain diverse ecosystems, healthy Albertans, strong communities and a prosperous economy" (Government of Alberta 2005a). It reflects a collaborative approach by using "stakeholder consultation, less 'command and control', and more 'let's sit down and discuss what everyone needs'" (Wuite p.c.).

Because Alberta Environment itself does not have the jurisdictional power—especially over land use—to make all its initiatives "stick" (Hill p.c.), collaboration amongst government

departments will be integral to fulfilling the promise of *Water for Life*. Improvement has been made over the last five years in Alberta in trying to "break down the silos, not only within the departments, but across departments. *Water for Life* is a very good example of that" (Wuite p.c.). The strategy has emphasised "cooperation and integration of multiple agencies and various water users and sectors and everybody coming together to make this all happen" (Wenig p.c.). Recognizing that environmental issues cut across ministries, sectors, and jurisdictions, Alberta Environment's *Business Plan* states, "co-operative action at the local, regional, provincial, national and international levels is essential for effective environmental management" (Government of Alberta 2005a). Alberta Environment is working with other ministries and stakeholders to develop a government-wide vision with cross-ministry implementation. It is moving to a place-based approach to integrate resource demands, recognize cumulative effects on the environment, and use management practices based on environmental boundaries. It aims to work collaboratively based on the principle of shared responsibility for the environment. It seeks to develop "a more comprehensive, flexible set of regulatory and non-regulatory tools and incentives" for effective environmental performance. It will "continuously monitor and improve all environmental standards, practices, and outcomes" (Government of Alberta 2005a). The *Business Plan* clearly indicates the Ministry's intention to cooperate and collaborate with other government ministries and provincial stakeholders and citizens. This new business strategy emphasises aligning policies among departments and departments with different responsibilities working together—for example, Alberta Environment is working with the Energy Utility Board to improve collection of water-use data relating to oil recovery (Griffiths p.c.).

Collaboration amongst government departments is evident as the cross-ministry group involved in the strategy's development. This cross-ministry group, involving 14 different ministries, "carries over now into the implementation" (Yee p.c.). At least ten ministries are involved in this coordinated effort, where each is collaborating or taking the lead on some aspect to implement *Water for Life* (Alberta Environment 2005a). Alignment of government is necessary for all to work towards the same goal (Yee p.c.). As a result Alberta Environment is moving from "that traditional command-and-control, regulatory function that we've always played" to a role of "systems coordinator" to ensure "all the pieces of the system are working well and that there are all the interconnections happening" (Yee p.c.). However, "[t]he command-and-control, the regulatory will always be there because you need the regulatory backstop" (Yee p.c.). Because "we tend to be good managers of individual pieces of the system, as opposed to seeing the whole system operating as a whole, we've even restructured in our department [Alberta Environment] to have within our environmental policy branch a section

that is looking overall at systems—water systems, land systems, air systems, and the integrated systems" (Yee p.c.).

Presumably Alberta Environment will continue to take a lead role in implementation, whether in a coordinating capacity or otherwise. However, Lorne Taylor, the former Minster of Environment, is no longer in government to act as a champion of the strategy and "there's always a risk that if you haven't got a champion for something, once the process is going, it's no longer in the headlight and it may lose momentum" (Griffiths p.c.). There's reliance on Alberta Environment to champion the cause; "My concern is will they have enough resources to do this? Will they have a strong enough voice when there are a lot of other demands, both for resources and to allow development rather than protect the water" (Griffiths p.c.).

Jurisdictional barriers are also present. Municipal boundaries do not coincide with watersheds; thus there will "have to be some work in all of these institutions to figure out how they behave in the watershed they live in" (Hill p.c.). The bigger municipalities, such as the City of Calgary, will look upstream and work with their watershed councils "to get their agenda on the table" (Thompson p.c.). Upstream water-related issues for Calgary include forestry management, tourism, off-highway vehicle use, and manure discharge (Fesko p.c.). The City of Calgary recognizes that its "legal boundaries end at the city boundary; but we know that our watershed boundary doesn't" (Fesko p.c.). The City is addressing upstream issues by being "participants in all the watershed groups—so there's the Bow River Basin Council; Elbow River Watershed Partnership; we're thinking about becoming members of the Ghost Watershed Alliance—and offering any support we can—financial, staff working with them, being a lobbyist on any item that affects us—then partnering up with people that have the same goals and objectives as us" (Fesko p.c.). Partnerships with organizations, such as Alberta Wilderness Association or Alberta Conservation who are lobbyists and have a say outside the city boundary, help the City extend its influence beyond its own borders (Fesko p.c.).

Conclusion

Water for Life represents a move towards holistic water management. The most positive attribute is its watershed approach. It is moving towards managing surface and groundwater together and quality and quantity together. The strategy has a long way to go to incorporate land and water management, and it is not treating all water as one resource. The strategy's partnership network and recent shifts in government support collaborative and nested governance.

4.4 CHAPTER SUMMARY

The preceding discussion represents an analysis of *Water for Life: Alberta's Strategy for Sustainability*, based on the water ethic principles proposed in chapter 3. *Water for Life* fulfilled the water ethic in some aspects and failed in others. Overall, *Water for Life* recognized limits and some degree of variability in water availability. Water is implicitly considered a common, shared resource in Alberta but it is not always treated as such due to the water allocation system. Meeting basic needs for water is not generally an issue in Alberta but is for some groups. Full participation of Albertans is the most positive aspect of the strategy. Future generations are an implicit motivation of the strategy, but barriers exist to protecting intergenerational equity. To recognize equity for the environment and embracing a holistic approach to water management, Alberta's strategy is a strong step forward; but the government and Albertans have significant changes to make and challenges to overcome, such as the prior appropriation allocation system. The following chapter discusses the analysis results of Victoria's document, *Securing Our Water Future Together.*

5. VICTORIA, AUSTRALIA,
SECURING OUR WATER FUTURE TOGETHER:
A "BEST" CASE EXAMPLE OF BALANCING NEEDS?

5.1 INTRODUCTION

Australia is water challenged as the driest inhabited continent in the world, has the greatest inter-annual variability of rainfall, and is experiencing declining water quality (Handmer *et al.* 1991; Smith 1998; Schofield and Burt 2003). Changes in Australian water resource policy and management are considered environmentally progressive (Arthington and Pusey 2003; Postel and Richter 2003). Recent changes to practice have included a move away from supply-side policy and toward corporate and market approaches and broader consciousness of environmental impacts (Handmer *et al.* 1991; Smith 1998). Australia is making a transition from former water management models to a "new triple bottom line" approach that supports environmental, community, and economic dimensions. The 1994 Council of Australian Governments (COAG) Water Reform Framework and later the National Water Initiative provide national guiding frameworks for state water policy reform.

Australian jurisdiction over water resources occurs at the state level—similar to provincial-level jurisdiction on most matters pertaining to water in Canada. A number of new state water laws have now been passed to reflect national agreements (Postel and Richter 2003). Australian Water Acts now require water allocation decisions to consider the following elements: ecologically sustainable development; present and future generations; social and economic benefits to the state; and integrated management (McKay 2003). Some issues still requiring attention include: indigenous water rights; transparent, capable governance; public participation; altering pre-existing rights; and incorporating environmental requirements (McKay 2003). Almost all states have begun environmental flow programs and published supporting policy and guideline documents that outline how to determine environmental flow in the allocation process (Schofield and Burt 2003). This chapter looks specifically at the 2004 water policy of the State of Victoria, *Securing Our Water Future Together*. The next chapter compares Alberta's *Water for Life* to *Securing Our Water Future Together*.

A Best Case Example?

5.1.1 Victoria situational context

Victoria is in the southeast corner of Australia with a population of 5,037,700 (September 2005 estimate) (Wikipedia 2006). From coastal temperate rainforest humidity to arid plains in the northeast (Smith 1998), Victoria is diverse in climate. The eastern highlands, Gippsland in southeastern Victoria, and the Otway Ranges in western Victoria receive the highest rainfall, in some areas more than 1000 mm annual average. The Mallee region receives the lowest rainfall with 327 mm annual average. Melbourne receives 660 mm average annual rainfall. Gippsland and the Western District are the leading farming areas due to having the most reliable rainfall (Wikipedia 2006). Victoria has 30 major river basins, many regulated by public reservoirs and weirs. Southern and eastern Victoria's river basins drain into coastal waters, while river basins in northern Victoria drain into the Murray-Darling basin (Productivity Commission 2003).

Total volume allocated in Victoria (5469 GL (gigalitres)) and to meet commitments to New South Wales (814 GL) is 92% of Victoria's sustainable yield of surface water, which is estimated to be 6828 GL. The average annual volume used by Victorians is estimated to be 5166 GL. Of this amount agriculture uses 4019 GL (78%), urban and industrial use is 861 GL (17%, where 47% is domestic use, 34% is industrial and commercial use, 6% for uses such as parks and gardens, and 13% in leaks), and rural use is 286 GL (5%) (Productivity Commission 2003). 3400 GL has been estimated to meet environmental requirements (Productivity Commission 2003).

Most of Victoria's groundwater resources are located south of the Great Dividing Range and in the arid west and northwest and, on a sustainable basis, have been estimated to provide 3660 GL (Productivity Commission 2003). Transboundary aquifers are shared among states through water sharing agreements, such as between Victoria and South Australia (Department of Sustainability and the Environment 2005a). Total groundwater allocation in Victoria is 779 GL and average annual use is estimated to be 622 GL—70% for irrigation, 10% for rural use, and 20% for urban and industrial use (Productivity Commission 2003).

Historically, water-related challenges have been supplying water for irrigation and urban populations and waste removal (Smith 1998). Availability of surface water dictated site selection of capital cities; for example, the Yarra River allowed Melbourne to grow and support its population (Smith 1998). Growing urban populations and demand for irrigation drove water supply storage and infrastructure construction; complementary sewerage was slower to develop (Smith 1998). Transplanted peoples, mainly from Europe, led to transplanted agricultural practices in climatically and geographically very different areas (Smith 1998). Rural settlement in Victoria was also directed by a transplanted vision of a "little England" of "cottage

farming" with "self-contained family farms, cropping in a well-ordered landscape" (Smith 1998, 150). During the twentieth century's first 50 years, dams were built to match demand, particularly for irrigation—construction that was driven by the predominance of an engineering approach. To meet urban demand for water, mostly small storages were built in the cases of some cities, with the exception of the Waragamba Dam (1976) as a reservoir for Sydney and the Thomson Dam (1984) to provide water for Melbourne as an inter-basin transfer via tunnels.

The inclusion of economists and policy specialists among the usual complement of engineers in development of state water plans led to questions about the economics of large storages and environmental concerns. Thus major dam construction declined in the 1980s and 1990s (Smith 1998). The shift in water management water prompted by embarrassing profligate garden watering during drought, salinity impacts from irrigation, lack of federal funding, and greater clout of environmentalists shifted water management (Smith 1998). Smith (1998, 185) states, "[f]urther development of water resources will be firmly based on rigorous economic and agricultural assessment rather than on national and state ideals. The time when water policy regarded any river flowing into the ocean as the waste of a valuable resource in a dry continent is gone for good. Environmental values now figure firmly in decisions involving abstraction".

5.1.3 Victoria intertextual context

A number of documents and agreements at both the national and state level form the intertextual context for *Securing Our Water Future Together*. This discussion contributes to understanding of the scope of Victorian water policy and the context within which it operates.

Victoria became independent from New South Wales in 1851. Australia became a nation in 1901. Legislative powers over natural resources, including water, remained with the states. Broad legislative powers do exist with the federal government with regard to foreign affairs, defence, and federal territories, as well as "implied powers stemming from its character as a national government" and financial power (Handmer *et al*. 1991, 4). The federal government has exercised its power in such cases as reserving area under obligations to the World Heritage Convention and legislating on Aboriginal cultural heritage matters (Handmer *et al*. 1991). The relationship between federal and state government has largely been cooperative (Handmer *et al*. 1991), leading to the formation of the Council of Australian Governments (COAG). This cooperative approach allows for strong national guidance in water policy and management.

A Best Case Example?

In 1994 the federal and state governments formed the COAG Water Reform Framework, a strategic framework for the reform of the Australian water industry, the Natural Heritage Trust, and the National Action Plan for Salinity and Water Quality (COAG 2004) and for recognising the environment requirements for water (Postel and Richter 2003). This Framework outlined eight key points to guide the states in their water management initiatives: (1) water pricing; (2) irrigation scheme investment; (3) state water allocation and entitlement systems; (4) allocations and entitlements to the environment as a legitimate user of water; (5) government role separation between resource management and regulation and water service provision; (6) integrated catchment management and greater local responsibility; (7) greater public education and consultation; and (8) research (Smith 1998; Department of History and Heritage 2004).

More recently the COAG developed the National Water Initiative (NWI), building on the achievements of the Water Reform Framework (COAG 2004). Renewing commitment to the Framework's initiatives, the NWI encompasses a wide range of water management issues and best-practice approaches. In particular, the NWI aims to: (1) expand permanent water trade for cost-effective and flexible water recovery to meet environmental objectives; (2) promote more secure water access entitlements, more compatible registry arrangements, better monitoring, reporting, and accounting of water use, and improved public access to information; (3) encourage transparent, comprehensive water planning to address such issues as surface and groundwater system interaction and water for environmental objectives; (4) promote immediate attention to over-allocated systems in consultation with affected stakeholders; and (5) endorse efficient management of urban water, through, e.g., increased use of recycled water and stormwater (DPMC 2005). The State of Victoria has progressed to meet many of the national objectives.

The riparian doctrine of english common law was the basis for water law in Victoria until individual rights were subordinated by state rights over water. Legislation development since the 1820s vested water use and control rights in the Crown along with the power to grant licences and permits (Smith 1998; Productivity Commission 2003). Prior to 1989, water legislation was described as "'a maze of antiquated, imprecise, overly complicated and often inconsistent', administered by nearly 400 authorities" (Handmer *et al*. 1991, 13). Victoria's *Water Act 1989* replaced 21 existing statues of water law (Handmer *et al*. 1991). Current legislation affecting water allocation and management include the *Water Act 1989*, the *Catchment and Land Protection Act 1994*, the *Environmental Protection Act 1970,* and the *Heritage River Act 1992*.

The *Water Act 1989* established a framework for water management and allocation as well as statutory water authorities. The *Act* introduced a number of water management initia-

tives: (1) an ongoing assessment of the water resources program; (2) provisions for source protection; (3) legal entitlements to water for the environment; (4) planning processes to allocate water to consumptive and non-consumptive uses that recognise existing entitlements and source protection areas; (5) processes to allow entitlements to be issued, revoked, amended, converted to other entitlements, and transferred; and (6) establishment of authorities able to hold bulk entitlements (Productivity Commission 2003). The *Act* removed riparian rights and enacted the right to use, flow, and control of all water in waterways and underground to the Crown. The *Act* recognized the following entitlements: (1) bulk entitlements (shares of surface water allocated by a water authority to meet primary entitlements); (2) rights to rainwater flowing on the land but not in a waterway or borehole; (3) rights to water for stock and domestic use if water is accessible from public roadways, on a public reserve, on occupied land, adjacent to occupied land, or in a bore owned by the taker; (4) water rights (transferable rights within or between irrigation districts while remaining attached to the land); (5) take-and-use licences (transferable to any land often outside public irrigation schemes); (6) registered licences (non-transferable and allow the holder to take water stored in a private dam); and (7) in-stream use licences primarily for non-consumptive uses or temporary diversions (Productivity Commission 2003).

The *Catchment and Land Protection Act 1994* provides a framework for creation of catchment management authorities (CMAs) and for integrated land management with cooperation of the CMAs and the community. CMAs are responsible for prioritising and nominating unregulated rivers for source protection under the *Water Act 1989* (Productivity Commission 2003). The *Environmental Protection Act 1970* offers a framework of environmental objectives for the public, industry, and commerce, as well as establishes the Environmental Protection Authority and its role and responsibilities, including protection of water quality (Productivity Commission 2003). The *Heritage River Act 1992* provides for protection of public land that has significant natural, recreational, scenic, or cultural value (Productivity Commission 2003).

One of ten departments that comprise the Victorian Public Service, the Department of Sustainability and Environment (DSE) is currently the lead agency for water resources management in Victoria (DSE 2006). It advises and supports Minister for Environment, Minister for Water, and Minister for Planning. Established in December 2002, DSE attempts to take a holistic approach, whereby "[t]he convergence of the government's responsibility for the natural and built environments in one department reflects the government's view that environmental issues are not simply about the 'green' environment—it is about every aspect of where and how we live our daily lives" (DSE 2006).

A Best Case Example?

In August 2003, DSE released a Green Paper for public discussion of future water re-
forms. Its primary objective was to create water reforms to benefit all Victorians now without
reducing choices of future populations (Productivity Commission 2003). Concerns discussed
by the Green Paper included "the over-allocation in some rivers, the lack of protection against
future allocation, and the lack of clear protection for environmental allocation" (Productivity
Commission 2003, 8). Proposals in the Green Paper provided the foundation for the White
Paper, *Securing Our Water Future Together*.

5.2 *SECURING OUR WATER FUTURE TOGETHER*: OVERALL ANALYSIS

Securing Our Water Future Together was released June 2004. With 110 initiatives for
water conservation "aimed at every sector of the community", the document discusses do-
mestic, industrial, and agricultural use, recreation and tourism, environmental impacts and
objectives, pricing, population increases, and climate change "to ensure there is plenty of
water to sustain growth over the next 50 years" (DSE 2005b). The policy's "groundbreaking
actions" are: to repair rivers and aquifers through restoration activities and establishment of
"legal water rights" for the environment; adjust allocation and trading systems to secure water
for farms; price water to achieve efficiency from water users; and, through water saving and
recycling, have permanent water savings in towns and cities (DSE 2005b). Its aims will be
supported through a legislative change program and financial backing (DSE 2004, 12). The
Victorian Water Trust provides financial backing of AUS$320 million over the next ten years,
allowing for innovative approaches and seed investment while seeking leverage investment
from other sources (DSE 2004).

5.2.1 Policy development process

Victoria's Department of Sustainability and Environment website states, "Eight years of
low rainfall, a growing population, climate change and degrading river systems have shown
why the State needs new and better ways to secure water for the future" (DSE 2005b). Plan-
ning for the next 50 years, DSE embarked on a policy development process. A 10-year plan
was announced by the state government in 2002 to meet the water challenge of "a secure
water future" in Victoria. Then Minister for Water, John Thwaites, delivered a 'Ministerial
Statement on Water' in Parliament in April 2003 (DSE 2004). The Green Paper for Discus-
sion, *Securing Our Water Future*, followed in 2003 and outlined 80 proposals for better
water management. Following extensive public consultation, an Expert Advisory Group, who
played a key role in the consultation process, analysed the submissions and provided advice to

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the government. The public submissions and advice had significant influence on the direction of these reforms (DSE 2004).

5.2.2 Purpose and rationale

The White Paper's title represents the overarching purpose of this policy document: *a secure water future for the state of Victoria* (DSE 2004). Past management had not valued water as the "precious resource" it is (DSE 2004, 8). The past approach was "to exploit rivers and aquifers, create dams to supply towns, industry and irrigation, and then dispose of the 'waste water' back into rivers or the ocean", which is "not sustainable" (DSE 2004, 11). Too cheap water led to excessive use (DSE 2004). Public consultation indicated Victorians supported policy reform (DSE 2004).

Four fundamental ideas represent the rationale behind the policy's production: water resources are limited; all water resources, from rainwater to wastewater, are valuable; Victorians' prosperity is dependent on the health of the environment; and water is a precious resource, whose provision must be reflected in its price (DSE 2004). The White Paper posits sustainable water management to address these fundamental ideas. Sustainable water management is defined to have six characteristics: provision of reliable and safe urban water and sewerage services; persistence of "a high value, low impact irrigation industry" supported by strong regional communities; assurance of healthy rivers, aquifers, floodplains, estuaries and catchments "capable of delivering a wide range of water services"; support for communities to "truly appreciate all the services water provides" and "make considered choices about how those services are delivered"; support for communities to have "a stronger ethic of water conservation"; and development of an efficient and accountable water sector which delivers "water services in an innovative way" (DSE 2004, 11). To achieve sustainable management a perceptual shift in how the Victorian public views water and their relationship to it is needed (DSE 2004). The policy outlines initiatives to achieve this vision of sustainable water management.

The key strategies the government proposes to meet the goal of a secure water future and achieve sustainable water management are the main themes of the document: (1) reallocation of water to balance economic, environmental, and social values; (2) river and aquifer restoration for future generations; (3) more careful use of water in irrigation and in urban settings; (4) water pricing to encourage conservation; and (5) more accountable and innovative institutional arrangements to support the changes. These themes make up the majority of the policy's chapters.

5.3 ANALYSIS BY ETHICAL PRINCIPLE

The following discussion represents conclusions drawn about Victoria's White Paper regarding how well it addresses the seven principles proposed in chapter 3. These conclusions also provide the basis of comparison to Alberta's *Water for Life* strategy in the next chapter.

5.3.1 Water should be treated as a finite and variable in availability

Does Victoria's 2004 White Paper recognize limits and variability in availability of freshwater? Does the policy state action to cope with these limits and with variability?

Limits

Limits in water availability form part of the policy's rationale. The policy's release was after an eighth consecutive year of drought, which the policy dubs as "the worst drought in a century" (DSE 2004, 68). Many towns across the state were on water restrictions partially due to low water levels in reservoirs. Reservoir storage in places fell to less than 10% of capacity (DSE 2004). Melbourne is now on permanent water savings measures.

Over the last few decades, a perceptual shift has occurred among Australian government and water managers from supply-oriented to demand-oriented approaches. Government is encouraging the public to change its behaviour accordingly, to smarter water use (DSE 2004). One of four rationales for the Victoria government's goal of a secure water future is "We can't create more water…We can't expect more rain to fall, and we can't generate more water by building dams" (DSE 2004, 11). This inability to create more implies Victorians must use what they have. While water's limited nature is not given the emphasis of an entire chapter, it is fundamental to every chapter. It urges wiser use of water through water efficiency, conservation, and reuse in urban and rural spheres, as well as more careful and flexible water allocation. What resources are available must ensure sufficient water to meet environmental requirements.

Economic prosperity depends on the limited water supplies—for agriculture, industry, and tourism sectors. The government plans to improve Victoria's farmers' global competitiveness through efficient and best use of water (DSE 2004). The tourism industry values healthy natural areas, thus the policy will maintain enough water for natural areas. The policy states that current rate and pattern of water use in Melbourne needs to change or the city will hit its limit within 15 years (DSE 2004). Melbourne's population is predicted to expand by more than a million people by 2030 while the rest of Victoria may grow by 350 000 people in the same period (DSE 2004). To meet this future demand present demand must change. The

government sees "pricing for sustainability" as a key approach to encourage conservation and to "better reflect the scarcity of the resource and costs related to the environmental impacts associated with the provision of water-based services" (DSE 2004, 128-129). Surface water allocation limits are being set; and, for groundwater systems, existing entitlements will be recognized and limits for extraction (permissible annual volumes) will be set (DSE 2004).

Seasonal difference

The policy recognizes the seasonality of water supplies and ecological stress caused by summer withdrawals. In unregulated rivers (those with no major upstream reservoirs) new licences to divert water in summer are banned (DSE 2004). Only new licences will be granted in winter if there is spare water over the sustainable diversion limit (DSE 2004). Management rules will be implemented to protect the environmental water reserve (see section 5.3.6) (DSE 2004). For regulated rivers (whose flows are managed by dam or weir operation) the policy does not specifically mention seasonality of flow; but limits to allocations exist which are based on maintenance of river health (DSE 2004).

Inter-annual difference and climate change

A key driver for water reforms is ongoing drought. The policy addresses change in precipitation over multiple years through initiatives such as permanent water savings in Melbourne and consumptive caps on water withdrawals from surface and groundwater—although caps were in place prior to this White Paper. The policy explicitly recognizes climate change as a significant threat to Victoria's water supplies and as a catalyst for better management of water use. Victoria is anticipated to be drier with more hot days, more dry days, and more storms (DSE 2004). Flow into the Murray-Darling system is expected to decrease by up to 5% of flow by 2023 (DSE 2004). These changes will reduce "the total available resource pool and potentially affects both the Environmental Water Reserve and consumptive entitlements" (DSE 2004, 34). To address these changes the government is conserving water now and will vary water entitlements and the environmental water reserve as necessary if long-term reductions in water availability occur (DSE 2004). A three-year collaborative research program will focus on improving understanding and predictability of "key climate parameters for specific regions over a range of time scales (e.g., short-term, seasonal, multi-seasonal, annual, inter-annual)" (DSE 2004, 34).

A Best Case Example?

Geographic variability

The policy discusses specific initiatives for particular areas that depend on current situational contexts of the areas, such as current demands and uses of water, biophysical character, environmental conditions, and projected changes in different river basins or catchment areas. Regional sustainable water strategies will be developed to reflect geographic differences in water supply variability and "the states of knowledge underpinning regional allocation decisions" (DSE 2004, 27). Institutionally, attention to geographic differences is achieved through local water authorities, both rural and urban, and catchment management authorities. These authorities provide for delivery of services and integration of land and water use, respectively, on a regional basis.

Conclusion

Limits are a central premise and conceptually underlie many of the policy's initiatives. Seasonal, annual, and long-term variability are well-recognized, and specific actions are identified. In action and institutionally the government recognises geographic variability.

5.3.2 Water should be treated as a shared, common resource

Does the policy regard water as a common, shared resource? Does the policy state action items that treat water as a common, shared good?

Sharing among users

The policy identifies water as fundamentally valuable to human activity: "Water supports our everyday lives—at home, at work or play, water is fundamental to our way of life" (DSE 2004, 8). Water has instrumental value for communities (which "thrive on it"), for "our economy" (which "relies on it"), and for "our environment" (which "survives on it") (DSE 2004, 5). This statement implies that water, as a limited resource, must be shared amongst all its users while recognizing its social, economic, and environmental value. The government claims overall ownership and stewardship of "all water resources irrespective of source, on behalf of all Victorians" (DSE 2004, 12). All rights to "Victoria's water", which includes surface and groundwater, stormwater, and recycled water, are held by the Crown (DSE 2004, 19). As steward of water resources, the government claims responsibility for sustainable management of the state's water resources, for allocation to agriculture and urban use, the environment, and all other purposes, and for the integrity of the system (DSE 2004). The allocation system is meant to recognise all water services and balance the needs of the environment with

the needs of other water users; to restore and protect the health of Victoria's rivers; and to facilitate future economic growth. Victoria's allocation system thereby attempts to distribute water based on its social, environmental, and economic value to users.

Reforms to the allocation system are meant to address a number of challenges: river and aquifer over-allocation; future over-allocation; no clear protection and responsibility for environmental allocations; ineffective management of emerging risks to future inflows and river health; and omission from the system of some water resources, such as recycled and stormwater, leading to "sub-optimal management of the total resource" (DSE 2004, 18). To address these challenges, the allocation system can recognize environmental value with the environmental water reserve (EWR), plan for and adapt in the future with sustainable water strategies, and begin to include all water sources; meanwhile it can maintain security for current users (DSE 2004).

Rural and urban water authorities administer the allocation system locally. They receive bulk entitlements and distribute each entitlement to individually held rights. Entitlements are primarily "a right to a volumetric component and a priority (security)" without rights to construct infrastructure to collect, store, take, use, or distribute water (Productivity Commission 2003, 20). These volumetric components are not guaranteed but are instead rated as high or low priority. High security rights are generally fulfilled prior to low security rights (Productivity Commission 2003). High security or priority entitlements "include delivery bulk entitlements, stock and domestic rights, water rights and take and use licences" (Productivity Commission 2003, 22). Individual rights to water come in various forms: licences to surface or groundwater; irrigation water rights and irrigation new water product; supplies by agreement; supplies to urban customers; private rights to rainfall; and riparian rights (DSE 2004). All of these individual rights come from consumptive-use bulk allocations or caps on total water use from catchments or aquifers (DSE 2004). Sales water is a new form of water entitlement that will become a "legally recognised entitlement", have "ongoing tenure", be a tradable share of consumptive water pool, retain a lower reliability, provide irrigators (initially) in northern Victoria with a more secure title to this water than in the past, and lend flexibility due to being separately tradable. Extra 'sales' water is available only once entitlements are secure (DSE 2004).

Victoria's allocation system exhibits two positive attributes for sharing a common-pool resource. First, the proportional aspect of water entitlements, through caps or sustainability limits, allows all participants of the system to share the benefit of abundance and the burden of scarcity. This aspect of the system creates a more equal distribution of benefits and burdens; and it is responsive to natural change. Second, the system is flexible to change in users of the system through unbundling of water entitlements, the addition of sales water as an en-

titlement, and water trading. The policy addresses the added complexity of unbundling water entitlements by simplifying them as low and high security (or priority) entitlements. As well, all water rights will have ongoing tenure (rather than some with limited tenure). This change seems to remove flexibility to change; however, reserve powers under the *Water Act 1989* (Sections 13 and 7) allow state government representatives to make changes to the entitlements (DSE 2004). The use of these reserve powers to make permanent adjustments to entitlements will only be considered on account of long-term changes to inflows or river health under the particular circumstances: (1) an expert water resource assessment and an open consultative review together recommend adjustment; and (2) adjustments are made no more frequently that once in 15 years. Because water rights are issued as part of bulk entitlements, they can be affected by amendments to a bulk entitlement (Productivity Commission 2003).

Sharing across borders

The Victoria White Paper recognizes water as a shared resource across borders through commitment to national objectives, agreements on the flow of the Murray River, and groundwater sharing agreements with adjacent states. The policy recognises that Victoria shares water with bordering states and that sustainable water management will generate shared benefits (DSE 2004). The Murray-Darling watershed, shared by Victoria, South Australia, and New South Wales, has an area of 1 050 111 km², within which there are two large cities and 12 large dams (Revenga *et al.* 1998). This watershed is considered the "bread basket" of the country with the majority of Australia's agriculture (DSE 2004). The government participates in the Living Murray program with the Murray-Darling Basin Ministerial Council to contribute to national commitments (DSE 2004)—as well as the state's own long-term prosperity. The program intends to successfully manage the water resources and the environment and communities they sustain (DSE 2004).

Under the Murray-Darling Basin Agreement, interstate trading is permitted on a permanent basis below Nyah on the River Murray and temporarily across the southern basin. But the state government has some concern about losing water "in a one-way flow to other States, which have not created water markets that are as open as in Victoria. Interstate trade requires a level playing field" (DSE 2004, 80). Much of the water that flows across the border is administered by irrigation districts and is not permitted to be sold out of those districts (DSE 2004). Therefore the state government is looking to the National Water Initiative to overcome barriers and create a level playing field (DSE 2004). Unbundling of water rights may cause further complications (DSE 2004).

Groundwater is also subject to transboundary sharing. Groundwater management areas (GMAs) are the units of management, a number of which lie along the South Australia-Victoria border. These GMAs are subject to groundwater sharing agreements between the two states. Permissible annual volumes (PAVs) have been gazetted for the 11 zones along this border. For other groundwater systems, existing entitlements will be recognized and limits for extraction (permissible annual volumes) will be set (DSE 2004).

Natural sharing

Recognition of the environment as a user of water alongside existing entitlement holders is an unique feature of Victoria's allocation system. By providing allocations of water to the environment through the environmental water reserve, the state government extends the sphere of sharing a limited resource to a nonhuman user. Primarily through bulk allocations the government will allocate water to the environment, finding the water through various mechanisms. Twenty percent of sales (tradable) water will be allocated to the environment to return or protect flows to particular rivers or wetlands and improve flows, protect aquatic habitat, and improve water quality (DSE 2004). To maximise the benefits of this sharing, flow regimes will be determined; and if river health is deteriorating significantly the government will fairly allocate remaining water depending on the circumstances (DSE 2004). The policy considers this allocation of 20% of sales water to be "a landmark change for water management across Australia. It provides improved security and choice for irrigators, a substantial increase in EWRs and the capacity to significantly improve environmental flows in several northern Victorian rivers" (DSE 2004, 49). CMAs will oversee management of this new environmental entitlement. This natural sharing will be further explored in section 5.3.6.

Best use for the community

Because the Victoria government honours social, economic, and environmental value, it uses water allocation, water markets, and pricing to encourage more efficient water use and incorporate flexibility and ecological needs into water allocation. Incorporation of ecological needs is discussed under natural sharing, above, and in section 5.3.6. Water pricing is discussed in section 5.3.5.

Unbundling of water rights in the water allocation system has the dual benefit of creating flexibility and adaptability in changing circumstances and encouraging more efficient water use. Three of the policy's sustainable water allocation system principles relate to flexibility, choice, and security. First, consumptive-use water entitlements will (1) have secure tenure, (2) aim to provide reliable water supplies, (3) link the entitlement to a share of the to-

tal amount of water available for consumption at any time, (4) specify obligations associated with holding entitlement, and (5) be allocated by market mechanisms, wherever possible, and allow trade between entitlement holders. Second, allocation decisions will take into account the availability of water for the diversity of non-consumptive water uses valued by the community. Third, adaptive management of the water allocation system will respond to changing demands, community expectations, and new knowledge while meeting EWR objectives (DSE 2004).

The policy proposes unbundling water entitlements into three key components: water shares, shares of delivery capacity, and water-use licences to use water on a site (DSE 2004). Unbundling will take effect system by system (DSE 2004). Unbundling entitlements will be simpler with just two kinds of water shares in each supply systems: high reliability and lower reliability. Users will have the choice they need, without risks and costs of relying heavily on the temporary water market. Users will gain the certainty of having ongoing, tradable rights, including for licences and "sales" water. The unbundling also allows for the "boundary between consumptive and environmental water" to be "modified, but in a way that rules out abrupt changes" (DSE 2004, 72). To create further flexibility the policy plans unbundling land and water rights to some degree. The policy aims to meet the challenge of prosperity for the irrigation sector by encouraging movement of water to higher-value users; reconfiguring irrigation infrastructure; and innovation and adoption of new technology. To help the irrigation sector adapt to changing community expectations about the environment, the policy proposes reducing losses in distribution systems and returning water to the environment (DSE 2004).

To distribute water shares, the Victorian system uses a water market, which privileges those with the capital and ability to gain water benefits but which provides an added asset to farmers and encourages efficient water use. Trading of water entitlements on the water market allows more users to be included in the system, creating more equitable access, and encourages better use of water. The policy states that it "is generating immense benefits for Victoria by revealing water's worth and encouraging its best use. Each year's permanent trade to high-value enterprises has a net present value of over $100 million….During droughts, temporary trade (i.e. of the current year's water) makes up as much as 15 per cent of total water use—offering income to those choosing to sell, while enabling high-value plantings and stock to survive" (DSE 2004, 78).

Sharing responsibility and accountability: common governance

Responsibilities for water management and governance are largely shared or delegated among government agencies. The public seems to have little involvement in decision mak-

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ing, except for a few instances of community consultation, such as with CMAs, and thus does little to contribute to shared responsibility and accountability in governance. The public does have involvement as consumers and users of water and can take responsibility for their individual actions through water saving in households, irrigation efficiency measures, industry and commerce water conservation, and preventing pollution of water ways. Language in the policy attempts to create solidarity by use of the pronoun "our". This style helps to encourage a sense of responsibility with the broader public.

Victoria's participation in the Living Murray initiative represents the state's sense of shared responsibility for use and health of the Murray-Darling river basin. The government considers sharing responsibilities with the private sector in water service delivery through capital expenditure on infrastructure establishment and operation for water recycling. These large-scale projects present the opportunity for private sector participation in infrastructure provision in line with the government's Partnership Victoria principles (DSE 2004). However, the government explicitly states that public ownership of water authorities will be maintained (DSE 2004).

Conclusion

Generally, Victoria treats water as a common, shared resource by maintaining state ownership of all water and retaining all water authorities in public ownership. The allocation system is flexible enough to allow for adaptation to changing circumstances and ideas of best water use for the community, such as meeting ecological requirements. Water sharing agreements and participation in multi-state initiatives means Victoria directly recognizes water as shared across boundaries. It does not truly embrace shared governance in terms of public inclusion; governance seems more "top-down" with decentralised responsibilities to more local government agencies.

5.3.3 Water security should be ensured for all humans

Does the policy support water security for all human needs? Does the policy state action items to ensure water security for all?

Water for basic needs—drinking water, cooking, and sanitation

The Minister's Foreword refers to water for drinking, washing, and watering as the "very basic human needs" (DSE 2004, 5). Otherwise, meeting basic human needs is not an explicit concern of this policy. Rather, smarter use to ensure future water security is the focus.

A Best Case Example?

To encourage "smarter" water use, the policy proposes a number of initiatives: education on water conservation, water efficient appliances, mandatory water saving measures, and pricing water using rising block tariffs. Various rebate and assistance programs are already in place to support these initiatives and will be extended based on the White Paper. Urban water authorities are establishing a rising block tariff system to encourage conservation. This tariff allows a higher price per kilolitre to apply above a specified level of consumption (DSE 2004, 127). Because pricing water is criticised as biased against those with lower incomes, the Essential Services Commission (ESC) will help ensure that price setting is "fairly and independently managed, and vulnerable groups in the community" will be "afforded protection when prices rise" (DSE 2004, 126). The policy states that this type of system is widely regarded as the fairest and most effective way to price water for conservation. To avoid hardship to citizens, concessions are available to those with large families (six or more members) (DSE 2004)—or those disadvantaged in some way. A range of concessions will improve affordability of key services for pensioners and vulnerable Victorian households. Reforms of the program "aim to distribute concessions support more fairly, more equitably, and to more Victorians in need" (e.g., pensioners, Health Care Cardholders) (DSE 2004, 136). The new arrangements will benefit about 420 000 households who currently receive the concession cap. As well, the average concession will no longer erode with inflation. Revenue from water charges will go to the water authorities, who deliver water and sewerage services. Part of this revenue is to be handed over to the state government and the other portion is intended to make water authorities more self-sufficient as government corporations.

The policy calls for interconnection of rural, regional, and metropolitan water supplies to improve drinking water supply security, increase flexibility in balancing supply and demand, use available capacity, and more cost-effectively supplement existing supplies in some areas most cost effectively. Desalination has potential to increase water supplies on a renewable basis and reduce pressure on rivers and aquifers. Smaller-scale desalination is already implemented in some areas (DSE 2004). Desalination, although becoming cheaper, is still an expensive alternative to freshwater and the state government plans further investigation (DSE 2004). Creating larger reservoir capacity through dams does not seem to be an avenue the Victorian government wants to follow, and few appropriate sites may be left.

While historically meeting sanitation needs lagged behind water supply (Smith 1998), only some areas seem to be of concern in the policy. AUS$30 million has previously been committed to water supply and sewerage issues in the Country Town Water Supply and Sewerage project (DSE 2004) and the government will commit a further AUS$42 million over the next eight years (DSE 2004). Some areas will require access to sewerage infrastructure to replace inadequate septic systems (DSE 2004). The New Town Sewerage initiative will

involve AUS$22.5 million in funding and sewer infrastructure over 50 towns across Victoria (DSE 2004). To minimise the impact of price increases for customers, implementation will be on a cost recovery basis (DSE 2004).

Food security

The policy aims to carefully allocate water to provide security, flexibility, and economic vitality for the agriculture industry. This may indicate attention to food security for the state.

Right to a healthy natural environment

Historically, the Victorian government has not protected the functionality of ecosystems due to its supply-oriented approach to water. Now the state government recognizes that economy and social well being of Victorians is dependent on the environment. This dependency is one of the five explicitly stated fundamental principles that underlie the policy's rhetoric and planned actions. Not looking after the environment's needs means not looking after the social (including basic needs) and economic needs of the people.

Economic vitality

The government explicitly recognizes the economy's reliance on water. The state government "recognises that the primary purpose of water infrastructure is to supply water for towns and irrigation" (DSE 2004, 64). Irrigation, the predominant user of water, "generates substantial—and growing—economic and regional benefits" for Victoria (DSE 2004, 66). The reformed water allocation system is flexible and the policy claims it provides some security for irrigators. Yet water markets, adjustable water entitlements, and the addition of the EWR may potentially threaten irrigators' security. Ensuring security while creating an adaptable system that maintains environmental sustainability seems to be an ongoing discussion, where water trading and pricing have multiple benefits but also challenges (Planet Water n.d.). The plan envisions provision to the broader community of financial or other assistance to adjust to impacts of change in the irrigation delivery infrastructure (DSE 2004, 86).

Pricing of water is potentially inhibitive for industry in urban settings. Water security for industry is subject to priority programs for initial funding (DSE 2004). The government acknowledges that the tariff system may not be appropriate for water-intensive industries. In these cases water authorities will consult with businesses and other non-residential customers before changing pricing structures (DSE 2004).

A Best Case Example?

All groups have access to good quality water and opportunity

The policy does not point to inequitable access by particular groups. Hillman (2004, 31) observes, however, that historical use in Australia is dominated "by consumptive use for irrigation and denial of any indigenous water rights, and in practice this is a strong tendency in water allocation 'when the chips are down'. Institutional and market failures in changing water allocations contribute to this tendency". The policy recognizes the cultural value water and rivers hold for indigenous communities (DSE 2004), but makes no indication of what the current situation is for aboriginal communities or what effect this recognition has on the policy's strategies.

Conclusion

Overall, intragenerational water security seems not to be an issue for Victoria. Measures to ensure a fair pricing system seem to be in place. Sanitation initiatives are being undertaken in needy areas. The government is now acting to ensure Victorians have a healthy environment within which to live through ecological water allocations and restoration activities. The government aims to widen access to water and its economic benefits by means of the water allocation system's flexibility. The policy does not indicate that some groups have less access to water security or economic opportunity.

5.3.4 Water management should entail full participation by those affected

Does the policy recognise full participation of all affected as important in planning, decision making, and implementation to meet water issue challenges? Does the policy indicate action items to this regard?

Inclusion in policy development

The policy states that the "public feedback and advice significantly shaped the direction and detail of the water reform package outlined in this document…and has reinforced the Government's commitment to reform outdated water policies and achieve robust water management system to secure Victoria's water future" (DSE 2004, 10). The Green Paper, with more than 80 proposals for better water management, was released in August 2003 for public discussion. The government held 40 separate stakeholder briefings and 21 public forums. These were attended by more than 1300 people. More than 670 suggestions provided feedback from individuals and community, industry, environmental groups, and authorities

(DSE 2005). From the policy's description and DSE website, the policy development process seemed be significantly inclusive of Victorians across the state.

Inclusion in planning, decision making, and implementation

Use of the words "our" and "together" in the title asserts a sense of solidarity amongst Victorians and implies shared responsibility in Victoria's water future. Consistent use of "our" and "we" throughout the policy also indicates solidarity. Yet, apart from discussion of the policy development process, public participation in planning and decision making is a limited focus of the White Paper.

Responsibility and accountability are primarily on the part of the water sector, comprised of state and local governments (including the Ministers for Water, Environment, and Planning), urban and rural water authorities, catchment management agencies, and supporting agencies such as Environmental Protection Agency, Essential Services Commission, and the Treasurer. Participants involved in implementation are the state government with the Department of Sustainability and Environment (DSE) as the lead agency; catchment management authorities (CMAs), water authorities, and local councils and government as primary delivery partners; and industry, irrigators, and households as secondary actors who are encouraged to make change.

The water authorities are to consult with their "customers" (DSE 2004, 140); CMAs are to consult with "communities" and "stakeholders" in their jurisdiction (DSE 2004, 163). Use of these terms indicates the respective roles of the government agencies and the public: Water authorities are in the business of delivering water to customers within a market-driven system. CMAs are protectors of the public trust and work with citizens in a democratic system. The terms imply the Victoria government subscribes to both an economic and a civic view of the world and recognizes that members of the public function in different capacities—as customers and citizens. Decisions differ for each person depending on the role being played (Dryzek 1997). Yet, in the case of the policy, the public in these roles seem passive receivers of services—their scope of influence being their households, farms, work places, and recreation areas. These roles are not activated unless one of the above agencies decides on a consultation process.

As part of community engagement by CMAs and customer consultation by water authorities, various venues allow for public participation. Regional management plans will form from stakeholder input. Stakeholders are considered urban and rural water authorities, catchment management authorities, DSE and other agencies, local government, and communities (DSE 2004). The management plan development process will be open and consultative,

"within a statewide and resources context" (DSE 2004, 26). The policy encourages community responses to securing regional urban supplies. Community groups may advise water authorities on the community's views concerning the options for water supply security in the case of the current drought continuing. However, other initiatives to secure regional water supply—water restrictions, permanent water savings, water conservation targets, recycling targets, long-term resources management plans, and community education and assistance programs—seem to be largely determined by the water authorities or other stakeholders not the general public.

Prior to pricing structure changes, and approval of them by the Essential Services Commission (ESC), the water authority must undertake sufficient consultation with customers about proposed changes and potential impacts and with the Minister for Water about how new structures fit with the water authority's Water Supply-Demand Strategy (DSE 2004). This consultation is appropriate because, if emphasis is on the user pays principle, they should have a say about services and what they will pay. Nor should the public pay for large dam construction that makes little sense economically and is environmentally damaging, or for desalination when less expensive and more efficient, feasible alternatives exist. In implementing price changes, communication strategies to advise customers of new pricing arrangements and opportunities to conserve water and save money are required (DSE 2004).

The policy states, "Everyone has a role to play in improving urban water management—individuals, households, community groups, industry, developers, local councils and the Government. Therefore, it is important that everyone works to a common purpose and objective" (DSE 2004, 93). Public education, incentives, planning provisions, technical change, pricing, and investments are the range of tools the policy proposes to achieve a common purpose of sustainable water management (DSE 2004). The public seem largely subject to these initiatives rather than participating in their development.

Decentralization: local knowledge and decisions

Through urban and rural water authorities and catchment management authorities—and local government—many decisions are decentralised to the local level. Development of regional sustainable management plans provide a process to address local issues and integrate local knowledge and concerns into policy and planning and ultimately into management practices. However, insufficient consultation—as discussed in the above subsection—can undermine the value of this decentralisation as a way to access local knowledge and create decision-making opportunities for those immediately affected.

All groups involved and represented

Other than government bodies, no group is discussed as part of the decision-making apparatus. Irrigators, urbanites, and industry are mainly recipients of government decisions, except in instances of customer or community consultation. The Victoria government values indigenous participation, where a "reform package" contributes to continued dialogue with indigenous communities: "The Government will continue to engage the knowledge and perspective of indigenous Victorians on land and resource management through its Indigenous Partnerships Strategy" (DSE 2004, 10). The government considers dialogue with indigenous communities to be a key input to the regional sustainable water strategies (DSE 2004). The extent of input from distinct groups might be gauged from interview data, which were not available from this thesis.

Education and awareness: creating partnerships and understanding

One of the policy's basic aims is to change everyone's behaviour towards water use (DSE 2004). The policy as a whole, while setting out changes to occur in the water sector and water legislation, acts as an educational tool: creating awareness and inculcating attitudes and actions to achieve sustainable water management as the policy defines it. The resulting perceptual shift is also part of the definition for sustainable water management, where communities "truly appreciate all the services water provides", "are able to make considered choices about how those services are delivered", and "have a stronger ethic of water conservation" (DSE 2004, 11).

The regional sustainable water strategies, which identify emerging issues and actions to address them, will function as a tool to communicate to regional communities about their water situation over the long-term and about actions they can take to improve it. These strategies will also incorporate public education as a measure to address future growth in particular areas (DSE 2004). DSE websites, such as the Our Water Our Future website (DSE 2005b), are another educational tool. They have information about water issues and programs to encourage water conservation, including information about permanent water savings in Melbourne. Regulation—such as permanent water savings—may also be important in awareness raising and educating the public about water issues, the implications of water use, and actions individuals can (and must in some cases) take to correct behaviours that have negative implications.

A Best Case Example?

Accessible information

While ensuring accountability is a focal point of the policy, accessible information is mentioned only a few times. Water authorities are to improve the information they provide to the public about necessary reductions and progress in water supply-demand strategies (DSE 2004). The CMAs are to produce annual reports on their activities, expenditures, resource conditions, river health programs, and Heritage River plans (DSE 2004). Presumably CMA reporting will be publicly accessible, but the policy does not indicate. The DSE website provides online access to the Victorian Water Resources Data Warehouse, which gives information on water quality and quantity, has a mapping interface, and will include information on groundwater management areas, streamflow management plans, water supply protection areas, and sustainable diversion limit catchments (DSE 2005c). Funds proposed by the White Paper will provide real-time access to data from more monitoring sites (DSE 2005c).

Resources available to enable participation

The policy makes little explicit mention of resources to support public participation. The policy itself provides a significant amount of information. Research initiatives to address emerging issues, such as climate change impacts, will provide further knowledge for better decision making. The policy explicitly states its financial commitment to specific program initiatives—some of which will likely include public participation. The government provides clear and specific principles and objectives which offer ample guidance for those implementing the policy. These guidelines encourage localised short-term interests to be expressed within a broader context. The institutional structure is meant to support local decision making, which will likely include some degree of public participation. Stone (1991) suggests that Victoria's salinity problem, particularly in the Murray-Darling Basin, provoked Victoria's institutional arrangement to become more publicly cooperative in integrated planning.

Conclusion

Although the policy development process supported public participation, public participation is not a central theme of the policy. Water authorities and catchment management authorities engage the public when necessary. These authorities offer a decentralised approach to decision making and implementation. Regional sustainable water strategies provide an opportunity for public interaction, decentralisation, and education and raising awareness. Information seems to be accessible and resources available, but this is not a central issue in the policy. The document does not suggest that not all groups are represented in decision making.

5.3.5 Intergenerational equity should be an essential consideration in planning decisions and water management

Does the policy recognise future human generations? Does it state actions that could ensure water for future generations?

The title of Victoria's White Paper indicates that the future is a central and explicit theme. Ensuring sufficient water for the future drives all initiatives indicated in the policy: reforming the water allocation system, ensuring sufficient water for the environment, conserving water in urban and rural spaces, and improving institutions. Anticipated population growth threatens future water security and is thus a primary motivator for developing this policy (DSE 2004). The policy recognizes that future water use cannot follow the past (DSE 2004). Rather, it seeks "sustainable water management of water, to allow all the benefits of water to be enjoyed today, while protecting the needs of future generations" (DSE 2004, 11).

Commitment to a "secure water future" is solidified by a AUS$320 million Victorian Water Trust. Prior financial commitments total AUS$34 million (DSE 2004). Programs to receive priority in funding include smart urban water projects and recycling programs, and sustainable irrigation practices. Water authorities will supply about AUS$225 million over four years to the government to support these programs (DSE 2004). The urban sphere is a primary focus for sustainable water management. To ensure water into the future, the policy proposes a sustainable urban water management framework. This framework includes reducing water consumption, balancing supply and demand, recycling and using alternative supplies, and securing water supply (DSE 2004).

Use on a renewable basis

Water efficiency, conservation, and recycling are characteristics of renewable water use and are all initiatives outlined in the policy. Improving efficiency and conservation—by urban users (regional and Melbourne), rural domestic and stock users, and irrigation—are key elements of the policy (DSE 2004). In anticipation of population growth and emerging risks, the policy plans for changing consumption patterns now and encouraging communities to embrace an ethic of water conservation (DSE 2004). This implies the government understands the correlation between behaviour and ethics.

Reducing consumption takes priority in sustainable urban water management because all Victorians can actively conserve water, conservation measures are less costly than finding alternative supplies, effluent discharge and treatment cost are reduced, greenhouse gas emissions from energy used for treatment and pumping are reduced, and conservation in combination with water recycling can enhance water flows for the environment (DSE 2004). For the

government, water conservation means using traditional water supplies more wisely. Education and awareness campaigns, pricing, regulation, rebates, and water sensitive urban development will help the government reduce drinking water demand and deliver water savings (DSE 2004). A wide variety of specific initiatives are meant to support conservation and renewable water use in the urban sphere (DSE 2004). The number and detail of the initiatives, and the commitment of funding to support them, illustrate the importance the Victoria government attaches to careful urban water use in its vision of a secure water future (DSE 2004).

Charging for water is one of the key methods to achieve conservation in the policy. Chapter 6 is devoted to "pricing for sustainability". To change behaviour and to contribute to conservation, reliability, and efficiency, the economic value of water's provision needs to be recognised: "Water is a precious resource and its value needs to be properly reflected...The price we place on water influences how we use it" (DSE 2004, 11). Pricing can (1) provide incentives to use water conservatively and, where possible, use water of quality that matches the purpose for which it is used, and (2) recover the full costs of sustainably managing water resources (DSE 2004). This economic instrument is supported by one of the policy's fundamental principles that users of services should, "wherever practical, pay the full cost, including infrastructure, delivery and environmental costs associated with that service" (DSE 2004, 7). Cost recovery principles require water authorities to recover their costs of operation, delivery, upgrading, and new investments (DSE 2004).

Irrigation is also a target for water conservation initiatives. Various water savings techniques for irrigation are suggested (DSE 2004). The government will boost funding to Water Smart Farms and Sustainable Irrigation Land Management programs to hasten improvements in irrigators' water security, reduce irrigation's adverse impacts, address legacy of history, and ensure water for environmental flows (DSE 2004). To reduce pollution-caused scarcity and environmental impacts, the government is introducing tradable permits for saline drainage within "carefully framed" regulation and continuing training and incentives to promote best practice (DSE 2004, 87).

Recycling water means reusing water and limiting unsustainable use of surface and groundwater. Water recycling is a supplementary approach to water conservation. Water recycling initiatives are developing under various water authorities in cooperation with the state government. Groundwater management area plans and sustainable water management plans support sustainable use of surface and groundwater. Water recycling will be further discussed in section 5.3.7.

Collecting data for future generations' use

The policy's content seems well informed by previous research about the current availability of water resources and their use, environmental impacts of water use and requirements for water, and options for achieving sustainability goals. Understanding of in-stream flow needs and groundwater seem strong and the government is using that knowledge in decision making. As a second step in long-term water resource planning, the government will publish and update every five years a State Water Inventory of water resources and associated conditions, pressures, and trends. The government will use this inventory to prepare regional sustainable water strategies (DSE 2004). One planned area of further research is emerging risks, such as climate change (DSE 2004). Other areas of research include recycled water in particular areas and for specific uses (e.g., irrigation), stormwater harvesting, desalination, and aquifer storage and recovery (DSE 2004). Presumably, collected data will be shared amongst the government agencies and contribute to state-to-state relations over water-related issues. This research will help the state cope with future constraints and develop improved initiatives in the future.

Adaptive management

The policy defines adaptive management as "responding to changing demands, community expectations and new knowledge, whilst ensuring the objectives of Environmental Water Reserves are being met" (DSE 2004, 18). Water conservation and renewable use provide the state with a buffer that allows adaptation to changing circumstances, such as population growth, climate change, and other societal and natural changes. Long-term planning processes allow change to be addressed as it arises and ideally ensure water supply security for urban areas, industry, and the environment—now and in the future (DSE 2004).

The government considers the White Paper to be the first step in long-term water resource planning. The state water inventory will provide a baseline for measuring change over time. The five regional sustainable water strategies, with stakeholder input, will focus on specific problems and opportunities (DSE 2004). The strategies will identify and suggest ways to manage emerging threats to supply and quality of water for cities and towns, industry, and rivers and aquifers. They will exploit new opportunities to improve water security and the health of rivers and aquifers. Flexible and functioning on 15-year time horizons, they will become the new planning framework of the government to decide large-scale, long-term changes in water use (DSE 2004). For example, decisions in the future about environmental allocations of water will be made within these strategies. The Minister for Water will also, as part of this process, "determine priorities and select projects for water recovery, set volumes and methods

of recovery and investment levels" (DSE 2004, 48). CMAs "will advise on regional priorities and required flows, based on scientific evidence" and "will aim to supply enough water to achieve community management objectives, maintain important environmental assets and ensure basic ecological health" (DSE 2004, 48). If these plans are regularly updated to reflect change, they will serve an adaptive management function.

Other adaptive management mechanisms are water markets and improvements to water-use efficiency. These are the preferred mechanisms of the government to allow for adjusting entitlements; but the government retains powers "to intervene if the assumptions, upon which our current water entitlements are based, are shown to be no longer valid" (DSE 2004, 29). These mechanisms, in addition to the water strategies, provide flexibility, the capacity for ongoing change, and the ability to adapt to change.

Precautionary principle

The policy assumes that Victoria must plan for population and climate changes by reducing water consumption and altering the water allocation system. Implicitly these initiatives indicate use of the precautionary approach. Specific actions that imply precaution include permanent water savings, water recycling initiatives and third-pipe systems in new developments, pollution-reduction incentives and regulation, and the environmental water reserve. For rivers that are not over-allocated, the EWR will be set on a precautionary basis to maintain a sustainable diversion limit and protect the "environmental values of a particular river or aquifer" (DSE 2004, 44). The policy not only aims to solve immediate problems but prevent further over-allocation, pollution, and excessive use in striving for a secure water future for Victorians.

Representatives for future generations in decision making

Future generations are a central consideration throughout this policy. There seem to be no specific representatives for future generations—such as youth—but future generations have a strong presence in the policy through the language, principles, and initiatives. Consistent mention of environmental protection initiatives illustrates the policy's desire to provide water for future generations, not just the present one.

Conclusion

Intergenerational equity is a central theme in the White Paper. Water conservation and recycling initiatives aim for renewable water use. Data already being collected will benefit future generations. Water conservation, planning processes, water markets, and rejection of new

dam construction support adaptive management approaches. These initiatives and establishing water allocations for the environment make the Victorian government's approach precautionary.

5.3.6 The environment should have standing in water use management

Does the policy recognise the value and needs of the environment? Do stated actions ensure the environment's needs are met alongside those of current and future human generations?

Environmental value recognized

A central theme of Victoria's policy is protecting environmental value. Chapter 3 is devoted to how the government will restore rivers and aquifers, and part of chapter 2 explains allocation provisions for meeting environmental needs. Threaded throughout the document is ecological language. To support environmental health, the government has committed AUS$100 million over the next four years to protect and repair river and aquifer health. Previous financial commitment included the Healthy Rivers program (AUS$16 million) and AUS$80 million to specific river systems (DSE 2004). These initiatives contribute to sustainable water management with "healthy rivers, aquifers, floodplains, estuaries and catchments capable of delivering a wide range of water services" (DSE 2004, 11).

The value of these natural water systems is primarily instrumental. Maintaining economic, social, recreational, and cultural value now and into the future requires ecological health (DSE 2004). Victoria's farmers, irrigators, and their global competitiveness rely on water availability with appropriate timing (DSE 2004). Industry and commerce rely on water for various processes and contribute to the economy. Water systems obviously have social value in delivering drinking water, servicing sewerage, and contributing to human dignity. In-stream uses of natural water systems include recreational uses and contribute to the tourism industry. Water bodies hold cultural value as landscape that embodies history, cultural phenomena, and sacredness for peoples (DSE 2004). Healthy natural and human-made water systems are also necessary for the possibility of future human generations (e.g., chapter 3's title, "Restoring Rivers and Aquifers for Future Generations").

Environment has standing

The policy also recognizes the intrinsic value of ecosystems: the "poor health of our rivers" is contributing to species loss—fish, birds, other animals, and plants—and two-thirds of wetlands are in poor or very poor condition (DSE 2004). To protect this intrinsic value and

environment's instrumental value, the White Paper introduces the environmental water reserve. This legal entitlement is held by the Crown and gives the environment legal standing in terms of water allocation and use (DSE 2004). The EWR is the "share of water resources set aside to maintain the environmental values of a water system and other water services which are dependent on the environmental condition of the system" (DSE 2004, 154). The EWR not only applies to surface water but also to groundwater. Recognition of existing entitlements and setting extraction limits, called permissible annual volumes, will establish EWRs in groundwater systems (DSE 2004).

Other reforms to support the environment's intrinsic value include: using the Victorian River Health Strategy to address all aspects of river health; increasing resources to implement the Strategy; enhancing EWRs in stressed rivers; investing in mechanisms such as water savings projects, water reuse, and the water market to recover water for the environment; progressing with the recovery of the Snowy and Murray Rivers; restoring other stressed rivers by improved environmental flows; and delegating management of EWRs to local CMAs (DSE 2004). The Victorian River Health Strategy offers a policy framework for managing the health of rivers, floodplains, and estuaries on a state-wide scale. It addresses environmental flows, water quality, and riverine habitat (DSE 2004). Funding (AUS$100 million) will seek significant improvement from degradation by 2010 (DSE 2004). Regional river health strategies will set community management objectives and management targets in developing an integrated program of river restoration.

Quality impacts on ecosystems

The policy offers only a few approaches to protecting water quality. In the agricultural sector, salinity (especially in the Murray-Darling Basin (Smith 1998)), drainage, and nutrient problems remain significant despite "strict rules" for new irrigation developments and training and incentives under land and water management plans (DSE 2004, 87). The policy is introducing "smarter or tougher" measures of pollution charges, tradable pollution permits, and regulation (DSE 2004, 87). Because tradable permits would make it more difficult to introduce other tools, the government has decided on regulation through water-use licences, reflecting "its awareness that strong drivers for environmentally-sound water use are already in place" (DSE 2004, 87). Water authorities will also pay an "annual environmental contribution based on a percentage of its existing revenues" to better account for environmental impacts (DSE 2004, 129). New pricing structures are meant to reflect "'externalities' (the consequential impacts) associated with providing water services" (DSE 2004, 129).

The government recognizes the significance of urban discharge, especially the ability to use recycled water as an alternative water supply (DSE 2004). Industry and commerce contribute high levels of salt to treated effluent and heavy metals and other pollutants to biosolids. Previously management of this waste was to protect public health, sewerage systems, and the environment. Objectives of waste minimisation and resource efficiency, including use of recycled water and biosolids, must now also be considered. New initiatives will address inconsistencies between water authorities regarding equal treatment for industry; poor linkages between waste management and use of recycled water and biosolids; and lack of a whole system approach to waste management (DSE 2004). The Victorian River Health Strategy and associated regional strategies will address, with other issues, declining water quality (DSE 2004). Regional sustainable water strategies will identify and address threats to water quality (DSE 2004).

Quantity impacts on ecosystems

The policy is far more attentive to quantity impacts on ecosystems than to quality impacts. While degradation is partially due to poor quality of water, "[m]any rivers have reached or exceeded the sustainable limits of diversion" and are thus losing their functionality (DSE 2004, 92). Flow regime is essential to river ecological health. High flows stimulate fish breeding and maintain estuary openings, floods replenish floodplains and flush organic material into the river, and groundwater provides base flows in many waterways maintaining pools as fish refuges during low flows (DSE 2004). To recognize that flow regime is crucial to environmental health, the government introduced the environmental water reserve (DSE 2004).

In establishing the initial EWR, rights of existing entitlement holders are recognized (DSE 2004). The initial EWR may not be sufficient for restoration; to prevent degradation in over-allocated aquifer and river systems, the government may have to determine an adequate volume at a later date (DSE 2004). For rivers that are not over-allocated, the EWR will be set on a precautionary basis to maintain a sustainable diversion limit and protect the "environmental values of a particular river or aquifer" (DSE 2004, 44).

Environmental and consumptive entitlements on regulated rivers will be managed using a bulk entitlement system—a system to be established across the state in two years (by the end of 2006). Entitlements will be issued to rural and urban water authorities to distribute for consumptive use, and bulk entitlements will be allocated to the environment where there has been a decision made to recover water for EWR enhancement using the criterion of river ecological health (DSE 2004). Tools to enhance EWR in regulated systems include: sustainable water strategies; water purchase for river systems; water recycling and reuse in urban areas;

demand management and water conservation strategies; 20% portion of sales water; irrigation system reconfiguration; private water donations; and on-farm water savings (DSE 2004). Rivers such as the Murray, Snowy, Thomson, and Macalister will receive particular attention and the policy sets out measures of restoration and protection of flows particular to each of these rivers.

Unregulated rivers make up the majority of stream length across Victoria but supply less than 10% of water used (Productivity Commission 2003; DSE 2004). Water authorities allocate this water through bulk entitlements and, to farmers for irrigation, through licences. What remains after accounting for existing bulk water entitlements and licensed diversions plus any additional water available under sustainable diversion limits comprise the EWR in these systems. In highly stressed rivers considered to have high environmental value, Stream Flow Management Plans (SFMP) are developed under the *Water Act 1989* and will enhance the EWRs (DSE 2004). SFMPs will set out clear objectives for achieving EWRs and will clarify security levels for water users and include rules for rostering, trading, and granting of new licences (DSE 2004, 23). Other mechanisms are also available to enhance EWRs in unregulated systems: better management of existing diversions; the introduction of sustainable diversion limits for winter months; and Groundwater Management Plans (GMPs) to manage stressed aquifers (DSE 2004).

Environmental entitlements are considered to have more flexibility than consumptive entitlements; hence water authorities can provide "different levels of service" to the environment than to irrigators and other consumptive users (DSE 2004, 65). The water system will favour consumptive use, even where the decision to enhance the EWR has taken place (DSE 2004). Bulk entitlements for the environment, when held in storage, can be traded on the temporary market, providing this does not disrupt achievement of EWR objectives (DSE 2004). But such trading must be approved by the Secretary of DSE based on advice and target ecosystems' conditions will be annually assessed. Funds from such trades will be put towards environmental water management costs, infrastructure to improve effectiveness of environmental flows, and temporary purchase of water when necessary (DSE 2004). Although the EWR has high priority in the allocation system, one study suggested that, in practice, this obligation is fulfilled after other high priority entitlements but before lower priority entitlements (Productivity Commission 2003). Thus an informal hierarchy is in place—one difficult to challenge due to the difficulty of representing environmental needs and the realities of anthropocentrism.

Representatives for environment in decision making

The state government, with the DSE as the lead agency, sees itself in a stewardship role (DSE 2004). It has delegated the responsibility of river caretaker to the catchment management authorities (CMAs). As "caretaker of rivers", the CMAs are responsible for protection and restoration of catchment areas (DSE 2004, 164). The government considers CMAs as the best placed to manage the operational delivery of the EWR in regional Victoria; while Melbourne Water will undertake this role in the metropolitan area as the waterway manager (DSE 2004). CMAs will manage any new bulk entitlements for the environment. Water authorities and CMAs will communicate to develop the most effective delivery pattern for the EWR without impacting existing entitlements (DSE 2004). Thus CMAs are the primary institutional representative for the environment.

Ecosystems as functioning systems

The policy seems to recognize ecosystems as functioning systems that need to be protected. However, it consistently uses the term "environment". Based on the policy's definitions of the terms "environment" and "ecosystems", environment is about surroundings, interdependent relationships, and includes humans. Ecosystems are also about relationships but seem more separate from humans (DSE 2004). Yet the policy discusses the environment as separate from human systems although interdependent. Regardless of the policy's inconsistency, water systems are "the lifeblood of Victoria" (DSE 2004, 9) and must be protected to protect the functionality of Victoria's ecosystems.

Conclusion

The policy clearly recognises environmental value and has moved as far as legal status for water allocations to the environment and meeting environmental needs. Yet statements of consumptive use taking priority in water systems and trading EWR water in storage illustrate that finding the right balance may be a matter of juggling priorities and may be less ecocentric than initially perceived. Quality issues for ecosystems receive far less attention than quantity, although problems exist from irrigation practices and urban effluent. The catchment management agencies are the primary representative for the environment. Ecosystems or the environment are recognized as functioning systems.

5.3.7 *Water management requires a holistic approach*

Does the policy treat water issues holistically, using an ecosystem-based approach? Does it state action plans to address water issues holistically?

Holistic approach

Overall, the White Paper attempts to take a holistic approach in water-use management. The approach is strategic, not entirely comprehensive, and is related to an integrated approach. The catchment approach of the policy follows ecological boundaries for water. The environmental water reserve and restoration initiatives support ecological integrity. Research and data collection support and are advocated by the policy. The state inventory allows for ongoing monitoring. It seeks an adaptive management approach, as discussed earlier. By seeking a balance between environmental, social, and economic values, the policy recognizes the interaction of and dependence of human systems and ecosystems. The policy also outlines organizational change and supports interagency cooperation to achieve integrated, nested, efficient, and accountable water governance. The policy recognises the interaction of land systems (and human use of them) and water systems—an interaction discussed next—and the effect of weather systems from seasonal to climate change. The policy, however, does not explicitly include extensive public participation in water governance.

Land use and water interactions

CMAs' mandate is to address both land and water use in planning and management at the catchment scale (DSE 2004). The policy identifies examples of land use affecting water that include: plantations and forestry practices, water diversions and dams, and agricultural, urban, and industrial effluent. Examples of water use affecting land include salinization of soil due to irrigation.

Large-scale plantations introduced in the catchment or changed logging regimes "affect the quantity of surface run-off and groundwater recharge" (DSE 2004, 34). The policy claims the *Planning and Environment Act 1997*, the *Catchment and Land Protection Act 1994*, and the *Code of Forest Practices for Timber Production*—legislation which manage plantations and forestry practices—generally do not address plantations' impacts on the quantity of surface water and groundwater resources (DSE 2004). Tools that will address negative consequences of plantations are planning provisions, incentives, and pricing systems. Current land uses will be used as a baseline and will not be affected by planning arrangements. In a major balancing effort, the Victoria government released *Our Forests Our Future* to signifi-

cantly adjust the timber industry and sustainable management of Victoria's forests by seeking "to balance communities, jobs and the environment. It also recognises the many roles our forests play—in protecting biodiversity, as water catchments, as sources of timber and non-timber products, as the generator of employment in many small rural communities, in nature conservation, in recreation and eco-tourism and as carbon sinks" (DSE 2004, 36). Specific to Melbourne, the Melbourne Water Resources Strategy raises the issue of the inter-relationship between logging in state forests that supply water to Melbourne and the available water yield from these catchments (DSE 2004).

The policy states no plans for future dams because they will not create more water and will take water from other users (DSE 2004). Thus land-use damage for dam construction will not be extended; although the impact on land and ecosystems is not explicit. Some dams, such as Lake Mokoan, are being decommissioned to better serve the environment and the irrigation community (DSE 2004).

A number of initiatives will address urban use of water including the Country Towns Water Supply Sewerage program, recycling efforts, stormwater use as a resource in new developments, as well biosolids management as fertilizer or fuel substitute and care by waste contributors. These initiatives imply a consciousness of effects caused by urban infrastructure. Water authorities are the key bodies dealing with these issues. Sustainable water strategies will help water authorities collaborate and coordinate planning processes and sustainable development of land at "the urban fringes" (Smith 1998; DSE 2004, 151).

Salinisation of soil, where natural or human activities increase concentrations of dissolved salts in water and soil, is an ongoing problem and affects water quality of stream run-off (Smith 1998), partially due to irrigation. This salinisation has been a significant issue in the Murray-Darling Basin and some other areas of Victoria (DSE 2004). Training, incentives, a tradable permit scheme, and regulation will contribute to reducing salinity issues (DSE 2004). Irrigation distribution systems will be reconfigured and 'rationalised' where land is not suitable due to salinised soil, or where land is flood-prone, with outdated infrastructure, or experiencing urban incursion (DSE 2004).

Surface and groundwater interactions

The Victoria White Paper explicitly recognises that surface water and groundwater are inextricably linked and thus must be "managed together" for a healthy environment (DSE 2004, 24). The policy recognizes three types of aquifer: not highly connected to surface water, highly connected to surface water, and those not connected to surface water with non-renewable water (DSE 2004). To address the water requirements of these systems, environmental wa-

ter reserves are set accordingly (DSE 2004). Although surface and groundwater are interconnected, the policy recognizes their different flow regimes by designating areas as groundwater management areas (GMAs) as the primary management unit for groundwater. GMAs are in addition to catchments managed by CMAs. Each GMA that is highly allocated or stressed will fall under a Groundwater Management Plan (GMP) and be declared a water supply protection area. A permissible annual volume (PAV) will be set for each GMA (DSE 2004).

Other issues to consider are water sharing agreements with South Australia and New South Wales. Offshore oil and gas reserves may negatively cause groundwater levels to drop in Gippsland at the point of extraction or along the coast (DSE 2004). Aquifers may also be used to store and recover freshwater as a temporary option for later recovery and reuse of alternative water supplies (DSE 2004). Thus groundwater is a significant water resource and is considered closely with surface water sustainability.

Quality and quantity considered together

The primary focus of the White Paper is quantity issues. Water quality issues are rarely mentioned. Attention to sewerage and urban effluent, recycled water, and irrigation-caused salinization imply recognition of quality issues. Yet due to the lack of attention to water quality, the two attributes of water do not seem to be managed together.

All types of water as one resource

A fundamental idea in this policy is that all water is valuable, "from the moment rain falls in our catchments… to the recycling plant" (DSE 2004, 2). The policy states, "we can put water to better use by recycling and reusing it. We can also capture the potential of stormwater to ease the pressure on our rivers" (DSE 2004, 11). Valuing water in this way provides part of the policy's rationale, moves the state towards sustainable water management, as the policy defines it, and is one of the principles of sustainable water allocation (DSE 2004). All types of water (surface water, groundwater, stormwater, and recycled water) will be managed under a single allocation framework (DSE 2004). The *Water Act of 1989* did not include recycled water and stormwater in what the government has control over; but future renditions of the *Water Act* will reflect this idea. This shift allows the government to manage water more holistically and make use of all water rather than only immediately available surface and groundwater.

The initiatives to recycle water, use alternative supplies, and use water fit-for-purpose are key elements of the policy's sustainable urban water management policy framework (DSE 2004). The government aims to be recycling 20% by 2010—11% is already being recycled.

Recycled water comes from treated effluent. Its benefits include reduction of discharges to marine and other environment (DSE 2004), freeing up water for the environment, agriculture, or industrial expansion, and potentially providing extra drinking water (DSE 2004). The challenges the policy identifies are securing markets for large amounts of recycled water; establishing infrastructure for recycled water; managing environmental (including energy use) and social impacts of construction and operational activities; and high capital and operating costs and thus financing such projects (DSE 2004). To assuage concerns over impacts of recycled water, the planning and regulatory framework will ensure "use of recycled water and alternative supplies is consistent with environmental and public health protection requirements" (DSE 2004, 122).

Stormwater, primarily an issue in urban areas, is being "managed from a drainage perspective rather than as an alternative water supply" (DSE 2004, 117). Like recycled water, possible uses of stormwater include use on golf courses, racecourses, sporting grounds and public open space, watering gardens, and toilet flushing (DSE 2004). New urban development could integrate stormwater use. The government plans to produce Water Sensitive Urban Development guidelines to encourage developers, industry, and local government to achieve 25% water savings in new developments (DSE 2004). "Third-pipe systems" can distribute recycled water in new residential, commercial, and industrial developments; retrofitting already established developments has prohibitive costs and disruption. Costs may be significant for the new developments because they are often far from treatment plants. But these systems will allow developers to offer 'drought proof' gardens, parklands, and recreational areas (DSE 2004).

Management of biosolids, from urban water waste, is part of recycled water schemes. Biosolids are valuable as a resource containing essential nutrients and organic matter and can be used as a natural fertilizer for agricultural and park soils. They may also be used as a substitute for fossil fuels (DSE 2004). EPA Victoria requires all sewage treatment licence holders to prepare biosolids management plans (DSE 2004). Prior financial commitment to recycled water initiatives was AUS$2 million in research into Water Conservation and Water Recycling (DSE 2004). Priority programs for initial funding include investing in urban water projects and recycling programs (DSE 2004).

Watershed unit

Catchments (or watersheds) are considered the main hydrological unit within which to integrate land use and water issues and catchment management authorities are the institutional body to do this (DSE 2004). An integrated approach to environmental flows, water quality,

and river habitat is considered the only way of "[i]mproving the health of Victorian rivers" (DSE 2004, 42). For example, using the EWR to improve environmental flows will be managed "within a broader integrated river restoration program to ensure we achieve healthy rivers, floodplains, estuaries and catchments" (DSE 2004, 62). Regional river health strategies and catchment management authorities will establish priorities and integrated programs for the region to achieve river restoration and protection (DSE 2004). Victorian River Health Strategy (2002) extended CMAs' role from waterway and floodplain management to "caretakers of river health" as the first step in establishing institutional arrangements to deliver integrated river protection and restoration (DSE 2004, 63). The policy identifies gaps and inconsistencies in institutional roles and responsibilities that "make it virtually impossible to take a whole of catchment approach to waterway and floodplain management and managing the effects of stormwater runoff" (DSE 2004, 147). The next section deals with how the government plans to rectify this issue.

Nested and collaborative governance

Collaboration amongst water sector bodies is central to integrated water management and addressing local and broader issues of water-use management. Specifically the National Water Initiative provides a broad framework. Within this framework, the states, with federal government assistance, can work towards jointly agreed-upon objectives, share and learn from each state's experience, and yet maintain the independence of their own actions. The state government, as the body with primary jurisdiction over Victoria's water provides the state-wide perspective and guidance to nested entities and acts as a coordinating body for those entities. DSE as the lead agency for water and environmental issues reports to and represents the state government. Water authorities and catchment management authorities carry out responsibilities within their regional jurisdictions and liaise with each other and the customers or communities in their jurisdictions. CMAs and water authorities also communicate with local governments. Thus collaboration occurs among these entities: government agencies and stakeholders, including communities and customers, ministries (Ministers for Water, Environment, and Planning and the Treasurer), government agencies (Victoria EPA, Department of Human Services, Department of Sustainability and Environment), and authorities (water authorities, local government, CMAs) (DSE 2004).

One of the central aims of the White Paper is to develop an innovative, accountable, and capable water sector, as chapter 7 emphasises. This idea is part of the policy's definition of sustainable water management and a fundamental principle underlying the policy (DSE 2004). The government hopes to foster "robust governance": "policy makers, regulators and

service providers working towards Government objectives and policies; capable, innovative, and accountable water authorities and CMAs; and a culture of service delivery that fosters customer service, continuous improvement, strong business practice, prudent and efficient financial management, collaboration and cooperation, innovation and excellence" (DSE 2004).

To improve overall governance, clarity of roles for organizations is significant in improving accountability and avoiding conflicts of interest (DSE 2004). The policy declares improvements are necessary in "the arrangements for regulation of water trading, for monitoring compliance with bulk entitlements, for managing water storages, recycled water and stormwater, and for shareholder governance of water authorities" (DSE 2004, 142). Better monitoring and compliance of water use with entitlements are other areas of improvement (DSE 2004). This information is vital for the Statewide Water Inventory preparation, to support regional sustainable water strategies, and to manage resources sustainably (DSE 2004). Greater public access to information is also essential to water sector accountability; it will provide entitlement holders and other community members confidence that the water allocation framework is being managed responsibly (DSE 2004).

Improving capability and effectiveness in the water sector requires not only the organization's financial health "but also its culture, its alignment and focus upon strategic objectives, and the depth and breadth of skills in the organisation to drive innovation and respond to changing circumstances" (DSE 2004, 146). The mergers of two or more authorities may improve sustainable management of water supplies in some regions by enabling an integrated approach to service provision, enhancing business capability by combining skills and expertise, eliminating system, assets, and equipment duplication, and simplifying relationships with other agencies (DSE 2004).

Conclusion

Seeking balance between environmental, economic, and social values, Victoria's White Paper approaches water issues holistically. Land and water interaction is explicitly addressed, but the primary focus is the effects on water quantity. The policy does not establish a connection between water quality and quantity and rarely addresses quality issues. Interactions between surface and groundwater are well addressed through environmental water reserves, management plans, and protection initiatives. The policy explicitly considers all sources of water as one resource and seeks to reconsider "waste" water as a valuable resource through recycling initiatives. The watershed approach is not emphasised but is embedded as an approach to water governance and land-use management through the CMAs. The policy aims

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for collaborative governance, among other characteristics, in an already nested governance structure.

5.4 CHAPTER SUMMARY

The State of Victoria's 2004 White Paper, *Securing Our Water Future Together*, meets the criteria of the water ethic in many ways. Limits and variability are addressed. The government treats water as a common shared resource and integrates elements in its allocation system to meet community and environmental objectives. Common governance is not part of Victoria's approach, however. Water security for intragenerational equity seems to be ensured. While the government seeks community and stakeholder involvement in some instances, full participation is not an element of the policy. Intergenerational equity is a central rationale for the policy and is well supported by the policy's initiatives. Equity for the environment is central to the policy's rationale and initiatives. Overall, the policy is taking an integrated holistic approach to water and associated issues.

The following chapter compares the preceding analyses of Alberta's *Water for Life* (chapter 4) and Victoria's *Securing Our Water Future Together*.

6. COMPARISON:
VICTORIA'S *SECURING OUR WATER FUTURE TOGETHER* AND ALBERTA'S *WATER FOR LIFE*

6.1 INTRODUCTION

Precedent for Australian and Canadian comparison goes back as far as the late 1800s. Australian water law had an early influence on Alberta water law, where Canadian *North-West Irrigation Act* of 1894 was the first legislation for managing water in Alberta and the remainder of what was then called the Northwest Territories. Section 4 of this legislation vested right of water use in the Crown and was almost entirely copied from Australian irrigation law of 1886 (De Loë 1994). More recently, Handmer *et al*. (1991) drew on Canadian experience of negotiation and mediation in water governance to discuss how best to breach conflict over water resources in Australia. In particular, Dorcey's (1991) chapter on conflict resolution in Canada represents a significant example of comparison. Other examples of Australia-Canada comparative literature include Bartlett and Milroy (1999), Havemann (1999), and Mitchell (2002). This thesis builds on this body of comparative literature. The present chapter compares the documents of Alberta and Victoria based on the water ethic principles and general similarities and differences relevant to water management. Given Alberta is the focal case study, this comparison highlights strengths and weaknesses of *Water for Life* in relation to the ethical principles described in chapter 3 and the possible improvements that would make it a more effective water strategy.

6.2 OVERALL COMPARISON

Of Australian states, Victoria may be the most appropriate for comparison to Alberta in terms of topography and climate. Both areas have experienced historical and very recent drought and each understands the economic, if not social and environmental, implications. These experiences have motivated drafting of the policy documents. Alberta has more water available per capita than Victoria—a point that affects the motivation and strategies each jurisdiction proposes to address water-related challenges.

Historically and politically, Australia and Canada are quite similar. Both countries emerged from British colonies. Both have a history of conflict with and subjugation of the

indigenous groups. For both nations, much of the population growth is from immigration (Handmer *et al.* 1991), lending cultural and ethnic heterogeneity. Both nations have similar governance structures based on parliamentary political systems. Both have powers split between the national and state or provincial level, where significant power over water is in the hands of the state or province. Federal governments have general powers over foreign affairs, defence, and federal territories, and play a role in transboundary water issues. Canadian federal government has jurisdiction over First Nations reserves. The *Native Title Act 1993* of Australia's federal government can confer rights to indigenous peoples, but access to water resources must also be in accordance with relevant state legislation (McFarlane 2004). Generally in Australian states, indigenous water rights are included as basic landholder rights and, like environmental flows and industrial and town water supplies, have priority over irrigation water supply (Department of Water 2006). At the state and provincial level, the institutional arrangement is similar, with Victoria's Department of Sustainability and the Environment and Alberta Environment as the respective lead agencies for water management. Victoria's government has agencies at the regional and catchment level: water authorities and catchment management authorities. Alberta's government has three regional administrative areas and now also relies on voluntary public participation and representation for watershed-level management.

While comparison seems straightforward, some caveats exist. History and basic culture are very similar between the jurisdictions; however, government and the culture of governance, particularly around natural resources, may vary considerably. The governance culture will affect which strategies are chosen. *Securing Our Water Future Together* at 168 pages is far more detailed than the 32-page *Water for Life*. The documents' difference in length is significant; because the analysis here is at the ethical, conceptual level, however, the comparison maintains validity. Both documents are meant to effect change. However, Victoria's document is meant to effect legislative change, while acting as an educational awareness-raising tool; Alberta's strategy is largely a vision statement to effect change in water governance and raise awareness, but is without legal implications.

6.2.1 Document overview comparison

The policy documents share similar stated purposes. Victoria seeks a secure water future for Victorians; Alberta seeks high quality of life for Albertans now and in the future. The strategies to achieve this purpose are ostensibly similar—sustainable water management (Victoria) and wise water management (Alberta)—although closer analysis will reveal substantial differences. The rationale driving the production of each is similar: limits to water availability;

unpredictable water availability in variable climate; population and economic growth; impacts on aquatic ecosystems and human dependence on the environment; and effects of land use on water. Victoria's government also recognizes the necessity to change the pattern and rate of water use; water's price should reflect its value; and all water resources are valuable. Alberta's strategy more explicitly identifies risk to Albertans' well being than does Victoria's policy. Goals expressed in each document are not dissimilar with attention in both documents to social, economic, and environmental values of water.

The language of both documents can be broadly characterised as sustainability discourse. Sustainability discourse, where environmental, social, and economic values are not seen as conflictive (Dryzek 1997), may encapsulate most of the ideas present in the Alberta and Victoria documents. For example, *Water for Life*'s three goals—healthy aquatic ecosystems, safe secure drinking water, and a sustainable economy—suggest the attempt to balance social, economic, and environmental values. The Victoria government's redesign of the water allocation system is meant to balance economic, environmental, and social values. Neither document recognizes any incongruence of achieving social, environmental, and economic goals simultaneously.

Another approach evident in each document is problem-solving discourse, where political-economic status quo is accepted but changes are necessary "to cope with environmental problems, especially through public policy" (Dryzek 1997, 14). The outcome-based approach evident in both documents—goals, objectives, action items, initiatives, and perhaps even the overall idea of a strategy—indicates a problem-solving approach. Performance measures to evaluate strategies also fit this description. Planning processes are another approach to solving problems. The metaphor of tools (e.g., economic instruments) indicates problems can be solved by adjustments without changing the whole system. Both documents tinker with the institutional structure—by adding public forums and advisory groups (Alberta), or by implementing policy to improve accountability and innovation (Victoria).

Democratic pragmatism, a specific problem-solving discourse described by Dryzek (1997), may well characterize *Water for Life*. The "network of partnerships" (the nested system of public participation in water governance) draws on this discourse's focus on democracy. Direct democracy is the primary mode of solving problems rather than only a representational form of democracy through a set of institutions such as elections and parliament. Dryzek (1997, 85) suggests for complex problems, "relevant knowledge can't be centralized in the hands of any individual or any administrative state structure". Problem solving should be characterized by a flexible process involving "cooperation across a plurality of perspectives" (Dryzek 1997, 85). The new participation model which the strategy lays out illustrates a shift towards this approach. Dryzek (1997, 85) describes "environmental pragmatism" as

battling "all attempts to propose moral absolutes to guide environmental affairs, which are treated instead as ripe for tentative problem-solving efforts in which a plurality of moral perspectives is always relevant". *Water for Life*'s lack of definitive guidelines, such as how to protect healthy aquatic ecosystems and to what extent, fits with this step away from moral absolutes. Devices indicating the democratic pragmatism approach used by the Government of Alberta include public consultation and policy dialogue oriented towards consensus and applied to strategic issues or specific cases (Dryzek 1997).

Economic rationalism, another problem-solving discourse, is present in both policy statements, but more so in Victoria's policy. Alberta's government seems hesitant to fully embrace it. This hesitancy may emerge from the uneasy combination of consumers and citizens, where the economic rationalist approach recognizes individuals as customers and democratic pragmatism recognizes them as citizens. Dryzek (1997, 102) characterises economic rationalism as a "commitment to intelligent deployment of market mechanisms to achieve public ends", recognising that "markets in environmental goods do not always exist and so often need to be created and managed". Because Victoria has created a water market for tradable shares of water, Victoria has embraced economic rationalism to achieve efficient and best use of water for the Victorian community. The state also aims for urban "customers" to pay the full cost of the water services provided by the state so as to recover costs and to encourage efficient use of a scarce resource. Tradable pollution permits are an approach to minimise salinisation effects of irrigation and fit an economic rationalist approach. Alberta's government is researching economic instruments and is introducing a water market for water allocation transfers, both to encourage efficiency.

Obviously an economic rationalist approach would not assist the environment to "buy" water. Therefore, the Victoria government also embraces characteristics of ecological modernisation (Dryzek 1997) and allocates water to the environment. Redesign of the water allocation system to include the environment as a user of water treats environmental requirements for water as a structural problem and thus adopts aspects of ecological modernization. This redesign is meant to indirectly serve the public interest. In ecological modernisation, nature is "treated as a source of resources and a recycler of pollutants, whose capacities and 'balance' should not be overburdened" (Dryzek 1997). This discourse takes the capitalist economy for granted but does not require "a de-emphasis of the state" (Dryzek 1997, 144)—an entity which is very much in the centre of Victoria's water management with corporatised government agencies and a claim on ownership of all water resources.

This analysis of discourse reveals the approach each government is adopting to address conflicting needs and the perceived relationship between human and natural entities. Strategies emerge from these approaches. Victoria's policy's strategies include reallocation of water

to balance economic, environmental, and social values; restoring rivers and aquifers for future generations; and creating more accountable and innovative institutional arrangements to support changes. *Water for Life*'s strategies are research and knowledge generation; participation; and water conservation. All strategies support problem-solving approaches. The next section analyses the chosen strategies in more detail.

Indicators of commitment to strategies include financial commitment. *Water for Life* fails to specify financial commitment to its ideas. Victoria's document specifies both past and future financial commitment to its ideas. Differing legal commitment of the policy documents may represent two approaches: a legislative approach (Victoria) with structures, statutory plans, administrative processes, and so on; and an approach characterised by inclusion, co-management, and multiple mechanisms (Alberta) (Schofield and Burt 2003). Planning commitment for each differs as well: *Water for Life'*s outcomes are attached to a ten-year timeline (until 2014); Victoria's government has a 50-year horizon (DSE 2004). The next section compares the policy documents by principle to understand which policy better addresses the water ethic described in chapter 3.

6.3 DOCUMENT COMPARISON BY PRINCIPLE

Table 6.1 summarizes the characteristics of the water ethic's principles and how each policy statement addresses these principles.

Comparison

Table 6.1 Comparison of the two policy documents to the proposed water ethic.
Note: Bold type indicates measures deemed to better address the characteristic of each water ethic principle, as discussed in this chapter. No boldface indicates little difference between the two documents.
Note: Please see Abbreviations for explanation of acronyms.

Water ethic PRINCIPLES	VICTORIA *Securing Our Water Future Together*	ALBERTA *Water for Life*
Limited, variable		
Limited, finite	Water limits policy's premise; conservation, reuse, allocation	Water limits strategy's premise; conservation, storage, transfers
Geographic vari-ability	Geographic differences with region-specific initiatives, water strategies; CMAs and water authorities	Geographic differences with WPACs, watershed plans
Seasonal variability	**Winter vs summer filling**	Seasonality: water capture
Annual/ inter-annual variability	**Drought and climate change motivate change, research**	Climatic variability motivates strategy
Common, shared		
Shared among users	Government owned water; **power to adjust licences**	Government owned water; user priorities; 'In perpetuity' volumetric licences a barrier
Shared across boundaries	Water sharing agreements with SA, NSW; **groundwater incl**.	Surface water agreements with BC, SK, Montana, Yukon, NWT
Natural sharing	**EWR; 20% of sales water**	IFN research; conservation holdbacks
Best use for community	**Best use encouraged in water pricing, water markets, & flexibility in water allocation**	Best use in goals, economic instruments, water transfers; prior appropriation a barrier
Shared responsibil-ity + accountability = common governance	Responsibilities delegated among govt' agencies; some public consultation	**GOA accountability; Albertans share responsibility; WPACs**
Water security		
Drinking water	Future security is the concern; fair pricing; **sanitation to replace some systems**	**Drinking water goal, actions**; sanitation not addressed
Food security	Security & flexibility in allocation system good for food security	Security in allocation system good for food security
Right to healthy environment	**Actions to protect environment**	Ecosystems a central goal for quality of life; few actions

Water ethic PRINCIPLES	VICTORIA *Securing Our Water Future Together*	ALBERTA *Water for Life*
Economic vitality	Allocation system to support economy; pricing to not be inhibitive	Economic vitality a central focus; allocation system not based on equality but provides security; water transfers help; watershed management plans; need info
All groups have equal access to good quality water and opportunity	**No groups distinguished**	First Nations, private systems & small communities concern
Full participation		
Inclusive policy development	Inclusive policy development	Inclusive policy development
Inclusion in planning, decision making, implementation	Govt' decisions; customer/ community consultation	**AWC, WPACs, WSGs recommendations**
Decentralization	Decentralized responsibilities (water authorities, CMAs); customers & communities	**Regional govt'; AWC (prov.); WPACs (watershed); WSGs (com.)**
All groups represented	**Dialogue with indigenous communities; customer/ community consultation**	First Nations engagement challenging
Education, awareness	Policy educates + creates awareness; strategy development, regulation, websites	Strategy educates + creates awareness; WPACs forums to educate, exchange ideas; public education program
Accessible information	Public register of rights holders; program updates; online data warehouse; monitoring data	Research centre; web-based information centre; flood-risk maps; Water Use Reporting Project; drought-risk information
Resources enable participation (information, guidance, financial and technical assistance)	Information; further research; financial commitment; specific guidelines in policy; but public participation not a focus	Research initiatives; financial resources (Alberta Environment 2005); technical assistance to WSG; updating Framework doc.; future guidelines from AWC
Future generations		
Future generations	**Future generations explicit**	Future generations implicit
Use on renewable basis	**Efficiency + conservation in urban, rural use; pricing; recycled water; concern for over-withdrawal**	Water conservation actions

Comparison

Water ethic PRINCIPLES	VICTORIA *Securing Our Water Future Together*	ALBERTA *Water for Life*
Collecting public data for future generations' use	Research on climate change, other opportunities; good under-standing of IFN & groundwater + using info. in decision making	Research plan and initiatives
Adaptive management	**Conservation; regional strategies; water market**	WPACs, AWC + planning process; protect ecosystems; water transfers; water capture + inter-basin transfer not adaptive
Precautionary principle	**Conservation; EWR; allocation + pollution limits**	No explicit mention of principle; strategy *is* precautionary; freezing new allocations
Representatives for future generations in decision making	Future generations central consideration	Future generations briefly mentioned; considered premise of strategy in interviews
Equity for environment		
Environmental value	Environmental, economic + social value of water; economic & social depend on environmental health	Environment, social, economic value for quality of life; research, policy, education initiatives
Environment has standing	**Environment has legal right to water with EWR; river health strategies**	WCOs, Crown Reservations, conservation holdbacks on transfers—discretionary!
Quality impacts	Tradable permits; recycling water; biosolids; river strategies	Wetland policy + plan; aquatic ecosystem objectives; source-to-tap approach; research
Quantity impacts	**EWR; river health strategies; conservation + recycling; SFMPs + GMPs**	IFN research; WCOs; holdbacks; wetland policy; allocation system a barrier
Representatives for environment in decision making	CMAs = "caretakers of rivers"; community groups	ENGOs' voice on AWC & WPACs; stewardship concept
Ecosystems as functioning systems	Environment as system	Aquatic ecosystems a goal
Holistic approach		
Holistic approaches	**Holistic approach**	Systems metaphor; moving to holistic approach; need info.
Land use & water interaction	**CMAs manage land use and care for rivers; avoid further damage by forestry, dams, urban effluent**	Land-water connection recognized but no explicit actions; wetland policy, source-to-tap approach, flood-risk, watershed man. plans, regional planning

Water ethic PRINCIPLES	VICTORIA *Securing Our Water Future Together*	ALBERTA *Water for Life*
Surface and groundwater interactions	**Surface and groundwater interconnection explained**	Surface and groundwater connection not addressed; wetland policy, research
Quality and quantity together	Quality & quantity not considered together	**Quality & quantity both imp.; conservation to address both, watershed management;** land-water disconnect affects quality
All types of water as one resource	**All water valuable: rainwater to waste water all under Crown's control; water recycling**	Not all types of water valuable; Calgary closer to this
Watershed unit	Catchment main hydrological unit; CMAs; recognizes institutional inconsistencies as barrier	Watershed main hydrological unit; WPACs
Nested & collaborative governance	Governance is nested; collaborative governance with govt' agencies; transboundary agreements; accountable water sector important	Governance is nested; collaborative governance with public; transboundary agreements; all responsible

6.3.1 Water should be treated as finite and variable in availability

Both policy statements explicitly recognize limits in water availability as a motivator for better water-use management. Each recognizes variability over space and time, but to varying degrees. Recognition of Victoria's geographic differences produces region-specific initiatives, water strategies, and the institutional arrangement of catchment management authorities and water authorities. Watershed councils and management plans allow for a place-based approach to water issues in Alberta. Alberta Environment's northern, central, and southern government offices help support geographic variances (Government of Alberta 2006). Biophysical, socio-economic, and cultural differences between northern and southern Alberta mean many water issues need to be addressed with locally appropriate strategies, and public engagement needs to be tailored to each area with a different message, goal, and target (Wilkie p.c.). To create locally appropriate strategies, Victoria relies mainly on government expertise in watershed governance, while Alberta relies on public participation and local knowledge but also requires capacity building and government support.

Temporal changes, from seasonal to long term, are well recognized by Victoria's policy and are addressed by switching seasons to fill off-stream reservoirs, conservation strategies,

water recycling, allocation limits, and research into climate change impacts. Alberta's strategy is less specific about temporal variability and only recognises recent climatic variability as a motivator for change in water management. It implies water conservation, capture, and licence transfers will cope with temporal changes.

6.3.2 Water should be treated as a shared, common resource

How each jurisdiction shares water among users is indicative of whether or not each treats water as a common shared resource. In both cases, the governments have rights over water and consequent allocation responsibilities. To share water among users, Victoria's state government retains overall rights and stewardship of all water in waterways and groundwater. Private riparian rights are maintained solely for domestic and stock purposes (Government of Victoria 2005). Authorities have the right to take water to fulfill granted entitlements, rights, or licenses (Government of Victoria 2005). These authorities then provide water to urban and rural domestic users without riparian rights. Under Alberta law, riparian household users have priority, followed by traditional agriculturalists with pesticide to apply and stock to water. Licensed users have last priority but maintain historical priority among them. The Victoria *Water Act* confers rights to riparian users and those with entitlements and licences, and states conditions under which the government may adjust these rights (Government of Victoria 2005). Alberta's government, on the other hand, does not confer rights, only priority; and only licences issued under the newest *Act* can be adjusted.

Alberta's first-in-time first-in-right principle jeopardizes treating water as a common-pool resource because licence holders under previous *Acts* have rights in perpetuity and effectively own their water allocation. Another important difference between the two jurisdictions is allocation amounts: Allocations in Alberta are specific amounts of water, regardless of that year's conditions. Victoria generally has proportional allocations rather than volumetric that can be temporarily changed based on current conditions and permanently changed every 15 years. This flexibility can be perceived as a lack of security for irrigators and seems to be an ongoing concern, especially in the context of the water market (Ladson and Finlayson 2002; McKay 2003; Gardner 2005). To address these concerns, Victoria's 2004 White Paper claims the government is introducing more security for irrigators, such as by making sales water a legal and tradable entitlement. In contrast, Alberta's system is more secure for license holders (Thompson p.c.) but is less adaptable should weather fluctuations become more extreme.

Both jurisdictions are explicit about surface water sharing or apportionment agreements with adjacent jurisdictions (states, provinces, or countries). Only Victoria, however, also has sharing agreements for groundwater. Intra-provincial or intra-state sharing is more complex.

Victoria's catchment management and water authorities are meant to liaise with each other and relevant local governments, customers, and communities; this arrangement presumably facilitates agreement within the state. Alberta's watershed councils, perhaps supported by regional government offices, provide a forum for local municipalities, groups, industries, and individuals to work to common solutions. In sharing among intra-state or intra-provincial jurisdictions, Victoria and Alberta have a different situation in sharing water between agricultural and urban uses. In Alberta, municipalities, which tend to be non-consumptive users, generally lie upstream of irrigators, who are consumptive users of water. Although these municipalities have licences junior to most irrigators, because they lie upstream they are less likely to be in conflict with irrigators compared to Australia. In Australia the situation is reversed, where cities often lie downstream of irrigators and are forced to buy water rights from those irrigators (Thompson p.c.).

Both jurisdictions suffer the legacy of over-allocation without consideration of environmental needs for water. Victoria is further ahead in natural sharing with its environmental water reserve (EWR), which provides the environment with its own allocation of water. In *Water for Life*, the medium-term outcome to manage and allocate water for healthy aquatic ecosystems is the closest and most specific that it gets to natural sharing. The *Report on Implementation* (2005) and interview data indicate in-stream flow needs tools are being developed so that water can be shared with Alberta's aquatic ecosystems at some point in the future. Water conservation objectives, which designate flow amounts for waterways, are to be defined in watershed management plans. Discretionary conservation holdbacks of up to 10% can occur with water transfers. These holdbacks are similar to Victoria's allocation of 20% of sales water to the environment. Other mechanisms in Alberta's *Water Act* are Crown reservations on water, which can be used for any purpose, and in-stream licences, which are little used. None of these mechanisms seems as certain or stable as Victoria's EWRs.

The root of conflict over water is generally over who gets what water when. Water is an emotional topic and often accompanied with a sense of entitlement (Smith p.c.). To achieve best use for the community, Victoria's government is unbundling water rights and relies on the water market to reallocate water shares, primarily in the agricultural realm. In the urban sphere, it is introducing rising block tariffs on water to encourage less wasteful use. In Alberta's urban sphere, cities such as Edmonton and Calgary have introduced water meters with which to measure and charge water users. For licence holders, Alberta's government uses water transfers to meet society's needs and is researching economic instruments to encourage conservation and distribution of water to its "best" uses. Some interview respondents implied that water uses should be ranked according to best and highest value in Alberta (Shyba p.c.; Hahn p.c.; Smith p.c.). For example, what uses should have priority: industry (such as oil and

gas, manufacturing, or food processing), agriculture, or municipal use? "The real split you get", Hahn (p.c.) stated, "is between agricultural use, industrial use, and urban use. I don't see it as a cultural one, more as an economic-sector one." The tension comes from the "written-in-stone" nature of the allocation system and the changing priorities of society. Over time, the new water market may help with this shift; but few transfers have occurred thus far—unlike in Victoria.

As expressed in interview responses, Alberta's best claim to treating its water as a common, shared resource is in its public partnership governance structure. This new structure allows everyone from government to citizens to participate in water governance and share responsibility for water management and decision making. This forum allows for such decisions as best community use to be debated; this debate is essential to take account of ethical perspectives and social goals. Victoria government bodies are the primary holders of accountability and responsibility in water governance. Isolated instances of public consultation occur. Users, such as in water saving measures, and community advisory groups have limited scope of responsibility in Victoria.

6.3.3 Water security should be ensured for all humans

Ensuring sufficient drinking water has a stronger focus in Alberta's strategy while sanitation is mentioned only in Victoria's policy. Alberta's strategy has safe reliable drinking water as one of three goals, highlighting water security's importance to the government. Alberta has begun analysing drinking water facilities across the province to ensure standards are met and identify necessary upgrades. Treatment facilities are particularly challenging for small Albertan municipalities. Private water systems will also be addressed as *Water for Life* is implemented.

Victoria's policy does not suggest that meeting basic needs is an issue, but future water security is a concern. Victorians are encouraged to reduce, or be "smarter" about, their water use. Water security for cities and towns—along with river and aquifer health, low cost to consumers, meeting all demands for water, and productivity and income for the state—will be jeopardized if the water allocation system fails to provide the right balance between economic, environmental, and social values (DSE 2004). In the urban sphere, the government also seeks to balance between intragenerational and intergenerational equity and equity for the environment with "safe, secure and reliable supplies" in cities and towns while providing for "growing populations into the future" and "managing environmental impacts" (DSE 2004, 89). For sanitation, Victoria's policy identifies areas that require sewerage infrastructure and financially commits to assisting these areas.

Food security is not an explicit concern in either jurisdiction. However, in both places agriculture—which implies food security along with economic vitality—continues to receive a large water share. Neither jurisdiction seems to want to change this situation; both aim, however, for a more efficient sector through water transfers and, in Victoria's case, water allocation system and infrastructure redesign. Both jurisdictions recognize the importance of a healthy environment to the health of their communities and economies. Victoria, however, is most active by protecting environmental flow requirements. Alberta's actions in this regard seem to be waiting for further research results.

Both jurisdictions recognize the importance of water to economic vitality, especially because both have strong agricultural sectors that rely on irrigation. Victoria's government has introduced flexibility in the allocation system by unbundling water rights and allowing transfers. These moves allow more users into the system and more security to those who need it most and capital for those who require it. Similarly Alberta has introduced water transfers to encourage conservation and better use by licence holders and to allow water for those who need more water or who want to be in the system. As price increases occur for commerce and industry, the Victoria policy states that water authorities will negotiate with water-intensive industries to avoid unfair consequences. Alberta encourages all industry to develop water conservation plans.

Juggling among economic sectors and priorities can also lead to unequal access among economic groups. Underlying priorities or agendas can undermine achieving the goals in *Water for Life* due to unequal power of some concerns over others. Traditionally there has been a hierarchy of interests in Alberta (Thompson p.c.). For example, development pressures tend to take priority, where "In Alberta we see time and again the development side of the equation wins out. Politicians, by nature, take a four-year view of things, not a 20- or 100-year view" (Griffiths p.c.). Griffiths (p.c.) fears that "the government and industry say that we need to get the oil out of the ground and that takes priority." This extraction may seem the most important in the short term, but may not be in the long term; "[t]hat's why I think it's so important that we have good baseline data and good monitoring" (Griffiths p.c.) and strong policy (Griffiths *et al*. 2006). Succumbing to development pressures is inconsiderate of future generations (Smith p.c.). Power in the agriculture industry, which has traditionally shaped Alberta water policy, has considerable implications for positive change and achieving equitable sharing amongst current uses and users, future users and uses, and aquatic ecosystems. There may be a lack of recognition of the need to shift the water paradigm in Alberta; or a lack of concern for shifting needs in the province, the environment, and future generations. The perceived costs and benefits of environmental initiatives may favour the short-term gains (e.g., resource extraction).

Groups without equal access or quality in Alberta are First Nations, small municipalities, and private water systems—as interview responses indicate. *Water for Life* does not address problems in First Nations communities, likely because First Nations issues are not under provincial jurisdiction. Victoria's policy does not distinguish groups who may not have equal access or quality; but it suggests indigenous communities and values are important.

6.3.4 Water management should entail full participation by all those affected

The language of each document promotes a sense of solidarity. Alberta's strategy includes the public in decision making; Victoria's policy, however, keeps the public at arm's length as customers and communities, not truly participants in decision making and implementation. In Victoria responsibility is largely limited to the water sector; in Alberta, *Water for Life* seeks to engender the sentiment of shared responsibility among citizens, communities, industries, and government in water management.

Each jurisdiction had an inclusive policy development process, including cross-jurisdiction expert committees, public consultation, and public review of draft versions. Decision making in Victoria comes from government bodies; regional catchment management authorities and water authorities consult with the relevant public and local government as they implement land-use or price changes, for example. In Alberta, decisions also come from government, but significant investment has been made in establishing provincial, watershed, and community-level forums for public input and advice. The resulting recommendations as watershed management plans or as advisory reports are meant to contribute to water management decision making.

Both Victoria and Alberta embrace a decentralised (to the local or watershed level) place-based approach to water management. Victoria decentralises government bodies as water authorities and CMAs; while Alberta, in addition to regional Alberta Environment offices, creates decentralised forums for public input with WPACs and WSGs. With the AWC, these public forums promise to include interests of all groups. First Nations' participation, however, during strategy development was small. They have been invited to participate on the councils, but their participation has not been significant. In contrast, Victoria's policy refers to ongoing dialogue with indigenous communities. Victoria's policy also emphasises inclusion of stakeholders in decision making; but the extent of involvement by public groups seems limited compared to Alberta.

Effective policy production and implementation require an educated public. Both policy documents themselves act as educational and awareness-raising tools. Education and awareness in Victoria also occurs through regional strategy development, the permanent water-

saving program in Melbourne and other regulation, and DSE websites. Alberta's *Water for Life* plans to develop public education programs and has implemented awareness days and campaigns around some aspects of water (Alberta Environment 2005). Alberta Environment has informative websites. Alberta's network of partnerships also acts as a significant forum for members of the public to educate and learn from each other as they strive to find common ground.

In Alberta's case, maintaining public support of *Water for Life*'s initiatives will be especially important given the reliance on public participation. While the strategy is a "very positive step…keeping the public interest in anything to the point where the politicians will allocate money to it on a continuing basis is a challenge. Keeping the public engaged and informed and supportive will be the biggest overall challenge" (Kelly p.c.). Public support, which helps guarantee spending, will be key for research and monitoring. These activities can be expensive, tedious, time consuming, and "not sexy" (Kelly p.c.) and thus may lose public interest and political will. Public education will be fundamental to maintaining public support (Shyba p.c.).

Related to education is making information available to the public, which also improves accountability. One of the Government of Alberta's aims is to provide real-time access to information about water indicators, such as quality. To do this, an online information centre is being developed and reporting about water use, drought risk, and flood risk is or will be available. Victoria's DSE websites offers information and has already established an online data "warehouse" with public access. CMAs must complete regular reporting, which may or may not be publicly available. The policy indicates that a public register of all land and water rights holders will also be developed—this register would be even more useful if it included associated water use information, and would then be something for Alberta to emulate. Unlike *Water for Life*, Victoria's policy does not emphasise the idea of accessible information; such access may already be available.

Based on the level of detail and the concreteness of the initiatives in each of the policy documents, Victoria is further ahead in its knowledge base than Alberta. While the strategy emphasises the need to gather information, the strategy itself lacks detailed information and understanding about the water resources in the province compared to Victoria's White Paper. In Alberta, professional planners have difficulty giving advice due to the lack of baseline information and "to expect the public to do that [through the watershed councils, etc.] without data just mystifies me" (Thompson p.c.). Alberta's strategy does address knowledge gaps by investing in knowledge and research actions (Government of Alberta 2003), such as establishing a water research centre to help complete and prioritize research initiatives.

In addition to information, government support is necessary for success of participatory governance and for quality advice from the Alberta Water Council and watershed councils (Hahn p.c.). Evidence of the WPACs receiving adequate funding is not in the strategy, interviews, and implementation report. Most of the councils are in the process of forming and thus might not be at the stage to receive funding. Although there is "the danger that there's not going to be enough funding for some of these groups", Kelly (p.c.) felt the intentions of Alberta Environment are that the WPACs will be "pretty well supported". Ensuring human resources, or adequate participation, from the general public—not just industry, for example—is also a concern because the number of people with sufficient time, money, and capability to participate is limited. Thus the more participatory processes, the more sapped is the pool of people capable of participating (Griffiths p.c.). If there is a comprehensive consultation process (e.g., one that involves more than a single meeting), the public should be compensated for their time as well as given their basic expenses such as travel (Griffiths p.c.). Yet participation should not become based on financial gain; instead it should be based on civic concern. By contrast, the Victoria government has only to ensure the capacity of its government employees and agencies to participate in decision making not the public as well.

Financial resource commitment is very specific for over the next four to ten years in Victoria's policy. *Water for Life* mentions nothing about money; the *Report on Implementation* states how much was spent over the first year of implementation but does not mention future years. Victoria's policy also includes specific implementation guidelines, unlike Alberta's strategy. A key document for water management in Alberta, Alberta's *Framework for Water Management Planning*, is to be updated to reflect the shift to watershed planning and has the potential to provide far more guidelines than currently evident. The Alberta Water Council will provide further guidelines for the watershed council and watershed stewardship groups. Given the lack of emphasis in Victoria's policy on public participation, few resources, other than information and detail, are obviously available to enable this participation.

6.3.5 Intergenerational equity should be an essential element in planning decisions and water management

In *Securing Our Water Future Together* future generations are a far more explicit concept than in *Water for Life*. Only once is the future mentioned in Alberta's strategy, although interview responses suggest future generations is a central premise. Future generations are repeatedly mentioned in Victoria's policy and their importance is emphasized in the document's title. Also, Victoria's planning horizon is further into the future than Alberta's.

Both policy documents seek a more sustainable approach to managing water and its use. To achieve sustainable water management, Victoria's policy commits to five fundamental

principles, which form the framework for this policy: dependence on a healthy environment, the government's overall stewardship, public ownership, full-cost pricing, and an innovative and accountable water sector. Specific to the urban sphere, the sustainable urban water management framework aims to reduce water consumption, balance supply and demand, recycle and use alternative supplies, and secure water supply (DSE 2004). *Water for Life* commits to wise management "of Alberta's water quantity and quality for the benefit of Albertans now and in the future" (GOA 2003, 5) but fails to define wise management. The bulk of the strategy, however, could be considered a long definition of what the Alberta government means by wise management.

Conservation initiatives are key strategies in both policy documents. These initiatives contribute to renewable, or sustainable, water use. In both documents, conservation is meant to meet multiple challenges: economic and population growth, changes to the future water supply, and water required for healthy aquatic ecosystems. In Victoria's document, conservation measures find greater emphasis in reference to urban water use, although efficiency measures are also important for irrigators or rural supply systems. In Alberta, conservation measures are one of three key directions, but are not specified to water using sectors. Alberta has yet to be specific about how and where the conservation initiatives and 30% target will be implemented. Victoria's approach to renewable water use is more specific than Alberta's. Victoria's policy discusses greywater third-pipe solutions, recycling water, and desalination possibilities in addition to water-saving measures and reducing demand. It also discourages over-withdrawal of surface and groundwater. The most specific initiatives in Alberta's document regarding conservation are developing a system to monitor water use, studying the true value of water to the economy, and studying economic instruments. These initiatives are far less specific and immediately effective than Victoria's initiatives. Likely it will be up to the local and watershed communities to determine specific conservation actions.

Information is clearly important for better decision making, now and for future generations. Victoria's government is knowledgeable about in-stream flow needs and groundwater-surface water interactions, for example, and has monitoring systems in place. It suggests future research to study climate change impacts and plans a state water inventory that will be updated every five years. Alberta's strategy, which indicates a lack of knowledge, has a strong emphasis on gathering information and creating information-gathering systems and a research plan.

Adaptive management is part of both policy statements' approach. Both have integrated flexibility and greater adaptability to changing demand and circumstances through allowing water transfers. This water trading allows irrigators and licence holders to adapt to changing water conditions and to better use their water assets. Victoria is further ahead in un-

bundling water rights and has an established water market. To embrace change, both jurisdictions are establishing ongoing planning processes—Alberta through the Alberta Water Council recommendations on emerging issues and the watershed councils' watershed management plans, and Victoria through a state Sustainable Water Strategy and regional sustainable water management strategies. These plans and strategies, if regularly revisited, allow integration of changing circumstances and expectations.

To adapt to rising demand but with a less than adaptable solution, Alberta's government indicates that it will combine water capture with conservation to deal with looming breach of limits. In contrast, Victoria's government rejects this approach because dams will not create more water. New dams simply take water from other users—communities, farmers, or the environment. However, Victoria has significant storage capacity compared to Alberta (Thompson p.c.), and appropriate sites may no longer be available in Victoria. Alberta is limited in its storage capacity compared to Australia and so has less management control (Thompson p.c.). Victoria's policy explicitly acknowledges the negative consequences past management, based on exploitation, damming, and disposing of waste, has had on environmental conditions (DSE 2004). Thus, given the strong focus on the environment, the government may be avoiding further harm from dams. Meanwhile, the Alberta strategy does not acknowledge past water management to be harmful (Government of Alberta 2003) and perhaps the government does not perceive the harm of new dams to outweigh their benefit.

Neither jurisdiction explicitly embraces the precautionary principle, but both imply it to varying degrees. Both recognize the limits of their watersheds and the necessity to cap new water allocations in some areas—at least until ecological objectives can be established. Victoria's policy takes a further step by introducing the environmental water reserve, which implies imposing a sustainability limit. Striving for healthy aquatic ecosystems or environment means creating resiliency in those systems and protecting against dynamic change. Alberta has yet to reach this stage. Conservation initiatives in both jurisdictions might help develop a precautionary buffer.

Neither jurisdiction has explicit representation for future generations. Victoria's policy, however, offers far greater attention to future generations than Alberta's strategy and thus might offer greater representation in decision making.

6.3.6 The environment should have standing in water-use management

Both strategies recognize environmental value, either alongside community and economic value (Alberta) or as essential for social and economic health (Victoria). The environment has instrumental value in both statements for quality of life. In some ways, the

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environment, or aquatic ecosystems, has standing in Alberta—through water conservation objectives, conservation holdbacks, in-stream licences, or potentially Crown reservations. These are all mechanisms offered in the *Water Act*, and are all discretionary. Victoria's policy, as a reflection of Australia's new direction with water management, more directly challenges the traditionally dominant anthropocentric discourse in water management through stating the environment is a legitimate user of water. This statement firmly entitles the environment to water, the environmental water reserve, and shifts Australian discourse to one that is more ecocentric. By comparison, Alberta's strategy does not seek to shift the discourse in this way. Instead, it recognizes the importance of aquatic ecosystems and suggests in time it will allocate water to those ecosystems. The tools are not sufficient to recognize the environment as a legitimate user of water in Alberta, particularly in those basins already over-allocated.

Victoria's policy mainly addresses quantity impacts on the environment and only sparsely quality impacts. It shows some concern about pollution from irrigation, industry, and urban effluent and suggests mechanisms to reduce it. Healthy river strategies will help address quality impacts on ecosystems, while tradable permits for pollution in irrigation, water recycling, and better biosolids management will assist with pollution prevention. In Alberta, research initiatives will explore quality issues for aquatic ecosystems. Efforts to protect drinking water could have indirect benefit for aquatic ecosystems if source protection measures are implemented. New wetland policy and action plan and defining aquatic ecosystem objectives will help water quality impacts on Alberta's ecosystems.

Quantity impacts on ecosystems in Alberta are addressed through in-stream flow needs (IFN) research, which will ultimately benefit ecosystems but has yet to do so, and potentially wetland policy and conservation strategies. IFN research can establish water conservation objectives to be set out in watershed management plans. WCOs and conservation holdbacks on water transfers have the potential to provide more water to ecosystems but are discretionary tools and are likely inadequate as human demand increases for water. A central focus of Victoria's government is supplying sufficient water for the environment through the environmental water reserve. The EWR will be enhanced through renewable water use and conservation, river health strategies, stream flow management plans, and groundwater management plans.

A major barrier in Alberta is the prior appropriation water allocation system, which the government refuses to alter except through water transfers on a water market. Victoria's system is also based on water entitlements as property rights but has the EWR and has established conditions with which to alter the entitlements to meet ecological objectives. Prior to Victoria's 2004 White Paper and the EWR, portions of entitlements could be traded on the water market. This practice is a similar to the current Alberta situation. These trades were intended to have economic and environmental benefits (Ladson and Finlayson 2002). The

Australian experience of introducing a water market without first designating environmental water allocations suggest several consequences (Ladson and Finlayson 2002). First, access to the market is restricted to those with water rights, making it difficult for environmental groups or other parties to buy water for the environment. In Alberta, land ownership is necessary to purchase a water licence, and some areas are over-allocated or "frozen". Second, transaction costs are high, such as the cost to gather information about environmental requirements, and inhibit buying water for the environment. Third, external effects from water trades can include changing the diversion point and can negatively affect in-stream flow. In Alberta's case, trades may remove natural flow from unused licence portions and leave less water for the environment in some places. Fourth, the water market may under-supply environmental flows because market participants do not derive direct benefit; thus strong market regulation is necessary to meet environmental criteria and protect environmental value as a public good. Fifth, government participation in the market to purchase water for the environment can be politically unpalatable.

Therefore, if Alberta plans to have a water market that truly benefits ecosystems, the government, as stewards of the public good, will have to designate environmental allocations. Simply taking 10% of water transfers as conservation holdbacks is unlikely to be sufficient in over-allocated areas. These holdbacks are discretionary—in that "If the Director is of the opinion that withholding water is in the public interest…or to implement a water conservation objective…the Director may withhold up to 10% of an allocation of water" (Government of Alberta 1996, Sec. 83)—and are only up to half of Victoria's 20% of sales water trade. These holdbacks may be perceived as a "tax" and inhibit water trade, which might hamper the aim to enhance water for ecosystems (Thompson p.c.). If Alberta's government does choose to designate environmental water allocations in the future, Gardner (2005) suggests that instituting "sophisticated regimes" for water accounting with strong legislative frameworks and the financial and human resources commitment are necessary for enforceable environmental water allocations. Support for this monitoring of and accounting information about current water use must be bolstered in Alberta.

To protect environmental interests, Victoria's catchment management authorities will manage environmental allocations and act as "caretakers of rivers". In this way CMAs represent the environment in local decision making. Some Victorian communities (i.e., towns) may choose to advocate benefits to the environment. Members on the Alberta Water Council, watershed councils, and watershed stewardship groups represent the environment. Whether their numbers will be sufficient remains to be seen. Presumably both Alberta Environment and the Department of Sustainability and Environment take an overall protective stance towards the environment given their mandates. *Water for Life* most explicitly recognizes ecosystems—

a more holistic concept than "environment" because it emphasises interrelationships—as aquatic ecosystems. Victoria's policy recognizes ecosystems but most consistently discusses the environment, in a similar fashion to Alberta's aquatic ecosystems.

6.3.7 Water management should entail a holistic approach

Both jurisdictions seek to balance social, economic, and social values and recognize that they are interrelated. *Water for Life* is moving toward a holistic approach in reshaping institutional arrangements (i.e., the partnership network), recognizing ecological boundaries and integrity (i.e., the watershed approach), and using research activities to create a more complete understanding. Victoria's policy is less inclusive of the public as stakeholders; but Victoria is further ahead in embracing this approach, especially by treating the environment as a legitimate user of water alongside human users.

Victoria's policy better integrates understanding of land-use effects on water than does Alberta's strategy. Victoria's policy discusses land-use problems—specifically forestry, dams and diversions, and effluent discharge. In seeking better forestry practices, the policy aims to avoid further degradation without affecting current land use. No future dams will be constructed and some will be decommissioned. Various initiatives aim to curb urban effluent in Victoria. Catchment management authorities integrate land and water management at a regional scale. Alberta's strategy only mentions that Albertans need to take responsibility for the effects of their land-based activities. Wetland policy and plan development, a source-to-tap approach to drinking water, attention to flood risk, and watershed management plans could address land-water interaction in Alberta. Watershed councils and watershed stewardship groups are intended to integrate water and land-use management. Despite implied action to address land-water interactions, specific policy regarding this interaction is necessary due the prevalence of resource extraction activities and rapid population growth in Alberta.

Victoria's policy explicitly recognizes the connection between surface and groundwater and explicitly states that they must be managed together. Victoria also distinguishes between the flow of surface and groundwater with catchment level management by CMAs and groundwater management plans to address withdrawal rates. In Alberta, efforts in watersheds are meant to take both surface water and groundwater into account; but more information about groundwater seems necessary to enable joint management of surface and groundwater. Research and future wetland policy in Alberta will ideally address the connection between the two.

Water for Life discusses quality and quantity attributes of water together in its principles and research initiatives. The strategy does not explicitly connect the two but some initiatives

offer opportunity to deal with them together. Conservation initiatives could address quality of water in terms of temperature and waste assimilation capabilities and address quantity issues. Improving wetlands in Alberta will help both attributes in terms of water storage and water filtering. Watershed management plans might also address quality and quantity concerns together through aquatic ecosystem objectives. Improvement of land-water integration will be essential, however, to improve or maintain water quality in the province. Victoria's policy speaks mostly to quantity issues; it does not address quality and quantity together.

Alberta does not suggest treating all water as a valuable resource, whereas this idea is an explicit rationale for Victoria's policy. Only at the municipal level, such as in the City of Calgary, are efforts being made to integrate stormwater into residential design and use waste-water as a resource. Victoria strongly supports the idea of all water as valuable through water recycling initiatives and the proposition of using water fit for purpose, not drinking water for every purpose. The Victoria government is trying to integrate stormwater into new develop-ment, rather than treating it from a drainage perspective. It also aims to manage biosolids more sustainably and productively.

Both policy statements consider the watershed or catchment as an appropriate man-agement scale. This shift is new for Alberta and is most clearly expressed by creation of the watershed councils in Alberta's seven watersheds. Through debate amongst council members who represent local stakeholders, watershed management plans will eventually emerge from all of these councils. Because the watershed approach will introduce new boundaries in ad-dition to political boundaries, further edge effects, where responsibilities or interests overlap between agencies (Mitchell 2002), will be introduced. Some municipal jurisdictions will be in more than one watershed and will have "to figure out how they behave in the watershed they live in" (Hill p.c.). These groups, however, will also offer the opportunity to work through and resolve long-standing edge effect problems. Catchment management authorities work at the catchment scale in Victoria and integrate issues at that level, while collaborating with stake-holders including local government, regional water authorities, and local communities. The Victoria government explicitly recognizes that institutional arrangements need to be adjusted to properly take a "whole of catchment" approach.

Victoria has a nested system of government bodies (but not civic bodies) as local gov-ernment, catchment management authorities, and regional water authorities, and a mix of gov-ernment departments, regulators, and ministries. Collaboration seems to occur among these entities and is evident between states and federal government in water sharing agreements and production of national objectives. The Government of Alberta is also moving towards bet-ter inter-agency collaboration with cross-ministry efforts and is collaborating with the public through the network of partnerships in water governance. Thus Alberta Environment, as the

lead agency in water management, has shifted its role from regulator to "systems coordinator" (Yee p.c.) as it tries to integrate concerns and activities with other government agencies and with the AWC, WPACs, and WSGs.

Alberta water governance is nested amongst government and public groups. The provincial level includes the Government of Alberta, led by Alberta Environment, and the multi-stakeholder Alberta Water Council. Northern, central, and southern Alberta offices provide regional Alberta Environment representation; and the multi-stakeholder Watershed Planning and Advisory Councils represent the watershed level. These WPACs can look to the AWC for "guidance and mentoring" but will not have a "direct reporting relationship" with the provincial council (Government of Alberta 2003, 16, 15). At the community level, the Watershed Stewardship Groups allow "neighbours [to] share information and take action to protect and enhance their local watershed" (Government of Alberta 2003, 17). WSGs can work with local governments and participate at the watershed council level "for guidance, technical advice, and mentoring" (Government of Alberta 2003, 16). This governance structure in Alberta offers a decentralised, locally appropriate solution to water management complexity, and better incorporates public participation in decision making than in Victoria.

Collaboration also occurs among the provinces or states through transboundary agreements in both jurisdictions. Only Victoria, however, participates in significant collaboration over water issues at the state-federal level. The Canadian federal government has not produced a federal statement or collaborated in a significant way with provinces since the late 1980s.

6.4 CHAPTER SUMMARY

On the whole—and on paper—Victoria's *Securing Our Water Future Together* better adheres to the ethical principles defined in chapter 3. This result is consistent with the claim that Australian water policy is progressive, particularly with regard to meeting ecological requirements. The suggestion is, therefore, that Alberta can learn from the Victoria experience. The table below summarizes how each document compares to each principle.

Comparison

Table 6.2 Brief summary of which document best meets the principle's criteria (X).

Principles	*Securing Our Water Future Together*	*Water for Life*
Limits and variability	X	
Common shared resource	X	
Water security for all	X	
Full participation		X
Intergenerational equity	X	
Equity for the environment	X	
Holistic approach	X	

In summary, both documents recognize limits to water availability and spatial variability, but Victoria's document better addresses temporal variability. Victoria has a more flexible allocation system to share among users and uses. Both have sharing agreements for transboundary surface water; but only Victoria has groundwater sharing agreements. Both have mechanisms to negotiate intra-jurisdiction transboundary issues. Victoria most conspicuously shares with the natural environment. Alberta's strategy best embraces common governance of a shared resource.

Victoria's policy's consistent focus on quantity and conservation measures implies the government's concern about future water quantity security. Alberta's strategy is explicit in its concern of both quality and quantity of water. Neither is concerned about food security, yet neither is willing to take water away from food producing irrigators or to sacrifice economic vitality. Neither document addresses marginalised groups. Alberta's strategy directs attention to small municipalities and private water users, while interviews indicate First Nations' communities have less secure quality of water.

Alberta has a far stronger emphasis on full public participation in decision making—and therefore procedural equity—than Victoria. In Victoria, public decision making seems not to be a focus. In Alberta, First Nations may be a concern in terms of all groups being represented in decision making. Both documents are educational and raise awareness about water issues; Alberta's strategy has a stronger emphasis on public education programming. Both jurisdictions offer accessible information. Victoria has gathered significantly more knowledge which is a valuable resource for decision making; but Alberta's research initiatives should close the government's knowledge gap. Victoria is more explicit about resources offered (e.g., money) to decision makers and those implementing policy. Future generations are a more explicit concept in Victoria's policy than Alberta's, but both seek to achieve future security through conservation and other initiatives—although Victoria's plans are far more extensive.

Both documents recognize environmental value and seek to protect it; only Victoria's government, however, ensures legal standing for the natural environment. Both Victoria's and Alberta's documents strive for a holistic approach, most fundamentally through the watershed approach. Victoria is more successful at integrating land-use and water decision making through their catchment management agencies. Victoria's policy is more explicit about the link between ground and surface water. Alberta's strategy better addresses quality and quantity of water together. Victoria's government values all types of water, Alberta's does not. Both jurisdictions aim for a nested and collaborative approach to water management. Alberta better incorporates public collaboration.

Given that Victoria's policy more successfully aligns with the water ethic, would it have achieved this success without the national guidelines from the 1994 COAG Water Reform Framework and the 2004 National Water Initiative of 2004? These frameworks guided and encouraged change in all Australian states, although expression of the ideas varies from state to state (Gardner 2005). This relationship may point to the importance of national guideline creation in cooperation with provincial and territorial governments in Canada. Australia's natural aridity may also have played a role in policy change, and suggests Alberta needs more comprehensive and powerful policy to address potential climate change scenarios of Alberta as a much drier place.

This chapter has explored the similarities and differences between Alberta's *Water for Life* strategy (chapter 4) and Victoria's *Securing Our Water Future Together* policy (chapter 5) based on the seven principles of the water ethic discussed in chapter 3. The following chapter draws on these conclusions to make recommendations for future renditions of Alberta's water strategy and implications for other jurisdictions.

7. THE STRENGTHS OF, BARRIERS TO, AND RECOMMENDATIONS FOR ALBERTA'S *WATER FOR LIFE*

7.1 INTRODUCTION

Due to the biological and social importance of water, complex situations and challenges arise. An ethical approach is one way to embrace complexity and assert a set of guidelines for resolving entrenched and emerging challenges. This thesis aims to define a water ethic that promotes sustainability and an expanded sense of equity in how we manage our use of water. Chapter 3 outlines the goals, framework, and principles that form a sustainable and equitable water ethic. That ethic provides a framework that can guide policy development and assess policy statements. Ethical ideas underpin *Water for Life: Alberta's Strategy for Sustainability*, as they do all policy statements. However, how does Alberta's strategy measure up to the water ethic proposed in chapter 3? Chapter 4 explores in detail Alberta's degree of success in meeting the characteristics of each principle with *Water for Life*. Chapter 5 analyses the 2004 White Paper of Victoria, Australia, *Securing Our Water Future Together*, based on the water ethic. Chapter 6 compares the analyses of the two policy documents. This comparison contextualises Alberta's strategy in international trends and highlights its value and opportunities for improvement. This chapter discusses the strengths of *Water for Life* and key barriers to alignment with the proposed water ethic. This discussion includes recommendations and implications for other jurisdictions, such as British Columbia. This chapter concludes with the contribution of this research and suggestions for further research.

7.2 STRENGTHS OF *WATER FOR LIFE*

As a recent example of water policy in Canada, *Water for Life* has much to offer to water-use management in Alberta. *Water for Life*'s most impressive, and concrete, initiative is the "network of partnerships", consisting of the Alberta Water Council, the watershed councils, and the watershed stewardship groups. This new governance structure encourages public participation in water management decisions and provides a forum for ongoing democratic dialogue among stakeholders. This approach can engender a sense of ownership over decisions and a sense of responsibility. This partnership network allows for procedural justice by having an inclusive view of stakeholders; and it sets up the opportunity to create relational

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justice and shift social relations among Albertan stakeholders. The network is nested, engaging people at different scales, and can thus address issues at the appropriate scale. Overall the network allows collaboration among Albertans and their government to develop solutions, and supports the idea of common governance. The Alberta government is also moving towards more cooperative government arrangements and integration of policies.

Through the watershed councils, the Alberta government embraces a watershed approach. This approach is holistic, follows ecological boundaries, allows water and land issues to be dealt with in tandem, and allows place-based decision making. It is an approach widely regarded as the most appropriate water management scale—for surface water management issues at least, though not necessarily for managing groundwater. Watershed management plans will support this approach.

Water for Life's strong emphasis on research and information-gathering initiatives will help fill knowledge gaps. The initiatives will benefit current and future generations. The information will improve decision making; for example, it will help determine ecological needs for water. Education relies on this information and is fundamental to creating social change. The strategy itself is educational and acts as a tool to shift attitudes. The stakeholder councils can be seen as educational forums to exchange ideas, experience, and information. The government also plans, and has already initiated, formal public education activities. Public education will be fundamental to changing attitudes and behaviour of the people of Alberta towards better water management.

In many ways, the strategy is forward looking and anticipatory. The provincial and watershed councils offer venues for ongoing public input and planning. Planning, research initiatives, decision-support tools, public education, and conservation initiatives will benefit future generations and the long-term quality of Albertan life.

Water for Life and Alberta's *Water Act* maintain security of water rights—both in priority and in quantity—for licence holders. Those who have water rights maintain their historical priority and maintain their volumetric allocation amounts. The degree of security that is thus engendered is highly valued by the irrigation community in Alberta. To protect this security but introduce flexibility in fully or over-allocated basins, the government introduced transferability of all or unused portions of water rights.

7.3 BARRIERS TO *WATER FOR LIFE*'S SUCCESS

Kirkland and Thompson (2002, 60) define barriers to environmental management as "conditions that may adversely affect the implementation or effectiveness of environmental initiatives". Based on interview data and the comparative analysis of *Water for Life* and Vic-

toria's policy, a number of key barriers do, or have the potential to, threaten *Water for Life*'s success in aligning with the proposed water ethic. These barriers are the prior appropriation water allocation system, the strategy's lack of detail, inadequate protection for aquatic ecosystems, compromised water security in First Nations communities, the possibility of new dams and inter-basin transfers, and poorly developed substantive connections.

7.3.1 Prior appropriation water allocation system

The same prior appropriation water allocation system that provides security to water licence holders is a barrier to fully embracing the proposed water ethic. It does not adequately address water limits because allocations are volumetric rather than a proportion of the water available in any planning or allocation time frame. The amount of water available for allocation is, however, both finite and variable. Allocations as volumetric rather than proportional amounts reduce the ability of the system to adapt to changing conditions. When the allocation system was established in the late 1800s, no consideration was given to ecological requirements for water, let alone to variability in the environment. Thus, in fully or over-allocated watersheds, environmental requirements are very difficult to meet without taking licences away, despite conservation holdbacks on water transfers.

Another aspect of this barrier is that many licences are held in perpetuity. The historical priorities entrenched in Alberta's water allocation system hinder changing notions of and priorities for best use of a shared resource because those who hold licences in perpetuity effectively "own" that water. The system is not based on social equity but on historical priority. The system thus inhibits equal opportunity for water-supported economic vitality and cannot support the principle of intragenerational equity. Only the newly introduced mechanism of water transfers allows new users into the system, but it relies on the willingness of licence holders to transfer water shares. Transferability of licences may not be sufficient as growth continues.

The strategy's explicit declaration to maintain the first-in-time first-in-right system (Government of Alberta 2003) limits the scope of watershed management planning. These plans decide whether to allow water transfers within the watershed, whether to mandate conservation holdbacks on transfers for in-stream flows, and what water conservation objectives to set (Thompson p.c.). The plans may recommend a temporary moratorium on new allocations until ecological requirements are determined in a watershed or a reach of a watershed—as in the South Saskatchewan River Basin (Government of Alberta 2006). But they cannot recommend taking back already allocated water, which hampers meeting ecological require-

ments and finding creative solutions in fully or over-allocated watersheds (Wenig p.c.). Thus, overall the water allocation system is a barrier to almost all of the water ethic principles.

7.3.2 Lack of detail in Water for Life

The strategy offers many laudable goals, outcomes, and action items associated with its goals; but it lacks detailed plans for how to complete those actions and who will complete them. It sets objectives but not how to get there: "[T]he water strategy is really short on implementation. It's long on studies and research and all of that but it's really short on implementation" (Kwasniak p.c.). While this characteristic of the strategy may not be immediately obvious, comparison to Victoria's much more detailed *Securing Our Water Future Together* highlights this problem. The level of detail, including financial detail, present in Victoria's policy illustrates high commitment to particular ideas and initiatives. A strategy is meant to go beyond, and be more specific than, a vision statement. Yet *Water for Life: Alberta's Strategy for Sustainability* is essentially a vision statement—a vision of what Alberta's government would like water management to become. *Water for Life* has few specific guidelines for how to follow through with its actions.

Detailed plans act as guidance to those implementing policy. The lack of detail gives little guidance to those implementing *Water for Life*, such as the watershed councils. For example, lack of guidance particularly affects ecological protection: "The province has given very little direction to the watershed councils in developing their water conservation objectives, except to honour all existing allocations" (Wenig p.c.). This lack of guidance means the government is not taking a leadership stance in protecting the public good, such as environmental value; instead it is leaving the details to less authoritative groups. This decision-making downloading can lead to local interests overriding broader (i.e., provincial or national) concerns such as ecological functioning and biodiversity (Wenig 2005a), intergenerational concerns, or even social justice and other concerns of the current generation.

Maintenance of the discussion at the level of platitudes avoids moral absolutes and allows for decentralized, local decisions. It also avoids commitment to particular actions. Alberta's lack of detail points not only to lack of knowledge and the necessity for research, but to the potential of wavering commitment to ideas and initiatives in the strategy. Presumably, this "how to" gap will be filled through implementation and research. But, there is ample room, should some initiatives become unpopular, to renege on the strategy's commitments or recommendations. Without legal imperative, the only reason to motivate full implementation is government reputation and credibility. Maintenance of agency credibility, such as that of Alberta Environment, is always important for government legitimacy and public support of

government. If the government does not fulfill its commitments—such as striving for healthy aquatic ecosystems—it runs the risk of losing credibility. Also to maintain credibility, government needs to take leadership on certain issues "that are of provincial scope", such as addressing the allocation system, or being decisive about economic instruments (Wenig p.c.). Overall this lack of detail affects full participation by not supplying sufficient guidelines; hampers altruistic protection of aquatic ecosystems because few guidelines are in place; and generally makes successful implementation of the strategy difficult.

7.3.3 Inadequate protection of aquatic ecosystems

The strategy "doesn't set out anything really concrete as to how we're going to get to healthy aquatic ecosystems" (Kwasniak p.c.). Water conservation objectives and conservation holdbacks on transfers are the most concrete mechanisms to ensure water for aquatic ecosystems. Both, however, are discretionary and decided at the watershed level with few guidelines from the government. Conservation holdbacks are unlikely to be sufficient in fully or over-allocated watersheds, especially as transfers will remove unused potions of licences that had remained as natural flow. It is questionable how effective WCOs will be; at least one respondent suggested that WCOs have not been set at sufficiently high levels (Kwasniak p.c.).

Beyond these mechanisms, the strongest initiatives are the knowledge-generating actions to better understand and at some point allocate water to aquatic ecosystems. Without adequate knowledge, specifically understanding in-stream flow regime needs, allocation of water to aquatic ecosystems is very difficult. Even in the absence of adequate knowledge, such allocations should be done on a precautionary basis. Victoria is clearly far ahead of Alberta in recognizing, and giving standing to the environment, and ensuring water to the environment through the environmental water reserve. Victoria's ecosystems may be more stressed than Alberta's. Alberta, with a booming oil and gas-based economy, rapid population growth, and the threats of climate change, needs to learn from such progressive initiatives and implement far stronger protection of in-stream flow needs if it plans to maintain the Alberta Advantage, which relies on a healthy Alberta landscape.

7.3.4 First Nations

Jurisdictional ambiguities over water seem to be the main cause of compromised water security in First Nations' communities and a barrier to social equity in the province. The problem evolves from ambiguity among federal and provincial jurisdiction over water on reservations and is complicated by aboriginal claims of self-governance. This issue also affects First Nations participation in policy development and planning. The absence of First Nations

participation is a barrier to achieving full participation and representation from all stakeholder groups. Their voice is particularly important because they have not always had "the same access to reliable quality water supplies as other communities do" (Hill p.c.). One limitation of this study was the inability (due to time limitations and lack of First Nations contacts) to speak with First Nations representatives. This topic deserves further research.

7.3.5 Possibility of new dams and inter-basin transfers

The strategy alludes to more dams in the province. Although the *Water Act* explicitly prohibits inter-basin transfers, the tool remains in the toolbox in the case of a special Act of legislature. Both of these hard infrastructure options could have positive effects by improving the supply situation—at least in the short term—but they could have negative socio-economic effects for current and future generations. Both options could cause ecological damage—through flooding and changing ecosystems in dam construction, or through introduced non-native species by sharing water between two or more watersheds. Inter-basin transfers fundamentally contravene the watershed approach. While both approaches are meant to adapt to changing water demand and dwindling supplies, once they are constructed, deconstruction would be difficult and costly.

7.3.6 Substantive connections not well developed

The connections between substantive issues, such as land use and water use, surface and groundwater quantity, and so on, are not well developed in *Water for Life* and prevent its embrace of a holistic approach. The connection between land use and water is highly complex and involves discussion among all stakeholders as well as prioritizing among uses. This connection is marginally recognized in the strategy but requires further attention. Although quality and quantity are mentioned together, and the *Water Act* is meant to address both, the *Environmental Protection and Enhancement Act* (EPEA) seems to have more regulatory power over land use and water quality than does the *Water Act*. This legislative separation might make it difficult to deal with land use and water, and quality and quantity, issues together. The inextricable link between surface water and groundwater is not at all explicit in *Water for Life* and there is no indication that they are treated as linked; the wetland policy, though, might help protect this link. Lack of knowledge about groundwater location, flow, and quality inhibit treating it as a shared resource. Water should be monitored like other finite natural resources such as natural gas. This information will better enable those implementing the strategy to meet the principles of the proposed water ethic, such as treating water as a common resource, sharing it more equitably, meeting ecosystem needs, and ensuring water for future genera-

tions. Connections made between these substantive water issues will have to be reflected in the institutional arrangements and become more collaborative and less fragmented.

7.4 RECOMMENDATIONS

From the comparison to an "ideal" water ethic (chapter 4) and to Victoria's relatively progressive 2004 White Paper (chapter 6), barriers became evident and a number of key recommendations can be drawn for *Water for Life*.

The first **recommendation** is to re-evaluate Alberta's water allocation system and the priorities to which it subscribes. This re-evaluation is necessary to truly address water's nature as a limited, variable, and shared resource and the concepts of intragenerational and intergenerational equity and equity for ecosystems. The system is based on society's priorities, whether explicit or implicit. Thus public education, sound information, and especially full participation from the public and government are fundamental to reassess, and potentially to redefine, the priorities of Albertan society and to either reject or reaffirm the system's validity. Significant investment in public consultation will be necessary, as might subsequent legal changes. If this discussion occurs soon, it can be a natural but broader extension of the current focus on the oil and gas industry's use of freshwater.

The next key **recommendation** is to develop specific, potent mechanisms of legal stature to restore and ensure sufficient water quality and quantity for healthy aquatic ecosystem functioning. If the government is serious about having "healthy aquatic ecosystems", and thus achieving some sort of equity for ecosystems, the government must take a leadership role and define environmental "bottom lines" or sustainability limits. Because environmental value is a public good, and often not of direct interest to human water users, these bottom lines require legal stature as environmental water allocations (EWAs). Models, such as those in Australia, would be informative with regard to what and what not to do while balancing the needs of society with those of ecosystems. Of course, ecological knowledge to define EWAs in Alberta is still being developed; thus precautionary interim actions are necessary, such as halting further allocations in many watersheds as has been done in some cases and even allocating interim EWAs on a precautionary basis. Such allocation will move the province towards recognizing ecosystems in its justice framework.

While water is one among many protracted issues around First Nations communities and the relationship between First Nations and other Canadians, a **recommendation** of this research is further attention to water security in these communities by the federal and provincial levels. The province of Alberta, as the primary manager of freshwater in Alberta, needs to explicitly acknowledge and work towards better supply and quality of water in First Nations

communities. With recent attention by the federal government to water in First Nations reservations, partnership between federal, provincial, and First Nation governments are a natural step. Such partnership can help resolve an entrenched social equity issue.

The strategy does not explicitly recognize climate change implications and precautionary action. The strategy itself and its objectives, such as water conservation and introduction of watershed management planning processes, may imply precaution and the necessity to act accordingly. However, explicit attention to climate change is a **recommendation** to properly address its possible implications for an already semi-arid environment experiencing significant pressures from population and economic growth. Alberta's government—likely in partnership with the federal government and private data sources—needs ongoing research to monitor, analyse, and project from current conditions. It also needs to act upon possible scenarios beyond the current limits to what further limits might inhibit quality of all life in the province.

In complement to explicit attention to climate change, the research **recommends** the provincial government should ensure future solutions to water quality and quantity concerns match an adaptive management approach rather than inhibit it. This adaptive approach means making current water uses wise through technology and changing behaviour; it also means adopting approaches that involve readjusting concepts of community's best use. This approach means rejecting solutions that offer short-term gain but long-term negative consequences. An adaptive approach will help maintain options for future generations.

To supplement *Water for Life*, the research **recommends** that the government provide specific, comprehensive guidelines to support the strategy's goals. These guidelines should enable efficient and measurable implementation. Updating Alberta's *Framework for Water Management Planning* to reflect watershed management planning offers an opportunity to include specific and measurable guidelines. The proposed drinking water strategy can better support water security in the province—and has the opportunity to address the abovementioned First Nations question. The proposed wetland policy can provide specific detail to support aquatic ecosystem protection. The already existing *Strategy for the Protection of the Aquatic Environment* can further contribute to this protection but does little for environmental legal standing. This rather piecemeal supply of guidelines for water management, though not uncommon, may cause implementation to be fragmented and more difficult. Perhaps periodic assessment or a new edition of *Water for Life* could be issued—as a five-year anniversary document, for example—that is specific and comprehensive.

Fundamental to all of these recommendations is the **recommendation** to integrate aspects of water management through information gathering, explicit recognition of substantive connections, and collaboration among government departments and multi-stakeholder groups.

The Government of Alberta will have to strengthen its efforts of collaboration to align and create integrated policy to recognise important issues, such as land and water interconnection. Embracing this holistic approach will better allow the province to balance its priorities, its activities on the landscape, and equity considerations necessary to sustain a healthy functioning Alberta ecosystem.

7.5 IMPLICATIONS FOR OTHER JURISDICTIONS

To understand the full implications of the policy and ensure the policy is relevant for the current context, the ethical and non-ethical ideas which underpin the policy need to become explicit and be questioned. A specific jurisdiction can use this research's ethical approach to assess its own context and policy development. Important considerations for any jurisdiction using such an approach is to assess its water governance system and water allocation system in terms of specific ethical principles. Specific considerations for a jurisdiction that would align it with the proposed water ethic and support sustainability and an expanded sense of equity include the following.

• *Does the jurisdiction embrace water availability limits of each of its watersheds in allocating and using water? Are the implications of climate change addressed?*
Each area has its own natural limits to water availability. Water use in the area should function within those limits, particularly to take a watershed approach and to not inequitably take water from other users in the area or other jurisdictions. With increasing variability in weather patterns, implications of climate change and inter-annual variability are being more broadly accepted in water management. These implications should be taken into account in watershed planning and be supported by research.

• *Does water allocation and use support current community priorities, and are there mechanisms to adapt to changing community priorities of this shared resource?*
Revealing entrenched priorities and the justice principles underlying the water allocation system may be a first step to changing water use in a jurisdiction and embracing an equitable and sustainable approach to water-use management. Introducing mechanisms, such as participatory mechanisms, to adapt to change may be necessary.

• *Are there groups who have been marginalised in some way due to the allocation system, water use, or government policy or lack thereof?*
To achieve social equity with regard to water's benefits and burdens, questioning how the current water allocation system and policy affect all groups of people is essential.

• *Are water-related decisions open to public debate that is inclusive of all stakeholders (tangible or not) or interested parties at multiple levels?*
Is decision making transparent, is decision making open to all stakeholders, and does the definition of stakeholders include all those currently and potentially affected? These are important considerations for procedural equity in water-use management.

• *Are management solutions considerate of long-term effects? Are they adaptable and precautionary?*
Every policy and management option should be analysed for its adaptability and precautionary implications. Each should support sustainability.

• *Do quantity and quality decisions provide for ecological requirements with enforceable and sufficient environmental water allocations and pollution prevention?*
Whether to protect the intrinsic or the instrumental value of ecosystems, ecosystem functioning should be protected with good quality water of sufficient quantities and avoidance of land and water use practices that degrade that functioning. Such measures should be enforceable and enforced.

• *Does the jurisdiction holistically embrace the relationships of substantive issues and have a governance structure that reflects their connections, the necessity for collaboration, and the proper scale of decision making for each decision?*
Understanding the inter-relationships among substantive water-related issues is essential to recognizing the many factors that affect water availability over time and space. Developing collaborative and nested institutional arrangements can support coping with these inter-relationships and functioning of human systems within natural ecosystems.

Some jurisdictions—like those in Australia and even Alberta in terms of its participatory approach to watershed management—illustrate some of the opportunities of progressive water-use management that rests on equity across space, beings, and time. As research about environmental water allocations and discussion over water ethics progresses, water-use management is likely to become less bound by anthropocentric values and purely technological solutions to meeting human demand. The success or failure of future implementation of particular initiatives in Victoria or Alberta will suggest further implications for other jurisdictions.

7.5 RESEARCH CONTRIBUTION

An ethical approach is only one way to analyse water issues. Unlike other approaches, however, it is able to explicitly address social values that underlie decisions that often cannot be made solely based on scientific evidence. Failure to acknowledge the ethical element of water decisions ignores water's fundamental role as a provider of life and the right to life of all beings. This failure also inhibits change to a more equitable and sustainable world. Little of the literature on global water issues explicitly addresses the ethics behind water use by humans. In the last decade, however, calls for a "new" water ethic have become more numerous and discussion has developed although it remains fragmented (Rahaman and Varis 2003) and not widely or explicitly applied. This research contributes to this evolving topic by collating previously proposed ethical principles, basing them on an equity and sustainability framework, and applying those principles in analysis of water policy examples. This research contributes to understanding "how abstract [environmental justice] principles apply in concrete historical and geographical settings" through case study research to "ground this material" (Hillman 2004, 36). It identifies principles to achieve equity over space, time, and entities in multiple settings and grounds them in real-world policy examples.

The study provides an ethical framework and recommendations for guiding development of future water policy and implementation of *Water for Life* in the Albertan context. The findings of this research may also be useful in planning for other semi-arid regions, with implications for coping with climate change variability and uncertainty now and in the future. This set of ethical principles may be a valuable assessment tool for ethical analysis of water policy statements and their move towards sustainability and equity. Overall, this set of principles can guide decision making around water challenges. The ethic questions and offers guidance on addressing substantive issues—such as effects of water use, multiple uses of water, regulations and policy, and water ownership—and procedural issues—such as who makes decisions about substantive issues, how, and when are they made (Dorcey 1991). It may also have applicability to other common-pool resources that engender conflict or competition, such as fish or trees, and may even be applicable to broader concepts such as biodiversity.

7.6 SUGGESTIONS FOR FURTHER RESEARCH

As one research question often leads to many more, the research results reveal other topics worthy of further study. Evaluating the success of implementation of Alberta's strategy and Victoria's policy is a clear line of enquiry from this research. These questions consider implementation implications from the intragenerational equity perspective to procedural equity, intergenerational equity, equity for the environment, and holistic perspectives. Such

evaluation is necessary to understand how well their ideas, which represent some of the water ethic, function in reality.

• *How can the Canadian-provincial-indigenous relationship in the water context be improved to better provide safe and reliable water to all indigenous communities?*
To effect intragenerational equity, how the relationship between First Nations communities, the provincial government, and the federal government around water issues can be improved is worthy of further exploration.

• *How effectively does the participatory approach function in Alberta?*
While the participatory approach is widely acclaimed for coping with natural resource and other public issues, how effective it is to resolve issues in actuality is an important follow-up question. This question is especially important for analysing the success of Alberta's *Water for Life*. A more abstract but related question is how can future generations and natural ecosystems be best represented in decision making? This question deserves focused attention for procedural equity if ecological or ecosystem justice is the goal.

• *What limitations and complications emerge from Alberta's watershed, place-based approach?*
Capacity and resources of the watershed councils will determine how well these councils function to produce watershed management plans, function as part of an ongoing planning process, and relate to the rest of the partnership network and government. Other complications that emerge from this approach can be compared to other jurisdictions embarking on similar watershed-based initiatives.

• *What are the successes and failures of economic-oriented mechanisms, such as water markets, and what are the ethical implications for current and future generations and for the environment?*
Because water markets are increasingly being used and have been introduced in the Alberta setting, understanding the ethical implications of this tool and other economic instruments is important for directing future water management.

Some broader questions also emerge from the research, including the following questions.

• *Does recognition of ecosystem needs in policy emerge from ethical enlightenment or from necessity? For example, do semi-arid and arid environments coupled with growing*

water demand lead to this type of thinking and policy?

These questions emerge from the question of why Victoria is ahead of Alberta with respect to extending ethical and legal standing to natural ecosystems. This question points to a much broader question of why and how society adopts ethical principles.

• *What trends are occurring in other countries to protect environmental value?*
To direct implementation and future renditions of *Water for Life*, awareness of trends in other places, such as South Africa, California, or other Australian jurisdictions, and lessons learned could be very helpful.

• *What are the dominant, emerging, and marginalised water discourses (e.g., the water soft path (Brandes et al. 2005; Brandes and Brooks 2006), "command and control" approaches, economic or market approaches, human rights and common good approaches) and how well do they support equity and sustainability in water use management?*
While comparison of approaches—such as a democratic pragmatist approach and an economic rationalist approach—were touched upon in this thesis, revealing the effectiveness of these approaches, other approaches, and their ethical implications can offer good lessons for Alberta and other jurisdictions.

7.7 CONCLUSION

Water has often been treated as inexhaustible, and nature, through which water flows and connects, has often been treated as highly malleable and persistently resilient. These views are changing. Nature is not infinitely malleable but can be radically altered to a non-functioning state, particularly when cut off from water. The case studies of this research illustrate that water discourse is shifting from anthropocentric, technologically dominated paradigms to an emerging discourse of greater social equity, legitimacy of intergenerational equity, and the imperative of ensuring enough water to maintain healthy ecosystems. The changing water paradigm and increasing relative scarcity of water require new ethical guidelines based on limits, water's nature as a shared resource, the expansion of equity and moral considerability to include the environment and future generations, and a holistic approach to encompass all of these values and realities.

APPENDICES

A. DISCOURSE ANALYSIS QUESTIONS FOR DOCUMENT ANALYSIS

The following questions were used to analyse the selected policy documents.

Questions about vocabulary

What type(s) of words and language were used in/throughout the policy document? (e.g., economic, ecological, and so on)

Is the language informal or formal? Are euphemistic expressions used? What social relationships are set up by word choice?

What key metaphors are used? And what other rhetorical devices are used?

Questions about grammar

Analysis of the policy documents in terms of grammar and wordplay will indicate ideological meaning not explicit in the text.

Is agency clear?

Are sentences active or passive?

Positive or negative?

Does language describe actions, events, attribution?

Who and/or what are the agents? … and what are their motives?

How are subjects positioned in relation to each other?

What pronouns are used—"we", "you"?

Which modes are used? Declarative, imperative, or question?

Comments on the overall structure of the document?

Interpretation Questions

Key topics and concepts:

What are the main topics and key concepts referred to or explained in the policy document?

What is the stated purpose of the document?

What is the rationale for the document's production?

Does policy explicitly state fundamental principles for water management?

Explicitly identified challenges?

Are there solutions proposed to those challenges?

Does the document propose ways of measuring success?

Are there explicitly stated anticipated objectives?

Are there explicitly stated actions to achieve the goals and anticipated outcomes?

How are the areas prioritised in the policy? What is the topics' relative importance?

What level of commitment is the document's producer giving to specific ideas or statements? (includes types of commitment)

What basic entities (their existence) are recognized or constructed?

What assumptions are made in the document?

What assumptions are made about natural relationships?

What relationship does the policy express with regards to water and ecosystems (e.g., stewardship, caregivers, protectors, etc.)? What role does the government play?

Does the policy document explicitly state what its policy will be?

Situational and intertextual context

What events led to the formulation of the new policy statement, what was the formulation process, who championed the new policy?

What are the key drivers motivating the formation of the policy?

Who are the water users and water-use sectors?

What values of water are recognized? Does it have economic, social, cultural, and environmental value?

Who does water 'belong' to? Is there someone who the document deems an 'owner' of water? Or how is authority over water expressed? Who's responsible for water?

What are the intertextual references in the document? Is the text part of a chain or network of texts? To what other texts is the document affiliated, or give reference? What is its intertextuality?

Is the document legally binding?

What conceptions of the past and past policy and management practices are evident in the text?

What is the biophysical context as expressed by the policy document?

What interpretations are participants—policy makers, politicians, relevant agencies, authorities involved, industry, agriculturalists, urbanites (users)—giving to the situational and intertextual context?

What discourse type(s) is the document drawing upon, including what classification scheme(s)?

Broader scale interpretation

The justification for the following questions is evident from the discussion in chapter 3. This line of questioning is directly ideological by explicitly addressing ethical value-based themes. These questions invite interpretation on a broader, cross-document scale. The questions themselves indicate particular discourses. The responses to many of the previous

questions contribute to the answers to these questions, which form the basis of my results in chapters 4 and 5.

Does the document recognise limits and variability in the water cycle and availability of water? Does the policy state action items to cope with these limits?

Does the policy regard water as a common, shared good or resource? Does the policy state action items that approach water as a common, shared good?

Does the policy state that there should be water security for all human users' needs? Does the policy state action items to ensure water security for all?

Does the policy recognise the importance of full participation by all affected in planning, decision making, and implementing action to meet water issue challenges? Does the policy indicate action items to this regard?

Does the policy recognise future generations? Does it state actions that would ensure the viability of future generations?

Does the policy recognise the needs of the environment? Does the environment have standing with regards to water allocation and prevention of pollution? Are there stated action plans to ensure that the environment's needs are met alongside those of current and future human generations?

Does the policy treat water issues holistically? Does it recognise the connection between land and water management, between surface and groundwater, between quality and quantity? Does it state action plans that would address water issues in this way?

Explanation

The analysis of these responses, in combination with the interview results in the case of Alberta, takes the discourse analysis to the explanation stage. Analysis of these questions indicate relations among themes and values, and the dynamic relations at the situational, institutional, and societal levels (Fairclough 1989).

B. INTERVIEW QUESTIONS

(1)   What is your involvement and interest in water issues in Alberta?

(2)   Some people say that water should be managed as a finite resource and as variable in its distribution and availability.
How do you think the *Water for Life* strategy recognizes this view?
How do you think the Alberta government (and those implementing the strategy) could effectively implement these conceptions of water?

(3)   Some people suggest that water should be treated as a common resource.
How do you think the strategy addresses this issue?
How do you think the government could implement this aspect of water use management?

(4)   Some discussion suggests that water should be ensured for all people (regardless of economic status, ethnicity, religion, and so on) to meet their basic needs.
How do you think the strategy addresses this idea?
How do you think implementation will address this?

(5)   A number of people state that the water management decision-making process should include all those directly affected by the decisions.
How does the strategy address the idea of full participation?
Have all, and will all, stakeholders (or affected parties) be included in the decision-making process in developing and implementing the strategy?
Have any groups been left out of the policy formation process?

(6)   Some current discussion suggests that future generations of humans should be considered and taken into account while managing natural resources.
How are future generations considered in this water strategy?
How will future generations factor in implementation of the strategy?

(7)   Some people suggest that the environment, or ecosystems, should be considered in allocation and quality management of water.
How are the needs of ecosystems being considered in the strategy?
How will ecosystems be taken into account upon implementation of the strategy?

(8)   Some discussion supports the idea of a holistic, systems-oriented approach to water management.

How do you think the strategy supports or does not support this idea?

How will implementation take this into account?

(Is land and water use considered together in any decision regarding land use? Are surface water and groundwater considered together as linked? Are government agencies working together in a lateral and nested fashion?)

(9)   What (other) ethical principles do you think are important to include in a water ethic?

(10)   Are there some questions that you think I should have asked?

Extra questions (particularly for those involved in the strategy development process)

• How does the water policy compare to past policies regarding Alberta's water?

• What were the key challenges in developing this strategy?

• What will be the key challenges to implementation?

C. INFORMATION LETTER

Department Letterhead
University of Waterloo
May 9, 2005
Dear (insert participant's name),

This letter is an invitation to consider participating in a study on Alberta's water policy. I am conducting this study as part of my Master's degree in the Department of Environment and Resource Studies at the University of Waterloo under the supervision of Professor Paul Kay. I would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

Alberta's *Water for Life* strategy represents this provincial government's approach to water issues now and into the future. The policy embodies the ethic(s) that guided the document's production and that will ideally guide its implementation. The purpose of this research is to examine the ethical basis of the *Water for Life* document and compare its approach to other water policies.

Interviews will contribute to the study by providing insight into the strategy's formulation, future implementation, and current context. Your input is important for understanding this context and its implications. Therefore, I would like to include you as one of several key informants to be involved in my study. I believe that because you have an active interest in Alberta's water issues, you are well suited to speak to the issues of interest in this study. If you know of other people who would be appropriate to speak to, please do not hesitate to inform me.

Participation in this study is voluntary. It will involve an interview of approximately one hour in length to take place in a mutually agreed upon location. Alternatively, I may email the questions to you and you may respond by return email. You may decline to answer any of the interview questions if you so wish. Further, you may decide to withdraw from this study at any time without any negative consequences by advising me or Paul Kay. With your permission, the interview will be tape-recorded to facilitate collection of information, my memory, and analysis. The choice is yours about whether all information you provide is considered completely confidential or not. If you chose confidentiality, your name will not appear in any thesis or report resulting from this study; however, with your permission anonymous quotations may be used. Data collected during this study will be retained for an indefinite period of time in the locked office of my supervisor. Only researchers associated with this project will have access to the information. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me by email at mbeverid@fes.uwaterloo.ca or at 519-884-7816 before June 13 and after July 5, 2005. You can also contact my supervisor, Professor Paul Kay at (519) 888-4567 ext. 5796 or by email pkay@fes.uwaterloo.ca.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes of this office at (519) 888-4567 ext. 6005.

I hope that the results of my study will be of benefit to those informants directly involved in the study, to those interested in water issues in Alberta, as well as to the broader research community. Upon completion of my study, I will provide you an abstract of my thesis. Access to the full thesis will be provided upon request.

I very much look forward to speaking with you and thank you in advance for your assistance in this project.

Yours Sincerely,
Meghan Beveridge
MES Candidate, Environment and Resource Studies
University of Waterloo
200 University Avenue West
Waterloo, ON, N2L 3G1
mbeverid@fes.uwaterloo.ca
519-884-7816

D. CONSENT FORM

I have read the information presented in the information letter about a study being conducted by Meghan Beveridge of the Department of Environment and Resource Studies at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing my interview to be tape recorded to ensure an accurate recording of my responses.

I am also aware that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous, if chosen to be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This project has been reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. I was informed that if I have any comments or concerns resulting from my participation in this study, I may contact the Director, Office of Research Ethics at (519) 888-4567 ext. 6005.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.
YES NO

I agree to have my interview tape recorded.
YES NO

I agree to use of quotations in any thesis or publication that comes of this research.
YES NO

I chose to have all quotations remain anonymous in any thesis or publication that comes of this research.
YES NO

Participant Name: _____ (Please print)

Participant Signature: _____

Witness Name: _____ (Please print)

Witness Signature: _____Date: _____

E. FEEDBACK LETTER

Department Letterhead
University of Waterloo
May 9, 2005
Dear (Insert Name of Participant),

I would like to thank you for your participation in this study. As a reminder, the purpose of this study is to examine the ethical approach of Alberta's *Water for Life* document and identify aspects of the policy formulation, implementation, and context not immediately evident in the document.

The data collected during interviews will contribute to a better understanding of the ethical foundations of the document.

Please remember that any data pertaining to you as an individual participant will be kept confidential, unless you chose for data to not remain confidential. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or if you have any questions or concerns, please contact me at either the phone number or email address listed at the bottom of the page. If you would like a summary of the results, please let me know now by providing me with your email address. When the study is complete, I will send an abstract of my thesis it to you. Access to the full thesis will be provided upon request.

As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes in the Office of Research Ethics at 519-888-4567, ext. 6005.

Regards,
Meghan Beveridge
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University of Waterloo
200 University Avenue West
Waterloo, ON N2L 3G1
mbeverid@fes.uwaterloo.ca
519-884-7816

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ABBREVIATIONS

AWC – Alberta Water Council

AUS$ – dollars in Australian currency

BACs – Basin Advisory Committees (Alberta)

BC – British Columbia

CAD$ – dollars in Canadian currency

CMAs – catchment management agencies (Victoria)

COAG - Council of Australian Governments

DSE – Department of Sustainability and the Environment (Victoria)

ENGOs – environmental non-governmental organizations

EWR – environmental water reserve (Victoria)

GL – gigalitres (Victoria)

GMAs – groundwater management areas (Victoria)

GMPs – groundwater management plans (Victoria)

GOA – Government of Alberta

IFN – in-stream flow needs

IWRM – integrated water resources management

l/c/d – litres per capita per day

NSW – New South Wales, Australia

NWT – Northwest Territories

PAVs – permissible annual volumes (Victoria)

p.c. – personal communication

Abbreviations

SA – South Australian

SFMP – Streamflow management plans (Victoria)

SK – Saskatchewan, Canada

SSRB – South Saskatchewan River Basin

UN – United Nations

WCOs – water conservation objectives (Alberta)

WPACs – Watershed Planning and Advisory Councils, or watershed councils (Alberta)

WSGs – Watershed Stewardship Groups (Alberta)