

Southern Alberta Resource Economics Centre

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SAREC Report 2011-4

**Exploring non-irrigator policy preferences
for water reallocation in southern Alberta:
Calgary and Strathmore**

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Southern Alberta Resource Economics Centre Publications

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Abstract

There is an increasing need, in southern Alberta, to reallocate water to meet growing urban and environmental demands and adapt to uncertain future water supply in the face of climate change. Since irrigation accounts for 72% of the water allocated in the SSRB, it is inevitable that reallocation will move water out of agriculture. Public reaction to previous water allocation transfers has been mixed, with opposition based on a wide variety of perceived impacts, ranging from economic to environmental and social.

Although the majority of tax revenues that might be used to ameliorate such effects of water reallocation come from large urban centres, non-farm dwellers in more rural areas have significant policy influence due to disproportionate representation in the provincial legislature. As a result, the differing perceptions of non-irrigators along the urban to rural spectrum toward water reallocation policy are of great interest to policy makers. In particular, the values and attitudes that shape people's perceptions of reallocating water from agriculture to other uses has been theorized to be related to their social and physical separation from agriculture.

This report explores the values, beliefs and expectations, attitudes and social norms that influence non-irrigators preferences for water reallocation policy based on 724 responses to extensive surveys in Calgary and Strathmore. The questionnaire collected information on socio-demographic data (17 items); values, attitudes and beliefs with respect to water reallocation (49 items); social factors (19 items); and policy preferences (10 items). In general, urban residents of Calgary expressed greater environmental concern and well as greater support for government control in emerging water markets. Respondents from Strathmore, a more rural community, had stronger economic and social ties to irrigators, and were more supportive of protecting irrigators' rights.

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1 Introduction

Alberta's growing population and expanding economy are putting pressure on the province's freshwater resources. In particular the burgeoning urban population has resulted in increased demand from municipal water users, while greater environmental awareness and concern for the health and sustainability of Alberta's natural environment has given rise to demand for greater in-stream flow, the amount of water kept in the river to encourage healthy aquatic and natural ecosystems. Historically, new demand for water in Alberta has been met by allocating water rights to new users under a prior appropriation, or first-in-time, first-in-right (FITFIR), system. Over time, many of Alberta's river basins, particularly those sub-basins within the South Saskatchewan River Basin (SSRB), have been fully or over allocated with many of the largest and most senior water licenses provided for the purpose of irrigated agriculture. This issue is especially pressing in the face of uncertain future water supply due to climate change. To help protect water users and the environment, sub-basins in the SSRB were closed to new applications for water rights in 2005. As a result, water users seeking new or expanded allocations must acquire them from existing users in transfers, made possible by the revised Water Act in 1999.

Since irrigation accounts for 72% of the water allocated in the SSRB, it is inevitable that reallocation will move water out of agriculture. The consequences of such a reallocation vary widely, and significant direct and indirect economic effects have been identified (Howe *et al.* 1990) and other social and environmental effects of varying significance may result (Gould 1988). In the Balzac transfer, the largest and most widely publicized transfer to date in Alberta, significant public opposition has been based on a wide variety of perceived issues (D'Aliesio 2007). Likewise, the attempt to amend irrigation district licences to allow them greater flexibility in transferring their water allocation to non-irrigation users is coming under heavy scrutiny (Droitsch 2007). Although the idea that water must be reallocated to align with society's changing needs and values is widely accepted by scholars and policymakers alike (Bjornlund 2010; Baron

et al. 2002; Alberta Environment 2008), how this reallocation should take place is still under debate. In particular, the use of markets for reallocating water is seen as problematic by some (Christensen and Droitsch 2008), a feeling which has gained significant support within the wider community (Percy 2005). In order to design successful policy that is in line with the desires of Albertans with respect to water resource management, the opposition to market-based water transfers must be understood. By minimizing the perceived economic, social and political costs of water reallocation, policy makers can increase the likelihood that necessary water reallocation is widely accepted and therefore be more likely to succeed.

One way to determine non-agricultural residents' acceptance of water reallocation policies is to determine their values and attitudes toward water management proposals. As noted by Routhe *et al.* (2005):

Citizens compare management proposals according to their perceptions of the probability and desirability of their potential consequences. Environmentalists worry about the potential impacts on the environment. But all rely on some set of beliefs, norms, attitudes and values to inform their decisions. (pg. 875)

If necessary water reallocation is to gain sufficiently wide acceptance to be politically feasible, we must develop an understanding of what beliefs, norms, attitudes and values are important to stakeholders and how they influence policy preferences for water reallocation.

Concerns over resource allocation are not exclusive to Alberta, nor are they specific to water. Similar issues are faced by governments around the world related to all manner of natural resources; however water reallocation in Southern Alberta provides an excellent case study for considering resource management and allocation between competing rural and urban uses and the environment. In addition to a review of the relevant literature, this report will communicate the overall findings from an extensive survey of rural and urban households not directly involved in irrigated agriculture. The survey investigated the respondents' level of agreement with a variety of policy proposals related to water management in addition to a wide variety of value and attitude objects, social factors, and socio-economic indicators expected to influ-

ence their policy preferences. A discussion of the overall findings with respect to social and physical proximity to agriculture follows.

2 Literature Review

A number of related bodies of literature must be explored to gain a strong understanding of how stakeholders form their preferences for policy related to resource management. Of particular interest in this study are the psychological tendencies of stakeholders that influence their preferences and behaviour with respect to water and water transfers. Since water reallocation has the potential for a wide range of effects on parties not directly involved in the transactions, the understanding of the issue gained from economic analysis alone provides insufficient information on which to base decisions affecting the wider population (Batten 2007; Hanemann 2005). As the literature concerning attitudes toward water transfers specifically is limited, the following review considers wider natural resource management, environmental and theoretical issues.

2.1 Resource Valuation

Water is an essential element of life, necessary for human life both directly for replenishing lost fluids and as an input for food production. It also serves a wide range of economic, social and environmental functions. The complex, dynamic character of water as a replenishable but depletable resource which provides multiple benefits as it moves through the hydrologic cycle makes it difficult to arrive at a complete economic valuation (Batten 2007; Tietenberg 2002). To further complicate matters, significant option and non-use benefits of water exist in addition to both consumptive and non-consumptive use benefits (Weisbrod 1964; Krutilla 1967), all of which are dependent on the quality, location and timing of the resource in addition to its quantity (Batten, 2007). In order to provide an accurate total economic valuation of the resource all of these benefits must be considered.

The many different benefits provided by water and the trouble in evaluating their worth, whether to an individual or society as a whole, highlight the management issues that surround resource management and

water reallocation projects. In particular, the more abstract benefits provided by water—including social, cultural and spiritual benefits—are difficult to quantify (Syme *et al.* 2008). These abstract benefits may be even more difficult for the general public to conceptualize and price in terms useful for an economic valuation. Despite this, water is seen by the vast majority of the population as an incredibly important resource worthy of protection (Nanos 2009). Accordingly, in order for water resource management decisions and water reallocation projects to be politically feasible they must be aligned with the policy preferences of the general public (Eisenhauer and Nicholson 2005). Although preferences and decisions are understood to be based on some widely defined conception of economic analysis, the majority of the public does not explicitly think in such terms. Rather, decisions are made and behaviours based on congruence with an individual's set of values or general value orientation (Rokeach 1973; Schwartz 1992). As a result, if we are to understand the policy preferences of stakeholders with respect to water transfers, in terms that are relevant to their actual decision making process, we must gain an understanding of the psychological and sociological constructs that underlie those decisions.

2.2 Theoretical Background

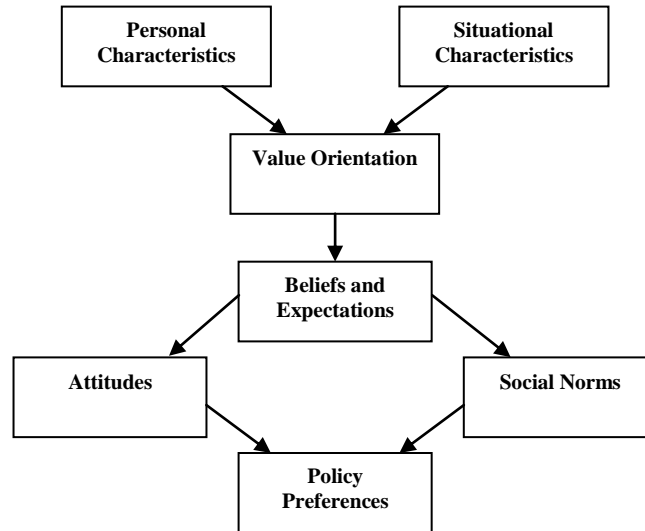
The relationship between various psychological constructs as they relate to preferences and behaviour has been widely explored in the psychology literature. Milton Rokeach, in his work on beliefs, values and attitudes, found that a relatively small number of values have a large part in influencing the full range of human attitudes and behaviours (1968; 1973). Along similar lines, Martin Fishbein found that expectations and values were determinants of attitudes (Fishbein 1967), which in turn were instrumental in the formation of behavioural intention—the immediate antecedent of behaviour, according to later work by Fishbein and Ajzen (1975). In this work, the theory of reasoned action is presented and includes attitudes and subjective norms, of which behavioural intention is a function. The theory of reasoned action was later extended by Ajzen to include a construct for perceived behavioural control and renamed the theory of planned behaviour (1988).

The theory of planned behaviour emerged as an influential and popular framework for the study of human actions, with applications ranging from health (Godin *et al.* 1996) to driving violations (Parker *et al.* 1992) and conservation behaviour (Poortinga *et al.* 2004) and many other fields. The application of the theory to conservation behaviour and other environmental suggests that it might also be applicable when exploring water-related behaviours including conservation, use, and the trading of water licences. In the present study, however, the goal is not to measure behaviours related to water reallocation, but rather policy preferences of stakeholders who are not directly involved in the reallocation transaction. As a result, behaviour will not be measured and the conceptual framework of the study will rely on a modified version of the theory. In line with Dunlap and Jones (2002) and Routhe *et al.* (2005), we contend that intention is the conative expression of preferences. Since we are interested in understanding policy preferences and their determinants, it is reasonable to base our conceptual model on the theory of planned behaviour, halting our analysis at the level of intent, for which preferences are a suitable proxy. In addition, we will remove the construct for perceived behavioural control, as no end-behaviours will be analysed and the expression of policy preferences is not expected to be limited by perceived control.

Also in line with the goal of exploring the determinants of policy preferences with respect to water transfers, the theoretical framework was extended to include personal and situational characteristics as well as expectations, beliefs and value orientation. According to Dietz *et al.* (1998), research into the determinants of environmentalism, which is closely aligned with research on natural resource management, can be divided into two major branches: those focusing on sociodemographic factors and those focusing on values, attitudes and beliefs and other social psychological constructs. Few studies combine these branches, and those that do (Dietz *et al.* 2007; Black *et al.* 1985) tend to find that social psychological characteristics have a greater impact on intention or preferences than do sociodemographic factors (Dietz *et al.* 1998). Nonetheless, sociodemographic factors provide a useful means to analyse the variation in policy preferences between communities, such as between rural and urban communities in the case of

rural to urban water transfers. Our hypothesized causal model is depicted in Figure 1 (only major hypothesized pathways are depicted).

Figure 1: Conceptual framework for resource management preferences



The causal ordering is based on a prior conceptualization that combines the value-expectancy theory (Fishbein 1967) with parts of the theory of planned behaviour (Ajzen 1988). First in the causal chain are personal and situational characteristics which shape values. These general values are expected to influence more specific beliefs and expectations. Beliefs and expectations, in turn, influence attitudes and the social norms, which are antecedent to policy preferences.

2.2.1 Personal and Situational Characteristics

Personal and situational characteristics include respondents' age, income, education and occupation and other sociodemographic measures but, for the purposes of this study, also include such measures as how they access water for domestic use and the water-related recreational activities in which they take part. It is expected that many of these characteristics will influence the values and attitudes toward water reallocation that respondents express. In past studies, for example, age and income have been found to be significant predictors of overall environmental concern and related values (Van Liere and Dunlap 1980)

which we expect will influence policy preferences. The tendency for those with higher levels of education to support greater government involvement in environmental issues is also well supported in the literature (Rasinski *et al.* 1994).

In addition to these general sociodemographic characteristics, situational characteristics specific to water use and irrigation are of interest. In particular, recreational uses of water are expected to shape respondents' opinions of water transfers. As found by Dunlap and Heffernan (1975), those who utilize water bodies and their surrounding environments for appreciative types of recreation versus consumptive types will likely have differing environmental values and attitudes toward keeping water in the river. Likewise, direct economic reliance of extracting water from the river system, or even living in an area where such uses are important economically, will most likely influence respondents' water-related values (van Liere and Dunlap 1980; Huddart-Kennedy *et al.* 2009; Berenguer *et al.* 2005).

2.2.2 Values

Values are defined in psychology as the guiding principles in the life of an individual or group which transcend specific situations. They are thought to be relatively permanent, although they may change over time. Pioneering work on the subject of values was undertaken by Rokeach, who established that values represent a "person's beliefs about ideal modes of conduct and ideal terminal goals" (1968, pg. 124). Rokeach also argued that the values held by individuals are not fully independent of one another, but rank ordered in value systems in terms of importance (1968). This allows for decision making in situations where a person is faced with options that are not congruent with all of their values, allowing a decision to be made based on which values are more important in that particular situation. In this way trade-offs can be made between, for example, high environmental concerns and economic growth which are often in opposition of one another.

Work on generating a list of universal values was done by Schwartz (1992), who identified fifty-six individual values which could be grouped into ten value types, including: power, achievement, hedonism,

stimulation, self-direction, universalism, benevolence, tradition, conformity, and security. Since not all of these value types are related to the environment, researchers studying environmental concern in individuals or across society have identified three distinct value orientations that are relevant in a variety of situations related to the environment (Schultz 2001). These three value orientations correspond with concerns that may affect preferences toward water policy, and can be classified as egoistic, altruistic or biospheric (De Groot and Steg 2008).

Those with an egoistic value orientation are primarily concerned with how the costs and benefits of policies or behaviours will affect them personally. With respect to water transfers, this may include any perceived effect on access to water for personal or recreational uses or use in support of the respondent's livelihood. The altruistic value orientation is more concerned with effects on others. In the case of water transfers, the most obvious group to be affected by water reallocation is farmers and those in communities that rely on irrigation to survive. Finally, those expressing a biospheric value orientation will be primarily concerned with the effect of water reallocation on the ecosystem and biosphere.

2.2.3 Beliefs and Expectations

Following work by Stern and Dietz (1994) into the relationship between values, beliefs and attitudes as they relate to environmental behaviour, personal beliefs and expectations toward a value object are expected to be strongly related to values. These authors found that salient beliefs about the likelihood and nature of outcomes on value objects mediated between values and attitudes. This mediating effect is theorized to be especially important with environmental attitude objects because of peoples' unfamiliarity with the environmental issues they are asked to form attitudes about (Stern and Dietz 1994). This initial unfamiliarity is also true of many stakeholders on the topic of water reallocation, and particularly the case for non-irrigators.

With respect to rural to urban/environment water transfers, the salient beliefs and expectations will relate to the primary concerns of stakeholders. Since the overall level of familiarity with resource management

issues is expected to be relatively low, these concerns are expected to align with those presented in the popular press, which has focused primarily on environmental and economic concerns, as well as social concerns with respect to irrigators (D'Aliesio 2007). Overall level of knowledge related to water management in the province may also influence beliefs and perceptions affecting attitudes, and will be measured as well.

2.2.4 Attitudes

Stemming from expectations and beliefs are attitudes which, unlike values, are purported to be situation specific, and relatively fluid given changes in knowledge or expectations (Rokeach 1968). In addition, rather than serving as situation transcendent guiding principles, they are best understood as evaluations of an specific attitude object as either good/bad, harmful/beneficial, pleasant/unpleasant, or like-able/dislikeable (Ajzen 2001). They are also widely theorized to be strong predictors of intent (Ajzen 1988; Thøgersen and Grunert-Beckmann 1997), which is identified by Routhé *et al.* (2005) as a conative expression of preferences.

When considering attitudes toward water and resource reallocation, a variety of different attitudes may be identified as relevant. Notably environmental attitudes have been found to be important predictors of policy preferences related to resource management (Tisdell and Ward 2003), as have attitudes toward the use of market-based systems (Percy 2005; Keenan *et al.* 1999) or government control for managing resources (Tisdell and Ward 2003; Millfont and Duckitt 2010).

2.2.5 Social Norms

Changing societal values are understood to be one of the driving forces behind rural to urban water transfers in Alberta and around the world (Bjornlund 2010). In particular, increasing environmental concern and greater knowledge of the need for water for environmental protection is resulting in increased demand for water resources for these purposes. However, reallocating water currently used for irrigation will impact irrigators and the rural communities that are reliant on agriculture for their economic well-

being or as an important part of the social fabric of their communities. These types of effects on individuals and communities (as well as the environment) elicit strong and varied social pressures on individuals to behave in certain ways. As a result, social norms surrounding agriculture and the environment are a critical part of understanding policy preferences for resource management.

Sharp and Adua (2009) studied the variation in attitudes about agriculture and the environment between urban and rural areas with respect to both physical and social proximity to agriculture, finding that any significant variation in agro-environmental concern based on physical proximity disappeared when social connections were controlled for. This finding emphasizes the importance of critically considering why observed differences between rural and urban areas in terms of policy preferences concerning water reallocation may exist, noting that simply location along the rural-urban gradient may not be as telling a factor as previously suggested.

2.3 The Rural-Urban Gradient

Although the findings of Sharp and Adua (2009) caution against drawing conclusions about attitudes and preferences based exclusively on location along the rural-urban gradient, this distinction is still useful for making general comparisons and expanding our understanding of attitudes towards rural to urban/environment water transfers. In order to do so, however, it is necessary to distinguish between rural and urban places as well as the gradient between them with regard to both form and function (Wirth 1938). The most urban areas have large, denser and more heterogeneous populations while truly rural communities have low, widely spread and often homogenous populations (Pahl 1966; Fischer 1975). Between these two poles lie progressively smaller cities and towns that exhibit some characteristics of each in both their geography and the values and attitudes of the people who settle them.

In recent years, the empirical evidence in support of different sets of values and attitudes at specific points along the rural-urban continuum has come under increased scrutiny (Jones *et al.* 1999; Sharp and Adua 2009). The changing demography of rural areas, the effects of mass media and the “decline in the impor-

tance of the friction of distance” (Halfacree 1993, pg. 28) have resulted in an increasing tempo and extended scale of the mobility and networks in contemporary societies (Marsden, 2006). Other key factors have been the growing interest in rural living as urban residents seek to experience the perceived benefits of living in rural communities (Halfacree 1993) and the resulting transition to a ‘post-productionist’ countryside as these new residents generally do not take up traditional rural occupations.

The result has been a notable decline in the agricultural hegemony in many rural areas and an emerging variety of political and institutional influences affecting many aspects of rural life as well as a convergence of expressed values and attitudes between rural and urban areas (Marsden 2003). Marsden (2003) further argues, however, that “agriculture and broader land-based social and economic relations still have a significant hold on the shaping of regulation, and the processes by which rural areas are differentiating” (pg. 108; also see Brownsey 2008). One result of these changes is that places that fall between the polar opposites of the rural-urban continuum are increasingly characterized by processes where place and identity are constantly being contested and reconfigured (Masuda and Garvin 2008).

2.4 Rural-Urban Differences in Environmental Concern

Previous research on environmental concern has found a clear distinction between the levels of concern exhibited by rural and urban populations, with rural populations exhibiting significantly less concern towards for the environment (Van Liere and Dunlap 1980; England *et al.* 1979; Tremblay and Dunlap 1978). These views might be expected to present themselves in the attitudes and preferences towards policy concerned with water reallocation as well. In either case, these differences are often attributed to the tendency for rural dwellers to have more utilitarian views of the environment in part because of their economic reliance on capitalizing natural resources (Jones *et al.* 1999; Lowe and Pinhey 1982). Other socio-demographic factors such as the historically higher age and lower education levels of rural residents have also been tied to lower overall environmental concern (Van Liere and Dunlap, 1980). Recently however, significant differences between general environmental concern between rural and urban populations has been seen as decreasing (Howell and Laska, 1992), while some studies have found that specific local en-

vironmental issues still arouse strong feelings (Jones and Dunlap, 1992; Freudenburg 1991). Such studies lead us to believe that the transfer of water allocations out of agriculture and into urban and environmental uses for the purposes of establishing minimal flows might be given less support by those living in communities reliant on irrigation.

Rather than the divergent environmental values between rural and urban populations predicted by earlier hypotheses, scholars in the critical era found similar underlying values but differing pro-environmental behaviours (Fortmann and Kusel 1990). The younger, more educated urban and ex-urban residents were more likely to act on their concerns, and had greater access to means of expressing their values and attitudes such as recycling programs and mass transit (Huddart-Kennedy *et al.* 2009). Additionally, they were more apt to be politically active than long-time rural residents, although in recent studies their underlying values towards the environment were very similar (Jones and Dunlap 1992). By identifying the relevant values and attitudes toward the local issue of rural to urban water transfers, the present study will attempt to identify and explain differences in policy preferences. Although the underlying components factoring into these differences may be converging, conducting cases studies at different locations along the rural-urban continuum will provide useful insights for policymakers and resource managers.

2.5 Summary

This literature review focused on identifying the psychological constructs that are likely to influence stakeholders policy preferences related to water reallocation from rural to urban and environmental uses. Values, beliefs and expectations, attitudes and social norms, as well as the personal and situational characteristics that help to determine them were identified as important factors throughout the literature, and are expected to aid in the understanding of preferences. Further, differences between these variables in locations with varying physical and social proximity to agriculture was identified as a useful frame with which to observe and understand the phenomena. Exploring these factors in the context of sustainable water reallocation in southern Alberta will provide empirical support for our expanded conceptual model, which links sociodemographic and situational characteristics with the psychological factors expected to

be relevant to stakeholders' policy preferences—particularly as they relate to the benefits of water whose complex and abstract nature make traditional economic valuation difficult.

3 Study area, data and methodology

The analyses in this report are based on a mail out survey sent to randomly selected households in Calgary and Strathmore, Alberta. The initial mail-out consisted of 3,000 surveys mailed to Calgary, which has a population of 1,071,515 in 414,185 occupied dwellings (City of Calgary 2010), and 2,338 mailed to Strathmore, with its population of 12,139 in 4483 occupied dwellings (Town of Strathmore 2010). A systematic random sample was performed on all available address for Calgary, with every n^{th} address selected. This ensured all listed addresses had an equal chance of receiving the survey. For the Strathmore sample, all available addresses obtainable through a list broker (West List Co.) were selected. The initial mailing included a cover letter explaining the project and requesting participation, the survey instrument, an entry form for a cash prize incentive and a postage-paid return envelope. Respondents were informed that the survey was voluntary and that it was expected to take 15 to 20 minutes of their time. Following the initial mail-out, three timed reminders were mailed at three week increments to encourage respondents to participate (Dillman 2000). The final reminder included a web address at which potential respondents could complete the questionnaire online.

In total, 2,693 surveys were delivered in Calgary with the remainder returned as undeliverable due to incorrect address information provided by the list broker. For the same reason, 2,216 surveys were delivered in Strathmore. Of these, 476 responses were received from Calgary and 347 from Strathmore, resulting in a response rate of 16.8%. After removing surveys with incomplete information as well as respondents who had self-identified as irrigators, 422 completed responses from Calgary and 302 completed responses from Strathmore remained. Census data was used to test that the respondents were representative of the population. Given that this is a household and not a resident survey, the respondents are not representative of the population with respect to age and gender.

The questionnaires collected information on demographic information (17 items); values, attitudes and beliefs with respect to water reallocation (49 items); social factors (19 items); and policy preferences (10 items). The value, attitude and belief statements, in addition to policy preference statements and some social factor statements utilized a five-point Likert scale to measure agreement to the statements provided. Statements referenced a wide range of topics relevant to the water reallocation discussion as identified in personal interviews with key informants involved in a variety of positions related to water policy, including environmental issues, municipal and health issues and irrigation.

In the findings sections the responses to all questions are discussed under the headings: 1) Demographic Characteristics; 2) Value Orientation; 3) Beliefs and Expectations; 4) Attitudes; 5) Social Norms; and 6) Policy Preferences. Descriptive statistics are reported and significance tests used to identify differences between the Calgary and Strathmore sample. The statistical methods used in the findings section are:

- Pearson Chi-square test – This test is appropriate for testing the association between two nominal variables or between one nominal variable and one ordinal variable.
- Wilcoxon-Mann-Whitney test – This test is appropriate for testing for significant differences between two independent samples measured at an ordinal scale. Since Likert-scale measurement may be interpreted as ordinal or interval, this test provides an acceptable means of testing for differences in response between the Calgary and Strathmore samples.
- Two independent sample T-test – Similar in function to the Wilcoxon-Mann-Whitney test, this test is appropriate for testing for significant differences between independent samples measured on an interval scale.
- Spearman's rank correlation coefficient – This test is appropriate for measuring the direction and magnitude of correlation between two ordinal variables, such as between policy statements and values, attitudes or beliefs.

4 Findings

As discussed in the preceding literature review, distinctions between rural and urban populations provide an interesting and useful perspective for discussions of resource use and allocation policy. This is particularly the case for water reallocation policy in Southern Alberta, as irrigation is an integral part of many rural economies and societies in the region. Following the design of the present study, the findings presented below will be divided into two groups for the purpose of descriptive analysis, with respondents from Calgary composing the urban sample while those from Strathmore composing the rural sample.

4.1 Demographic Characteristics

Demographics include such characteristics as gender, age, income and occupation which might be expected to impact a respondent's policy preferences with respect to water reallocation, or the determinants of those preferences.

Table 1: Completed surveys received by survey area (location of residence)

	Complete sample	
	Frequency	Percent
Strathmore	302	41.7
Calgary	422	58.3
Total	724	100

Respondents from Strathmore accounted for 41.7 percent ($n = 302$) of the completed surveys while urban respondents in Calgary accounted from 58.3 percent ($n = 422$) (Table 1). Of the households responding, males accounted for 68.2 percent in Strathmore and 66.0 percent in Calgary while females comprised 31.8 percent in Strathmore and 34.0 percent in Calgary (Table 2). The difference in gender composition between the locations is not statistically significant.

Table 2: Gender by location of residence

	Strathmore		Calgary		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Male	206	68.2	278	66.0	484	66.9
Female	96	31.8	143	34.0	239	33.1
Total	302	100	421	100	723	100

Pearson Chi-squared test statistic = .377; p-value = 0.539

The difference in age distribution (Table 3), however, is statistically significant. 37.9% of respondents from Calgary were younger than 50 years old, while only 31.6% of respondents from Strathmore were under 50. In both samples, respondents between the ages of 50 and 59 years old were the largest group represented, making up 29.0% in Calgary and 27.4% in Strathmore. Just 33.0% of the Calgary sample was 60 or older, while 41.0% of the Strathmore sample fell into that age range. This is consistent with findings in the literature that people living in rural areas are generally older (Van Liere and Dunlap 1980).

Table 3: Age group by location of residence

	Strathmore		Calgary		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
20 - 29	20	7.1	16	4.3	36	5.5
30 - 39	29	10.3	46	12.4	75	11.5
40 - 49	40	14.2	80	21.2	120	18.2
50 - 59	77	27.4	108	29	185	28.3
60 - 69	60	21.4	69	18.5	129	19.8
70 - 79	48	17.1	34	9.1	82	12.6
80 - 89	6	2.1	19	5.1	25	3.8
90+	1	0.4	1	0.3	2	0.3
Total	281	100	372	100	653	100

Pearson Chi-squared test statistic = 19.754; p-value = 0.006

The variation of annual household income between Calgary and Strathmore (Table 4) was consistent with findings in the literature that those in more urban areas generally have higher incomes than those in more rural areas (Jones and Dunlap 1992); however the difference was not statistically significant. The percentage of households in the top two income brackets (“\$70,000 – 79,999” and “\$80,000 or more”) was

higher for Calgary, while the percentages in the lower seven brackets were consistently higher in Strathmore.

Table 4: Annual household income by location of residence

	Strathmore		Calgary		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Under \$10,000	3	1	3	0.8	6	0.9
\$10,000 - 19,999	6	2.1	7	1.8	13	1.9
\$20,000 - 29,999	19	6.6	24	6.1	43	6.3
\$30,000 - 39,999	24	8.3	22	5.6	46	6.7
\$40,000 - 49,999	29	10	33	8.4	62	9.1
\$50,000 - 59,999	28	9.7	36	9.2	64	9.4
\$60,000 - 69,999	27	9.3	27	6.9	54	7.9
\$70,000 - 79,999	22	7.6	30	7.7	52	7.6
\$80,000 or more	132	45.5	210	53.6	342	50.1
Total	290	100	392	100	682	100

Pearson Chi-squared test statistic = 5.900; p-value = 0.658

Level of education did vary significantly between Calgary and Strathmore (Table 5). While the majority of respondents in Strathmore did not have a university degree at the bachelor's level or higher (74.3%), a majority of Calgaryans (52.7%) did have a degree. A fair percentage (42.3%) of the Strathmore sample did, however, have post-secondary education in the form of a college or other non-university degree or diploma compared to 29.7% for Calgary. This is consistent with other findings in the literature that people living in urban areas have a higher level of education (Berenguer *et al.* 2005).

Respondents' primary sector of employment also varied significantly between Calgary and Strathmore (Table 6). This variation is consistent with findings in the literature that those living in rural areas are more likely to be employed in trades or processing activities (20.8% and 5.7% respectively in Strathmore; 8.2% and 3.8% in Calgary), while those residing in more urban areas are more likely to be employed in higher-order service sectors such as management, finance, or the sciences (Jones and Dunlap 1992). Notably, a relatively large proportion of the Calgary population reported "Primary industry" as their principle occupation, reflecting the importance of the oil industry to the local economy.

Table 5: Education by location of residence

	Strathmore		Calgary		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
No certificate, diploma or degree	25	8.3	12	2.9	37	5.1
Secondary (high school) diploma or equivalency certificate	71	23.7	62	14.7	133	18.4
College or other non-university certificate or diploma	127	42.3	125	29.7	252	35
University – Bachelor’s Degree	54	18	149	35.4	203	28.2
University – Master’s degree or doctorate	23	7.7	73	17.3	96	13.3
Total	300	100	421	100	721	100

Pearson Chi-squared test statistic = 56.991; p-value = 0.000

Table 6: Principle occupation classification by location of residence

	Strathmore		Calgary		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Management	34	11.4	58	13.9	92	12.9
Business, finance or administration	36	12.1	75	18	111	15.5
Natural and applied sciences	5	1.7	38	9.1	43	6
Health	23	7.7	31	7.4	54	7.6
Social science, education or government service	59	19.8	65	15.6	124	17.3
Sales, service, culture, recreation or sport	29	9.7	59	14.1	88	12.3
Trades, transport or equipment operator	62	20.8	34	8.2	96	13.4
Primary industry	20	6.7	30	7.2	50	7
Processing, manufacturing or utilities	17	5.7	16	3.8	33	4.6
Other	13	3.7	11	2.2	24	2.8
Total	298	100	417	100	715	100

Pearson Chi-square test statistic = 48.939; p-value = 0.000

In addition to respondents' chosen careers, their recreational choices are also expected to influence their perceptions of water reallocation. Overall, those residing in Calgary are significantly more likely to engage in recreational activities that makes more passive use of the environment around water bodies such as viewing scenery (76.8% versus 69.2% in Strathmore) and walking or hiking (72.3% versus 55.6%)

(Table 7). Residents of Strathmore, on the other hand, were more likely to engage in consumptive forms of recreation or active use of water sources and their immediate environments, with a greater percentage engaging in fishing (37.7% versus 25.4% in Calgary), hunting (12.6% versus 5.9%) and camping (53.0% versus 45.0%). The exception to this trend was the greater tendency for Calgarians to use rivers, lakes and reservoirs for canoeing or kayaking (22.7% versus 10.3%).

Table 7: Recreational uses of water bodies by location of residence

	Strathmore		Calgary		Total		Pearson Chi-squared
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Fishing	114	37.7	107	25.4	221	30.5	12.75 ***
Bird watching	57	18.9	95	22.5	152	21.0	1.4
Canoeing/Kayaking	31	10.3	96	22.7	127	17.5	18.97 ***
Motorized watersports	38	12.6	47	11.1	85	11.7	0.355
Viewing scenery	209	69.2	324	76.8	533	73.6	5.20 **
Walking/Hiking	168	55.6	305	72.3	473	65.3	21.53 ***
Hunting	38	12.6	25	5.9	63	8.7	9.82 ***
Swimming	81	26.8	118	28.0	199	27.5	0.12
Camping	160	53.0	190	45.0	350	48.3	4.46 **
Other	25	8.3	28	6.6	53	7.3	0.7
None	21	7.0	18	4.3	39	5.4	2.5

Note: respondents could select multiple answers; *** p<0.01, **p<0.05

As the formation of values and attitudes is understood to occur throughout one's life, the place of residence along the rural to urban gradient throughout life may influence this process. In particular, those who have spent the majority of their lives in a particular urban or rural setting might reasonably be expected to have values and attitudes congruent with those settings, even if they now live in a different setting. There was a statistically significant difference between where current residents of Calgary and Strathmore had spent the majority of their lives, with the majority of those in Strathmore spending most of their lives outside of cities (75.8%) while those residing in Calgary had overwhelmingly spent most of their lives within cities (72.0%) (Table 8). Residents of Strathmore were also far more likely to have spent the majority on their lives in the countryside, whether on- or off-farm (15.2% versus 4.5% in Calgary).

Table 8: Location of residence during majority of life

	Strathmore		Calgary		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
City	73	24.2	304	72.0	377	52.1
Suburb	16	5.3	68	16.1	84	11.6
Small Town	167	55.3	31	7.3	198	27.3
Countryside (non-farm)	14	4.6	10	2.4	24	3.3
Farm	32	10.6	9	2.1	41	5.7

Pearson Chi-squared test statistic = 268.193; p-value = 0.000

Although value and attitude formation is a continuous process, a person's formative childhood years may have a disproportionate effect on their values and attitudes later in life. Those raised in rural areas, for example, might be expected to value the protection of irrigators and small communities dependent on agriculture, as opposed to providing water for new development and the environment. Of those respondents residing in Calgary, 47.4% were raised in a city compared to 22.5% of those residing in Strathmore (Table 9). Also notable is that 27.8% of those residing in Strathmore were raised on farms, while just 12.8% of those living in Calgary claimed the same.

Table 9: Location of residence during childhood

	Strathmore		Calgary		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
City	68	22.5	200	47.4	268	37
Suburb	10	3.3	51	12.1	61	8.4
Small Town	113	37.4	85	20.1	198	27.3
Countryside (non-farm)	27	8.9	32	7.6	59	8.1
Farm	84	27.8	54	12.8	138	19.1

Pearson Chi-squared test statistic = 85.949; p-value = 0.000

The difference between respondents who had or had not been residents of Alberta before 2001 was not statistically significant between Calgary and Strathmore, with roughly 15% of respondents in each area claiming to be more recent migrants (Table 10).

Table 10: Resident of Alberta prior to 2001 by location of residence

	Strathmore		Calgary		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
No	43	14.2	65	15.4	108	14.9
Yes	259	85.8	356	84.6	615	85.1

Pearson Chi-squared test statistic = .200; p-value = 0.655

Membership in conservation and stewardship groups did not differ at significant levels between Calgary and Strathmore (Table 11), with group members being a small minority in each study area. Financial support of such groups, however, was significant, with a higher proportion of respondents in Strathmore (32.5%) claiming to provide such support that in Calgary (22.0%).

Table 11: Support of conservation or stewardship groups by location of residence

	Strathmore		Calgary		Total		Pearson Chi-squared
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Member of a WPAC or watershed stewardship group.	3	1.0	8	1.9	11	1.5	0.96
Member of an environmental or conservation group.	19	6.3	21	5.0	40	5.5	0.57
Financially supports one of the above groups.	98	32.5	93	22.0	191	26.4	10.00 ***

Note: respondents' positive responses only; *** p<0.01

The final set of questions posed related to demographic and situational characteristics of stakeholders in Calgary and Strathmore related to usage patterns of water both inside and outside of the home (Table 12). Responses to these questions were measured on a Likert scale from 1 to 5, with the respondent selecting 1 if they strongly disagreed with the statement posed and 5 if they strongly agreed. Statistically significant differences between the samples occurred for statements A2 and A31, indicating a stronger reliance on water for income in the more rural area (Strathmore), while respondents in Calgary were more likely to only use water for domestic purposes. This lower economic reliance on natural resource use in urban areas is consistent with the literature, and might be expected to influence the rural population's reluctance to reallocate water from rural to urban uses.

Table 12: Household water use by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A2: At least some of my household income depends directly on an activity that uses water from the river. **/**	27.2	26.8	14.9	24.5	6.6	33.2	25.4	13.3	23.5	4.7
A24: I use rivers and their surrounding areas for recreation on a regular basis.	8.3	30.5	17.5	35.8	7.9	9.7	21.1	16.4	39.3	13.5
A30: The amount of water I use in and around my home would change depending on how much I had to pay for it.	5.3	22.2	14.6	44.7	13.2	5.5	22.1	9.5	47.7	15.2
A31: I only use water for domestic purposes such as washing, cooking and cleaning. **/*	2.0	33.4	8.3	42.7	13.6	4.0	24.5	8.6	44.2	18.8

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

4.2 Value Orientation

Values are prioritized beliefs that serve as guiding principles for evaluating behaviour or events. If a person’s values contradict each other, choices are based on the value of greatest importance to the person at the time (Rokeach 1968). As such, values generally transcend any single situation, but not all of a person’s held values have an effect on every situation they evaluate.

With respect to resource management issues in general, and water reallocation in particular, a subset of values is expected to heavily influence peoples’ attitudes toward and preferences for given policy options. This section compares the answers provided by respondents in Strathmore and Calgary to a number of value statements categorized into four general value orientations.

A strong biospheric, or environment centered, value orientation is evident across both samples, particularly with respect to the appreciation of the natural beauty of the environment and the desire to take care of the environment for future generations (Table 13). There was also a strong sense that a healthy aquatic ecosystem adds to the quality of life in Alberta, although respondents in Calgary responded significantly more strongly to this statement (59.7% strongly agree versus 51.0%) than did respondents from Strath-

more. Likewise, those from the urban sample were more likely to agree with the pre-eminence of a healthy aquatic ecosystem over human uses of water.

Table 13: Biospheric values by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A1: A healthy, functioning aquatic environment should always take priority over human uses of water. **/**	3.7	26.3	22	36	12	2.6	21.4	19.5	44.4	12.1
A4: Healthy aquatic ecosystems add to the quality of life in the province of Alberta. **/*	0.3	0.3	3	45.4	51	0.9	0	2.6	36.7	59.7
A29: When I think about the potential consequences of water markets the impact on the environment is the first thing that comes to mind.	2.3	18.5	23.8	39.7	15.6	2.6	17.3	26.3	36.7	17.1
A33: I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now.	0.3	2.6	18.5	52.3	26.2	0	3.3	20.2	47	29.5
A41: The environment is important to me because of its natural beauty.	0.3	4.3	13.9	51.3	30.1	0.7	2.9	11.4	51.5	33.5

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

The egoistic value orientation, which places personal needs before all other needs, is also important to consider when discussing resource management. This construct measures respondent's belief in their personal rights to use water as they see fit. There are not statistically significant differences between the Calgary and Strathmore sample for these statements and respondents in both locations are more likely to claim equal entitlement to water as opposed to the right to put it to consumptive use for their own benefit over that of the environment (Table 14).

Table 14: Egoistic values by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A7: I'm more concerned about my livelihood than I am about the environment.	13.2	41.7	24.2	18.2	2.6	11.6	46.8	19	20.4	2.1
A9: I use water for washing my vehicle even if doing so may harm the river where the water comes from.	23.5	36.4	18.5	20.2	1.3	26.1	36.3	19	18	0.7
A15: I am entitled to use as much water as any other resident of the province of Alberta.	5.3	29.8	23.8	32.8	8.3	7.6	30.6	23.5	31	7.3
A28: I enjoy having a lush green lawn and/or garden even if doing so may cause environmental harm to the river where the water comes from.	14.2	54.6	18.5	10.9	1.7	17.1	46.4	23	11.8	1.7

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Stakeholders opinions of and values towards agriculture in southern Alberta are also important to consider, as allocating water away from agricultural uses will have a significant effect on farms and farmers. Although Calgarians generally agreed with the benefits of agriculture, residents of Strathmore were significantly more likely to strongly agree with the positive impact of agriculture on quality of life in Alberta, as well as its continuing importance as a part of the province's identity (Table 15). These findings suggest that transfers that may harm agriculture will find higher levels of opposition in rural areas than they will in urban areas.

Table 15: Agricultural values by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A11: Overall, irrigated agriculture positively contributes to the quality of life in southern Alberta. ***/**	1.3	2.3	10.6	57	28.8	0.2	4.3	17.3	59	19.2
A25: Alberta's traditional farming heritage is an important part of the province's identity today. ***/**	0.3	3	7.3	61.6	27.8	0.7	5.5	10.4	63.5	19.9

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

The final set of values tested in this survey considered the importance of basic human needs (Table 16). In combination with the pro-agricultural values, these statements make up the altruistic value orientation which expresses concern for the needs of others and for humanity as a whole. Residents of Calgary were significantly more likely to disagree with the statement that domestic uses should be provided for before the needs of the environment, while both samples generally agreed that if water is to be used, basic human needs should take priority.

Table 16: Basic needs values by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A16: Domestic uses of water such as washing, cooking and cleaning should take priority over the needs of a healthy aquatic environment. **/**	3.0	32.1	36.1	26.2	2.6	5.2	40.8	27	24.2	2.8
A36: Water for basic human needs should have priority over all other water uses.	0	10.9	13.2	49.3	26.5	0.7	10.9	17.1	47	24.2

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

4.3 Beliefs and Expectations

People’s attitudes are suspected to be informed by their beliefs and expectations with respect to the value object under consideration. Perceptions of need as well as expected outcomes of particular policy options help to frame peoples’ understanding of how a proposed policy change might relate to their individual value orientations and attitudes.

One key set of beliefs is who (or what) a particular change might be expected to affect and how. Water transfers from agricultural uses to other uses, particularly under a market-based system, might be expected to affect a variety of entities. Overall, the majority of respondents in both locations expected water transfers to negatively impact the environment (51.6% in Strathmore and 54.7% in Calgary), with a lower proportion expecting negative effects on agriculture and the economy (Table 17). There was no statistically significant difference in the expected effects between Calgary and Strathmore.

Table 17: Expected harmful effects of water transfers by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A43: I expect that an increase in water transfers will harm rather than benefit the environment.	1.0	6.6	40.7	43.0	8.6	0.2	6.2	38.9	41.9	12.8
A44: I expect that an increase in water transfers will harm rather than benefit Alberta's economy.	1.7	12.9	53.0	26.8	5.6	0.9	11.4	56.2	25.4	6.2
A47: I expect that an increase in water transfers will harm rather than benefit Alberta's farmers.	0.7	8.9	44.0	38.7	7.6	0.9	7.8	49.1	34.8	7.3

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Since the majority of transferred water will necessarily come from agriculture, stakeholders' perceptions of agriculture also play an important role in the support for water reallocation. Consistent with our hypothesis, there was a statistically significant difference in perception of agriculture between the urban sample of Calgary and that of Strathmore (Table 18), whose economy is much more closely tied to irrigation and agriculture. The results suggest that stakeholders in Strathmore and other communities similarly dependent on agriculture as a part of their local economy might be more likely to oppose measures perceived as harmful to farmers.

Table 18: Perceptions of agriculture by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A14: Irrigated agriculture is the most economically profitable use of water in southern Alberta. ***/**	4.3	11.0	39.5	39.2	6.0	4.5	14.9	46.9	29.6	4.0
A27: Irrigated agriculture produces locally grown, healthy food for me and my family. ***/**	1.3	5.0	14.2	58.3	21.2	0.5	5.9	18.2	63.7	11.6
A37: Alberta's farmers are good stewards of land and water. ***/**	4.6	9.3	38.1	40.4	7.6	2.4	14.7	45.6	33.5	3.8
A39: Alberta's economy will suffer if the province continues to lose farmers. ***/**	1.0	6.0	15.2	55.3	22.5	0.7	7.6	22.3	55.3	14.0

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Stakeholders perceived knowledge of resource management issues and the conflict surrounding changes in the way resources are managed can also be an important influence on their attitudes and preferences towards related policy. There is not a significant difference between each sample with respect to respondents' opinion that they have a better general grasp of water policy in Alberta than others within their own communities, but differences do appear when specific issues are raised (Table 19). A greater proportion of Strathmore residents claim to be aware of both the possibility of water transfers under the current water management regime, and the conflict surrounding the amendment of licences that would facilitate such transfers.

Table 19: Percieved knowledge of water management by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A34: I have a better understanding of how water in southern Alberta is managed than do most of my neighbours.	3.0	20.9	49.0	22.2	5.0	5.0	24.7	46.3	18.5	5.5
A42: I am aware that water licences can be transferred in Alberta. ***/**	10.3	22.8	32.8	28.5	5.6	14.5	22.1	41	18.1	4.3
A48: I am aware of the conflict surrounding the amendment of irrigation district water licences. ***/**	8.6	18.2	49.3	20.9	3.0	15.0	22.1	47	14.3	1.7

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Much of the conflict surrounding transfers and amendments stems from a belief that the environment is already suffering under the current allocation scheme. The following questions explored the perceived need for water for both the environment and to better meet societal values (Table 20). Although Calgaryans were significantly more likely to agree that they lived in a drier environment than most Canadians there was not a statistically significant difference between Calgary and Strathmore when it came to perceived health of the aquatic environment: both samples tended toward the belief that the environment was unhealthy.

Table 20: Percieved need for water reallocation by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A5: I live in a drier environment than most Canadians. ***/**	2.6	12.6	17.5	54	13.2	0.5	10.9	15.2	51.4	22
A21: The way we manage water in our rivers in Alberta is outdated and not in line with society’s current values.	1.3	12.3	49	29.8	7.6	1.9	8.1	52.9	27.9	9.3
A45: I am aware that the majority of rivers in southern Alberta are environmentally impacted or degraded.	2.6	9.9	25.2	49.7	12.6	2.8	13	23	49.3	11.8
A49: The aquatic environment in southern Alberta is healthy.	6	34.1	38.7	20.5	0.7	4	30.6	43.6	21.1	0.7

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

4.4 Attitudes

As opposed to the general nature of values, attitudes are situation specific. This section discusses a number of attitude statements and is broken down into four general attitudes: environmental, market-oriented, non-use and pro-governmental.

Pro-environmental attitudes are apparent across both sample areas, with a majority of each sample agreeing with the pro-environmental attitude statements and disagreeing that economic uses should take precedence over the needs of the environment (Table 21). Notably, stakeholders in Strathmore are significantly less likely to strongly disagree with providing for economic needs before the needs of the environment.

There was wide agreement between both samples that pricing in emergent water markets should not be determined exclusively by buyers and sellers (Table 22); rather, equitable access to water should be guaranteed. Nevertheless, respondents were largely neutral as to the suitability of market-based systems for reallocating water with respondents in Calgary slightly more opposed (40% disagree or strongly disagree versus 34.1% in Strathmore).

Table 21: Environmental attitudes by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A13: New subdivisions should not be allowed in this region if supplying the water they need would cause harm to the environment.	1.3	8.3	16.9	52.3	21.2	2.4	10	13.3	49.5	24.9
A20: The environment's needs for water should be met before water is used for human economic purposes such as industry and agriculture.	1.3	19.9	25.8	40.1	12.9	1.4	17.1	23.5	44.1	14
A23: Water should be made available for economic uses before the environment. **/**	12.6	46	29.8	10.6	1	18.2	47.9	23.2	9.5	1.2
A26: I'm concerned that aquatic habitats in southern Alberta are not receiving enough protection.	0.3	11.9	21.9	48.7	17.2	0.5	7.8	29.6	45.7	16.4

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Table 22: Market-oriented attitudes by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A3: I think that water is a commodity that individuals and private groups should be able to buy and sell.	43.7	30.1	10.9	12.9	2.3	39.9	34.7	10	12.6	2.9
A12: Buyers and sellers of water licences should be the ones who decide the price of water.	36.4	40.1	12.9	9.3	1.3	36	37	16.8	8.8	1.4
A17: Water from rivers should be used to provide benefits to the whole community, not just to those who can afford to buy a water licence.	0.7	1	5.6	47.7	45	0.7	1.7	2.8	48.8	46
A46: Market-based systems provide a good way of reallocating public goods such as water in accordance with the present and future needs of our province. -/*	9.6	23.5	49	14.6	3.3	13.5	26.5	41.9	16.6	1.4

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Maintaining in-stream flows serves a variety of purposes for society and the environment stemming from non-use values such as the value derived from knowing that the river exists and that it will continue to for future generations. In-stream flows also benefit use values such as recreation. As a result, attitudes toward

conserving water in-stream are an important part of the water reallocation discussion. Attitudes towards maintaining minimal in-stream flows did not differ across locations (Table 23).

Table 23: Non-use attitudes by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A6: Using water to create green and lush public spaces adds more to my quality of life than leaving the water in the river.	9.6	27.2	24.5	37.1	1.7	8.3	33.6	26.3	29.1	2.6
A22: I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers.	7.3	39.4	33.4	18.5	1.3	9	39.9	30.6	18.3	2.1

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

The final group of attitudes explored in this portion of the survey concerned government involvement in protecting the environment (Table 24). Notably, attitudes toward government responsibility for ensuring healthy water quality and quantity was significantly higher in Calgary than Strathmore (50.4% strongly agree versus 38.4%), while trust in the government to fulfill this roll was not significantly different.

Table 24: Pro-government attitudes by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A19: The government should be responsible for ensuring that water quality and quantity are good enough to ensure a healthy environment. ***/**	1	2.6	5	53	38.4	0.7	1	4.5	43.5	50.4
A32: I trust the government to manage water in ways that are best for the environment.	9.3	28.5	22.2	34.8	5.3	10.7	25.1	17.7	35.8	10.7

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

4.5 Social Norms

In addition to the personal values and attitudes that may influence a stakeholder's perception of policy, social norms also have a role. This section explores how the opinions of the respondent's social network (friends and family), the community and wider society are perceived by the respondent.

Respondents in Strathmore were significantly more likely to disagree with the statement that rivers tie communities together, as well as the sentiment that people in their community generally agree on water issues (Table 25). This is likely because of the wider awareness of conflict surrounding water issues within this irrigation dependent community. Another significant difference is that Calgarians are more likely to agree that they use water more carefully than their neighbours, and that they desire to remain living in their current area. No significant difference was recorded with respect to the expectations of personal social networks or society at large. However, respondents in both samples usually felt some social pressure to support environmental causes and oppose water markets. Attachment to and involvement in the community was also generally strong across both samples.

Table 25: Community cohesion by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
A10: Rivers tie communities together. ***/***	1	9.3	19.5	57.9	12.3	0.9	5.7	17.3	57.6	18.5
A40: I use water more carefully than most of my neighbours. ***/***	0.7	7.9	39.1	39.4	12.9	1	4.3	33.3	44.4	17.1
B1: People in my life whose opinions matter to me disapprove of water markets.	1.3	12.6	62.9	18.2	5	2.1	7.8	67.5	19.9	2.6
B2: Supporting environmental causes such as maintaining minimum levels of water in the river is expected of me.	1.3	12.3	24.2	54	8.3	2.4	10.4	25.6	47.6	14
B3: People in my community agree on water issues. ***/***	7	33.2	45.5	13	1.3	3.8	21.6	62.3	11.1	1.2
B4: People in my community support using markets to reallocate water.	4	17.2	69.9	8.3	0.7	2.4	14.5	76.3	6.6	0.2
B5: I'm not very interested in local community issues.	16.2	53.6	16.9	11.3	2	17.3	54.3	15.9	11.1	1.4
B6: I want the same things from my community as other local people.	2.3	14.2	29.5	51	3	1.2	11.8	30.1	53.3	3.6
B7: I would like to remain living in this area for a long time. **/**	3	8.3	9.3	54	25.5	1.4	6.2	8.8	53.3	30.3
B8: The future of this community is important to me.	0.7	2	5.3	61.9	30.1	0.7	1.7	3.3	59.2	35.1

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Consistent with the hypothesis that respondents in more rural areas would have closer social ties to agriculture, there was a statistically significant difference between locations with respect to having friends and family work in agriculture or an agriculture related field (**Error! Not a valid bookmark self-reference.**). Only 33.1% of respondents from Strathmore claimed to have no friends or family employed directly in irrigated agriculture compared to 68.5% in Calgary. Likewise, 22.3% in Strathmore and 44.8% in Calgary did not have family or friends employed in fields related to agriculture.

Table 26: Friends and family employed in agriculture by location of residence

	Strathmore				Calgary			
	1	2	3	4	1	2	3	4
B10a: How many of your friends or family work directly in irrigated agriculture? ***/***	33.1	30.5	23.5	12.9	68.5	23.7	7.3	0.5
B10b: How many of your friends or family work in an agriculture related field? ***/***	22.3	30.2	29.2	18.3	44.8	36.0	14.2	5.0

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
 1=none, 2=few, 3=some, 4=many

Consistent with their having more friends and family involved in agriculture, respondents from Strathmore also had significantly more frequent social contact with people employed in and around the industry and were also more likely to travel to rural areas for recreation (**Error! Not a valid bookmark self-reference.**). Calgarians, on the other hand, were more likely to use water bodies for recreation on a frequent basis, implying that they more often did so within urban areas. Also notable is that there was no statistically significant difference between the frequency with which respondents from Calgary and Strathmore visited farmer’s markets, roadside stands, or the farm gate to purchase produce.

4.6 Policy Options

This section compares level of agreement to ten policy statements between the Calgary and Strathmore samples. It will also explore policy preferences based on other demographic factors and selected value orientations, attitudes and social norms.

Table 27: Social distance from agriculture by location of residence

	Strathmore				Calgary			
	1	2	3	4	1	2	3	4
B11a: How often do you use rivers, creeks or reservoirs near where you live for commercial, domestic or recreational purposes? **/**	12.6	33.1	39.1	15.2	10.5	29	37.1	23.5
B11b: How often do you travel to rural areas for recreational purposes, including visiting with family and friends? **/**	4	23.2	50.7	22.2	5.2	30.3	44.5	19.9
B11c: How often do you have a conversation with a farmer or member of a farm family? ***/**	4.6	21.5	36.1	37.7	19.2	42.8	25.7	12.4
B11d: How often do you socialize with people whose primary source of income is agriculture related? ***/**	6	20.9	41.1	32.1	28	40	24.9	7.1
B11e: How often do you purchase farm produce at a farmer's market, roadside stand or farm gate?	4.3	17.9	51.7	26.2	6	23.3	44	26.7

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=never, 2=seldom, 3=occasionally, 4=frequently

4.6.1 Government's Role

The first set of policy statements deals with the government's role in water reallocation (Table 28). Significant differences between the Calgary and Strathmore sample are present for all policy statements explored, with the urban residents of Calgary generally more in favour of government intervention and Strathmore respondents more strongly opposed. Of the policy statements provided, the strongest support in both locations was for that which gave the government a regulatory role at the expense of a market system, rather than a more powerful role within such a system.

Table 28: Support for government role in water reallocation by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
C1: The government, rather than market forces, should decide who gets to use Alberta’s water. ***/**	5.6	13.3	24.6	44.9	11.6	2.8	10.7	21.8	49.1	15.6
C4: If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation. ***/**	6.6	25.8	26.2	33.4	7.9	3.3	22.3	23.2	41.0	10.2
C6: If water is to be traded among irrigation districts and/or municipalities, the government should set the price. **/**	4.7	15.6	35.2	41.9	2.7	1.9	14.0	34.8	42.4	6.9

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Although location of residence was highly significant when the government’s role in water reallocation was considered, respondents’ age did not have so clear an effect (Table 29). The opinion that the government, rather than market forces, should decide who gets to use Alberta’s water appeared to increase slightly with age, but this trend was not statistically significant.

The impact of education on support for the government’s role in water reallocation was statistically significant across all related policy statements, with support increasing with education for all statements—particularly for those with graduate level educations (

Table 31).

There was also a significant correlation between attitudes concerning the responsibility and trustworthiness of the government and support for an increase role of government in water reallocation policy (Table 32). Attitudes favouring government responsibility for water quality and quantity were significantly correlated with an increased government role, including allowing the government to appropriate water rights from licence holders who were not making full use of their licence. This policy option was not significantly correlated, however, to trust in government to manage water in the best way for the environment. This may be interpreted to mean that even those who trust government may desire that they maintain a role as an overseer rather than that of a more direct command-and-control entity.

Table 29: Support for government role in water reallocation by age bracket

		20-39 years	40-59 years	60-79 years	80+ years
		n = 111	n = 304	n = 211	n = 27
C1: The government, rather than market forces, should decide who gets to use Alberta's water. (Chi ² = 9.7, p=.641*)	1	4.5%	4.3%	4.8%	0.0%
	2	16.2%	12.2%	9.0%	18.5%
	3	25.2%	22.0%	21.9%	18.5%
	4	41.4%	46.4%	52.9%	51.9%
	5	12.6%	15.1%	11.4%	11.1%
C4: If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation. (Chi ² =10.7, p=.556)	1	4.5%	5.6%	4.3%	3.7%
	2	24.3%	25.3%	23.7%	11.1%
	3	23.4%	23.7%	25.6%	25.9%
	4	34.2%	36.2%	40.8%	51.9%
	5	13.5%	9.2%	5.7%	7.4%
C6: If water is to be traded among irrigation districts and/or municipalities, the government should set the price. (Chi ² =4.5, p=.973*)	1	3.6%	2.6%	3.3%	3.7%
	2	16.2%	14.8%	14.3%	18.5%
	3	34.2%	35.5%	32.4%	29.6%
	4	38.7%	41.1%	46.2%	44.4%
	5	7.2%	5.9%	3.8%	3.7%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Table 30: Support for government role in water reallocation by income bracket

		\$0 to \$39,999	\$40,000 to \$79,000	\$80,000 or more
		n = 108	n = 232	n = 342
C1: The government, rather than market forces, should decide who gets to use Alberta's water. (Chi ² =5.9, p=.662)	1	4.6%	3.5%	4.1%
	2	13.9%	13.0%	10.8%
	3	26.9%	22.9%	20.5%
	4	45.4%	46.8%	48.2%
	5	9.3%	13.9%	16.4%
C4: If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation. (Chi ² =5.8, p=.675)	1	6.5%	4.3%	4.7%
	2	28.7%	21.1%	24.0%
	3	25.9%	24.6%	22.8%
	4	32.4%	38.8%	39.2%
	5	6.5%	11.2%	9.4%
C6: If water is to be traded among irrigation districts and/or municipalities, the government should set the price. (Chi ² =7.1, p=.528)	1	3.7%	2.6%	3.2%
	2	17.6%	16.4%	14.0%
	3	35.2%	31.5%	35.7%
	4	41.7%	44.8%	40.1%
	5	1.9%	4.7%	7.0%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Table 31: Support for government role in water reallocation by level of education

		No certificate, diploma or degree	Secondary school diploma	College or other certificate or diploma	Bachelor's Degree	Master's degree or doctorate
		n = 37	n = 133	n = 252	n = 203	n = 96
C1: The government, rather than market forces, should decide who gets to use Alberta's water. (Chi ² =25.4, p=.062)	1	10.8%	6.0%	4.0%	2.5%	2.1%
	2	16.2%	11.3%	12.0%	11.3%	11.5%
	3	29.7%	27.1%	25.9%	17.2%	18.8%
	4	29.7%	48.1%	43.8%	51.2%	54.2%
	5	13.5%	7.5%	14.3%	17.7%	13.5%
C4: If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation. (Chi ² =24.0, p=.089)	1	8.1%	3.0%	5.6%	5.4%	2.1%
	2	40.5%	24.8%	24.2%	23.6%	15.6%
	3	10.8%	25.6%	25.0%	25.1%	25.0%
	4	24.3%	37.6%	37.7%	34.5%	50.0%
	5	16.2%	9.0%	7.5%	11.3%	7.3%
C6: If water is to be traded among irrigation districts and/or municipalities, the government should set the price. (Chi ² =23.8, p=.093*)	1	13.9%	4.5%	2.4%	2.0%	1.0%
	2	11.1%	18.0%	12.7%	16.3%	13.5%
	3	38.9%	34.6%	36.9%	34.0%	32.3%
	4	30.6%	39.1%	42.1%	42.4%	49.0%
	5	5.6%	3.8%	6.0%	5.4%	4.2%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Table 32: Spearman correlation between government role and pro-government attitudes

	A19: The government should be responsible for ensuring that water quality and quantity are good enough to ensure a healthy environment.	A32: I trust the government to manage water in ways that are best for the environment.
C1: The government, rather than market forces, should decide who gets to use Alberta's water.	.251***	.103***
C4: If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation.	.147***	0.034
C6: If water is to be traded among irrigation districts and/or municipalities, the government should set the price.	.193***	.149***

*** p<0.01

4.6.2 Environment's Rights

The second set of policy options focuses on environmental policy options (Table 33). Calgarians view both private and public holding of water licences in trust for the environment more favourably than do those in Strathmore and are also stronger supporters of setting minimum flows to protect the environment. There is not a significant difference between samples for providing public funds to irrigators with the understanding that water saved must be left in the rivers.

Table 33: Support for environmental policy by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
C2: Private individuals and groups should be able to hold water licences for environmental protection. **/**	7.0	19.3	31.6	35.9	6.3	4.5	15.9	30.6	37.7	11.4
C8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers.	3.3	17.5	24.8	48.0	6.3	1.7	12.3	27.5	50.7	7.8
C9: The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment. -/*	3.6	18.9	42.4	31.1	4.0	2.8	16.8	39.8	34.4	6.2
C10: Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation. **/**	1.3	7.6	20.5	51.7	18.9	0.2	3.6	20.4	50.5	25.4

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Age was also a significant predictor of agreement with some of the environmental policy statements (Table 34). In particular, younger people were more likely to support the idea of private individuals being allowed to hold water licences in trust for the environment, while older respondents tended to disagree. Older respondents were also more likely to disagree with providing public funds to irrigators for efficiency improvements with the stipulation that saved water be used for environmental purposes. The final significant difference showed a tendency for younger respondents to be more supportive of establishing

minimal flows in rivers. Support for the government purchasing water in trust for the environment was not significantly correlated with the age of the respondent.

Table 34: Support for environmental policy by age bracket

		20-39 years	40-59 years	60-79 years	80+ years
		n = 111	n = 304	n = 211	n = 27
C2: Private individuals and groups should be able to hold water licences for environmental protection. (Chi ² =27.7, p=.006)	1	5.4%	5.6%	5.2%	7.4%
	2	4.5%	16.8%	21.8%	29.6%
	3	34.2%	27.6%	32.2%	29.6%
	4	41.4%	38.5%	35.5%	29.6%
	5	14.4%	11.5%	5.2%	3.7%
C8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers. (Chi ² =18.7, p=.096*)	1	0.0%	2.3%	3.3%	3.7%
	2	9.9%	14.5%	17.1%	11.1%
	3	31.5%	23.4%	26.5%	25.9%
	4	45.0%	53.9%	47.4%	55.6%
	5	13.5%	5.9%	5.7%	3.7%
C9: The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment. (Chi ² =10.6, p=.559)	1	0.9%	4.3%	3.8%	0.0%
	2	19.8%	17.4%	16.6%	18.5%
	3	36.9%	40.5%	43.1%	44.4%
	4	33.3%	32.6%	33.6%	33.3%
	5	9.0%	5.3%	2.8%	3.7%
C10: Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation. (Chi ² =20.4, p=.059*)	1	0.0%	1.3%	0.5%	0.0%
	2	3.6%	5.9%	7.1%	3.7%
	3	22.5%	16.1%	20.9%	40.7%
	4	48.6%	51.0%	55.0%	44.4%
	5	25.2%	25.7%	16.6%	11.1%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Income level did not have a significant effect on agreement with environmental policy statements, with the exception of support for the establishment of minimal flows, which was seen as more agreeable by those with higher annual incomes (Table 35).

Table 35: Support for environmental policy by income bracket

		\$0 to \$39,999	\$40,000 to \$79,000	\$80,000 or more
		n = 108	n = 232	n = 342
C2: Private individuals and groups should be able to hold water licences for environmental protection. (Chi ² =9.668, p=.289)	1	7.5%	5.6%	4.4%
	2	22.4%	19.0%	14.0%
	3	29.0%	30.2%	30.4%
	4	34.6%	37.1%	39.2%
	5	6.5%	8.2%	12.0%
C8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers. (Chi ² =4.98, p=.760)	1	1.9%	1.7%	2.9%
	2	15.7%	14.7%	13.2%
	3	27.8%	25.4%	25.7%
	4	49.1%	53.0%	49.4%
	5	5.6%	5.2%	8.8%
C9: The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment. (Chi ² =6.5, p=.587)	1	0.9%	2.6%	4.7%
	2	18.5%	18.1%	16.7%
	3	38.9%	38.4%	41.8%
	4	38.0%	35.3%	31.6%
	5	3.7%	5.6%	5.3%
C10: Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation. (Chi ² =21.4, p=.006*)	1	0.0%	0.9%	0.9%
	2	11.1%	6.0%	2.6%
	3	24.1%	19.4%	19.0%
	4	51.9%	51.3%	50.3%
	5	13.0%	22.4%	27.2%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Level of education had a somewhat higher impact on support for certain environmentally focused policy statements (Table 36). In particular, support for regulatory changes that would allow private individuals to hold water licences for the environment and support for the establishment of minimal flows both faced lower opposition from more highly educated respondents. Environmental measures that involved government involvement in a market for the purpose of leaving more water in the river, however, did not see the same differences across respondents with varying education levels.

Table 36: Support for environmental policy by level of education

		No certificate, diploma or degree	Secondary school diploma	College or other certificate or diploma	Bachelor's Degree	Master's degree or doctorate
		n = 37	n = 133	n = 252	n = 203	n = 96
C2: Private individuals and groups should be able to hold water licences for environmental protection. (Chi ² =36.265, p=.003)	1	16.2%	7.5%	4.0%	5.9%	2.1%
	2	16.2%	21.8%	21.1%	13.3%	10.4%
	3	37.8%	28.6%	32.3%	26.6%	36.5%
	4	27.0%	37.6%	33.9%	39.9%	41.7%
	5	2.7%	4.5%	8.8%	14.3%	9.4%
C8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers. (Chi ² =14.2, p=.586*)	1	5.4%	3.8%	2.4%	1.5%	1.0%
	2	13.5%	15.8%	13.1%	16.3%	13.5%
	3	18.9%	30.1%	29.0%	21.2%	27.1%
	4	51.4%	45.1%	50.0%	51.2%	51.0%
	5	10.8%	5.3%	5.6%	9.9%	7.3%
C9: The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment. (Chi ² =9.6, p=.887*)	1	5.4%	3.0%	3.6%	2.5%	3.1%
	2	13.5%	17.3%	17.9%	19.2%	16.7%
	3	35.1%	37.6%	39.3%	44.8%	43.8%
	4	37.8%	36.8%	35.7%	28.1%	29.2%
	5	8.1%	5.3%	3.6%	5.4%	7.3%
C10: Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation. (Chi ² =28.8, p=.026*)	1	2.7%	0.8%	0.8%	0.0%	1.0%
	2	5.4%	5.3%	7.1%	4.9%	1.0%
	3	13.5%	25.6%	24.2%	17.7%	12.5%
	4	56.8%	52.6%	49.6%	48.8%	54.2%
	5	21.6%	15.8%	18.3%	28.6%	31.3%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

The correlation between pro-environmental beliefs and values and policy options related to the environment's rights was significant between all policy options and a wide variety of values and beliefs (Table 37). The expected negative correlations between economic uses as more important than environmental uses are present, with the strongest correlation between this and establishing minimum flows for the environment.

Table 37: Spearman correlation between environment’s rights and environmental beliefs/values

	A1: A healthy, functioning aquatic environment should always take priority over human uses of water.	A23: Water should be made available for economic uses before the environment.	A26: I’m concerned that aquatic habitats in southern Alberta are not receiving enough protection.	A45: I am aware that the majority of rivers in southern Alberta are environmentally impacted or degraded.
C2: Private individuals and groups should be able to hold water licences for environmental protection.	.106***	-.095***	.151***	.132***
C8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers.	.213***	-.144***	.245***	.153***
C9: The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment.	.168***	-.130***	.250***	.125***
C10: Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation.	.154***	-.284***	.220***	.244***

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

4.6.3 Irrigator’s Rights

When policy options concerned with irrigators’ rights and economic advancement were considered, little divergence in opinion was based on location of residence (Table 38). Respondents from Strathmore were slightly more likely to support the use of water saved from efficiency gains to increase economic activity, however the expected effect of physical proximity to irrigation, operationalized here by residence in either Calgary (far proximity) and Strathmore (close proximity) was not as strong as expected.

Table 38: Support for irrigators' rights by location of residence

	Strathmore (%)					Calgary (%)				
	1	2	3	4	5	1	2	3	4	5
C3: All water licences, no matter when they were issued or for what purpose, must be honoured.	7.0	33.8	33.8	21.2	4.3	8.3	35.8	36.7	15.2	4.0
C5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient.	6.0	21.5	20.9	44.7	7.0	5.2	20.0	19.0	47.0	8.8
C7: Water that is saved through improved water use efficiency should be used to increase economic activity. */*	2.0	22.2	34.8	37.7	3.3	2.6	24.6	38.9	31.0	2.8

*** p<0.01, **p<0.05, *p<=0.1: Wilcoxon-Mann-Whitney test/two independent sample t-test
1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

The use of water saved through efficiency gains to increase economic activity was also more acceptable to younger respondents than older, as was the idea that all licences must be honoured, although there was, on balance, more opposition to that idea than there was support (Table 39). The use of public funds to help irrigators become more efficient also appeared more appealing to younger respondents, however the differences were not statistically significant.

Table 39: Support for irrigators' rights by age bracket

		20-39 years	40-59 years	60-79 years	80+ years
		n = 111	n = 304	n = 211	n = 27
C3: All water licences, no matter when they were issued or for what purpose, must be honoured. (Chi ² =25.0, p=.015*)	1	3.6%	10.9%	6.6%	0.0%
	2	28.8%	37.2%	40.3%	14.8%
	3	42.3%	30.6%	34.1%	44.4%
	4	20.7%	17.1%	16.1%	33.3%
	5	4.5%	4.3%	2.8%	7.4%
C5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient. (Chi ² =14.7, p=.261)	1	2.7%	5.9%	7.1%	3.7%
	2	18.9%	19.1%	24.8%	25.9%
	3	14.4%	19.1%	21.9%	22.2%
	4	53.2%	47.4%	41.9%	40.7%
	5	10.8%	8.6%	4.3%	7.4%
C7: Water that is saved through improved water use efficiency should be used to increase economic activity. (Chi ² =20.908, p=.052*)	1	1.8%	3.0%	1.9%	0.0%
	2	29.7%	25.3%	19.0%	7.4%
	3	37.8%	39.1%	32.7%	37.0%
	4	27.9%	29.3%	43.1%	51.9%
	5	2.7%	3.3%	3.3%	3.7%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Income levels also dictated respondents' feelings toward how water saved through efficiency gains should be used. Those with lower annual incomes were significantly more likely to support the use of those gains to increase economic activity. Other policy statements related to irrigator's rights did not differ significantly based on income.

Table 40: Support for irrigators' rights by income bracket

		\$0 to \$39,999	\$40,000 to \$79,000	\$80,000 or more
		n = 108	n = 232	n = 342
C3: All water licences, no matter when they were issued or for what purpose, must be honoured. (Chi ² =4.9, p=.766)	1	6.5%	7.3%	8.8%
	2	33.3%	35.3%	35.7%
	3	41.7%	32.3%	33.9%
	4	15.7%	20.7%	17.0%
	5	2.8%	4.3%	4.7%
C5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient. (Chi ² =8.0, p=.435)	1	2.8%	8.2%	4.4%
	2	22.2%	20.3%	19.9%
	3	20.4%	20.3%	17.8%
	4	46.3%	42.4%	50.0%
	5	8.3%	8.7%	7.9%
C7: Water that is saved through improved water use efficiency should be used to increase economic activity. (Chi ² =16.4, p=.037)	1	1.9%	3.9%	1.5%
	2	21.3%	24.6%	24.9%
	3	29.6%	34.1%	40.9%
	4	45.4%	34.9%	28.7%
	5	1.9%	2.6%	4.1%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

The effect of education on support for irrigator's rights was also varied (Table 41). Those with higher levels of education were significantly more likely to support the use of government funds to help large water users become more efficient, while those with lower levels of education were more likely to oppose such policy. With respect to the honouring of all licences and the use of saved water to increase economic activity, education didn't play a strong role in forming people's opinions of policy.

Table 41: Support for irrigators' rights by level of education

		No certificate, diploma or degree	Secondary school diploma	College or other certificate or diploma	Bachelor's Degree	Master's degree or doctorate
		n = 37	n = 133	n = 252	n = 203	n = 96
C3: All water licences, no matter when they were issued or for what purpose, must be honoured. (Chi ² =17.5, p=.353)	1	2.7%	6.0%	9.1%	9.9%	4.2%
	2	29.7%	31.6%	32.5%	37.4%	41.7%
	3	37.8%	42.1%	34.1%	33.5%	33.3%
	4	27.0%	18.8%	18.3%	15.8%	15.6%
	5	2.7%	1.5%	6.0%	3.4%	5.2%
C5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient. (Chi ² =34.8, p=.004)	1	8.1%	9.0%	5.2%	3.4%	4.2%
	2	18.9%	30.1%	21.1%	16.3%	16.7%
	3	29.7%	18.8%	20.7%	18.2%	17.7%
	4	29.7%	40.6%	42.6%	53.2%	55.2%
	5	13.5%	1.5%	10.4%	8.9%	6.3%
C7: Water that is saved through improved water use efficiency should be used to increase economic activity. (Chi ² =20.6, p=.194*)	1	2.7%	3.0%	1.2%	3.4%	2.1%
	2	18.9%	21.8%	21.4%	26.1%	29.2%
	3	27.0%	30.1%	38.1%	40.9%	39.6%
	4	48.6%	40.6%	35.3%	28.1%	27.1%
	5	2.7%	4.5%	4.0%	1.5%	2.1%

* due to low cell count this Chi² results may be invalid.

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

The correlation between social proximity to agriculture and policy options concerned with irrigators' rights was not a significant as expected. There were significant but relatively weak correlations between having friends and family working in irrigated agriculture and respecting existing licences; frequency of travel to rural areas and using public funds to improve efficiency; and frequency of travel to rural areas and the belief that water saved through efficiency gains should be used to promote economic activity. Of the three, the last has a relatively weak negative correlation.

Table 42: Spearman correlation between irrigators' rights and social proximity to agriculture

	B10a: How many of your friends or family work directly in irrigated agriculture?	B10b: How many of your friends or family work in an agriculture related field?	B11b: How often do you travel to rural areas for recreational purposes, including visiting with family and friends?	B11e: How often do you purchase farm produce at a farmer's market, roadside stand or farm gate?
C3: All water licences, no matter when they were issued or for what purpose, must be honoured.	.079**	0.053	-0.034	-0.063
C5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient.	0.024	0.02	.088**	0.062
C7: Water that is saved through improved water use efficiency should be used to increase economic activity.	0.034	-0.015	-.105***	0.016

*** p<0.01, ** p<0.05

5 Discussion

A series of patterns emerge from the findings presented above, reflecting important variations in the way rural and urban households view water issues. In this report, statements were divided into four groups corresponding with the constructs in the conceptual framework: Values; Beliefs and Expectations; Attitudes; and Social Norms. In conjunction with a wide range of Personal and Situational Characteristics, these constructs were expected to affect resource management Policy Preferences, and in many cases were expected to vary significantly between our urban study area of Calgary and the relatively more rural and irrigation dependent study area of Strathmore.

The Values construct was divided into four orientations: Biospheric; Egoistic; Pro-agriculture; and Basic Needs Values with the Pro-agriculture and Basic Needs orientation evocative of a general Altruistic value orientation. Two of five statements falling under the biospheric value orientation were significantly more agreeable to Calgarians, while the remainder showed little variation between Calgary and Strathmore. This demonstrates a somewhat higher level of basic environmental concern among more urban residents, consistent with much of the literature on the social bases of environmental concern (Dietz *et al.* 1998; Arcury and Christenson 1993; Fortmann and Kusel 1990; Jones and Dunlap 1992). Supporting the findings of Huddart-Kennedy *et al.* (2009) egoistic values were not significantly greater in the more rural sample.

With respect to agricultural values, the opinion that Alberta's traditional farming heritage is an important part of the province's identity today was more strongly held by respondents from Strathmore, where agriculture was also seen as a more positive contributor to quality of life. This confirms a more pro-agricultural value orientation within the rural area consistent with the findings of Sharp and Adua (2009). Also apparent was a lower concern on the part of the urban sample for the protection of basic domestic uses of water over the needs of the environment. When combined, these value types make up the altruistic

value orientation, which expresses concern for others and humanity as a whole. The finding that more rural residents have more altruistic tendencies with respect to relevant water-related value statements is consistent with the similar findings of Huddart-Kennedy *et al.* (2009).

The Beliefs and Perceptions construct contained 14 statements divided into four groups: Expected Effects; Perceptions of Agriculture; Knowledge of Water Management; and Perceived Environmental Need. The three statements that corresponded with peoples' expectations of the effects of water transfers did not differ across sample areas, with wide agreement that transfers would harm both the environment and farmers, and somewhat more moderate expectations of harm to the wider economy. If these similar expectations are considered alongside the findings of Stern and Dietz (1994) who found that attitudes are determined primarily by expectations and values, the implication is that the variation in attitudes towards water transfers and policy preferences between Calgary and Strathmore will be dictated largely by differences in values.

Where differences in perceptions emerge, however, is toward agriculture. Here, four out of four statements exhibit significant differences between sample areas, with respondents from Strathmore exhibiting more positive opinions of farmers and agriculture. This finding is consistent with Sharp and Adua's (2009) findings on agrarian support across the rural-urban continuum. In conjunction with this variation in support, the similar expectations of harm from water transfers across sample areas might be expected to result in greater opposition to transfers from within rural areas since those in rural areas are more supportive of the population seen as bearing much of the harm.

Respondents from Strathmore were also significantly more likely to be aware that water licences can be transferred in Alberta and of the conflict surrounding licence amendments facilitating such transfers. This is likely due to access to water being a larger issue within the community and especially because Strathmore is home to the offices of the Western Irrigation District, a large licence holder who played a large role in the Balzac water transfer, the largest and most public water transfer to date in the province.

Greater awareness of water policy issues, however, did not translate to higher environmental awareness in Strathmore. In fact, Calgarians were significantly more likely to strongly agree that they lived in a drier environment than most Canadians, although the remaining three of four statements were not significantly different across samples. This similarity is in line with the supposition of an emergent new environmental paradigm as put forth by Dunlap and Van Liere (1978) and Dunlap *et al.* (2000) and the findings of Freudenburg (1991), who while maintaining that urbanites are somewhat more likely to express environmental concern based on their differing appreciative or recreational uses of the environment, hold that environmental awareness is growing across all aspects of society.

Attitudes toward water reallocation also broke down into four groups, including: Environmental Attitudes; Market-oriented Attitudes; Non-use Attitudes and Pro-governmental Attitudes. The rural and urban samples were similar in concern about reallocating water away from environmental uses, but the Calgary sample was especially opposed to the idea that water should be made available for economic uses before the environment. Similarly when it came to market-oriented attitudes, the urban sample disagreed with the statement that market-based systems provide a good way of reallocating goods like water in accordance with the present and future needs of the province significantly more than the rural sample. That being said, general opposition to market-based mechanisms was strong across both samples.

Non-use attitudes measured attitudes based on the non-use values of water, rather than specifically stating that the water will benefit the environment. Attitudes toward non-use did not vary between Calgary and Strathmore, but were generally less strong than comparable pro-environmental attitudes.

Households in Calgary and Strathmore did differ significantly, however, in their level of agreement with the idea that the government should be responsible for ensuring sufficient water quantity and quality for a healthy environment. Respondents for Calgary were more likely to strongly agree with the statement, while although the vast majority of respondents from Strathmore did agree, most did not feel so strongly

about it as those from Calgary. Trust in the government in meeting this responsibility, however, did not differ significantly between the two samples.

In addition to values, expectations, and attitudes, social norms were expected to affect stakeholders' policy preferences. In particular, social proximity to agriculture was hypothesized to shade respondents' opinions of policy related to irrigators' rights. Social norms were examined with respect to community cohesion, the employment of family and friends in agriculture and agriculture related fields and social distance from agriculture.

There was significantly greater disagreement in Strathmore that people in the community agreed on water issues as well as the idea that rivers tie communities together. This reflects the greater potential for conflict over water issues in rural areas, where competing water uses may generate discord. Calgarians were also significantly more likely to desire to remain in their current areas, and despite reporting wider agreement with their community on water issues they were significantly more likely to believe they used water more carefully than their neighbours. Although this claim was not verified as part of the research, it probably implies greater conservation behaviour on the part of Calgarians, which is in line with their higher level of environmental concern—although Berenguer *et al.* (2005) did find a low correlation between pro-environmental orientations and actual behaviour.

As expected, respondents from Strathmore exhibited closer social proximity to agriculture, reporting significantly more friends and family involved in agriculture and related fields. In addition, they were more likely to use rural areas for recreation, despite respondents from Calgary reporting greater usage of water bodies in recreation. Those from Strathmore were also far more likely to converse or socialize with those employed in or around agriculture. Notably, however, residents of Calgary and Strathmore did not differ in the regularity with which they purchased produce from farmer's markets, roadside stands or the farm gate.

Responses to policy statements across sample areas were largely consistent with related attitudes. Urban respondents in Calgary, for example, were significantly more supportive of an enhanced government role in regulating water use and prices in a market, with greater levels of agreement to all three policy statements related to an increased government role. Independent of location, age and income did not have a significant effect on support for the government role, while increasing levels of education resulted in increasing support for government involvement across all related policy statements. Support for strong government policy was also significantly correlated with attitudes expressing government responsibility for protecting a healthy environment and trust in the government; however, no significant correlation was noted between trust in government and agreement that the government should be able to appropriate unused allocated water for environmental uses.

Support for policy statements linked to the environment's rights was less consistently different between Calgary and Strathmore, with three of four statements significantly different. In each of these cases, the urban population of Calgary expressed greater environmental policy preferences, agreeing more strongly that private individuals should be allowed to hold water licences for environmental purposes, that the government should buy water licences so that more water can be left in the river, and that minimum levels should be set for all rivers beyond which no more water can be extracted.

Greater levels of agreement with policy statements concerning the environment's rights were also related to age and income, with younger and wealthier respondents more likely to respond positively to establishing minimum flows, and younger respondents also agreeing that water licences for environmental protection should be available to private individuals. Both of the previous policy preferences were also supported in significantly larger proportions by those with higher levels of education and consistent with the findings of Van Liere and Dunlap (1980) in their review on the social bases of environmental concern.

With respect to policy concerned with irrigators' rights, there was surprisingly little variation between respondents from Strathmore and Calgary. The only policy statement that fell into this group that showed

significant difference between the two samples was that water saved through improved water use efficiency should be used to increase economic activity. The same policy option varied significantly with age and annual income, with older respondents and those with lower household incomes favouring reinvesting saved water into the economy. Age was also significant for the statement stating that all existing water licences must be honoured, with younger respondents especially in agreement.

The only similarly grouped policy statement for which responses differed significantly based on the education level of the respondent was that public funds should be used to help larger water users to become more efficient. This is consistent with the observed tendency for more highly educated respondents to prefer greater government involvement and oversight in water reallocations, as seen in the previous discussion of policy statements related to increased government role.

Respondents' close social ties to irrigated agriculture and the regularity with which they traveled to rural areas for recreational purposes were also significantly correlated to their support for irrigators' rights in water reallocation. Those with more friends and family dependent on farming were more likely to feel that all outstanding water licences should be respected, while those who frequently recreated in rural areas were more supportive of using government funds to improve efficiency and less willing to see those efficiency improvements reused in other economic undertakings, preferring that the saved water be used to benefit the environment.

6 Conclusion

This report has investigated the variation in values, beliefs and expectations, attitudes and social norms as they relate to policy preferences across two samples of households in Calgary and Strathmore, Alberta, Canada. Of 5,338 questionnaire mailed, 724 complete responses were obtained and analyzed. Between the samples, the following statistically significant differences (at the 10% level) were noted: the Calgary respondents were younger and more highly educated. They were also more likely to be employed in higher level service industries including: management; business and finance; the sciences; and sales, art and cultural industries rather than trades. They also took part in fewer consumptive recreational pursuits such as hunting and fishing. Residents of Calgary were also significantly less likely to have grown up or spent the majority of their life in the countryside (on- or off-farm, or in a small town).

The findings indicate that there is indeed greater environmental concern surrounding water transfers in urban than rural areas, and particularly among younger and wealthier respondents. Respondents from Strathmore were somewhat more likely to support economic growth over the health of the environment, but although social proximity to agriculture played a part, it was not as significant as originally expected. Also notable from these findings is a clear desire on the part of urban populations for greater government control over water resource management, implying that increasing the role of the market in reallocating water might be met with greater opposition from urban populations. Given that both rural and urban populations ranked similarly in their support for irrigators' rights, greater involvement by the government in alleviating the burden of rural to urban water transfers on urban populations may be more widely accepted than a market-driven approach.

In any case, further research is needed to more fully explore the determinants of the population's policy preferences. Although there are significant differences between the urban population of Calgary and the rural population of Strathmore, a more sophisticated analysis—forthcoming under this project—is neces-

sary to understand the more nuanced interactions between and determinants of values, beliefs and expectations, attitudes and social norms as they relate to policy preferences for water reallocation.

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