

# Southern Alberta Resource Economics Centre

Department of Economics, University of Lethbridge  
4401 University Drive, Lethbridge, Alberta, Canada, T1K 3M4

**SAREC Report 2010-12**

## **Exploring attitudes to water re-allocation in Southern Alberta**

**2010**

**Zuo, A., Bjornlund, H., Wheeler, S.,  
Khan, E. and Corral de Zubielqui, C.**



## **Southern Alberta Resource Economics Centre Publications**

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K. K. Klein and Henning Bjornlund, SAREC Research Leaders

Department of Economics, University of Lethbridge

Lethbridge, Alberta T1K 3M4

[klein@uleth.ca](mailto:klein@uleth.ca); [henning.bjornlund@uleth.ca](mailto:henning.bjornlund@uleth.ca)

## **Acknowledgements**

This research is funded by the Alberta Water Research Institute and the Canadian Water Network for Governance for Source Water Protection. The authors would like to acknowledge the work of Masters Student Cameron Parrack who did a lot of the hard work in designing questionnaire, administering the survey and the data entry/validation process. The results of Cameron's own research are published in his thesis *The Influence of Stakeholder Values on the Acceptance of Water Reallocation Policy in Southern Alberta*. We would also like to acknowledge the contribution of Cameron's co-supervisor Professor Rob de Loe from University of Waterloo.

## **ABSTRACT**

Escalating demand for water resources due to population and economic growth as well as changing environmental values have resulted in increased pressures on existing water resources and represent a challenge for many governments around the world. As currently irrigation accounts for around 80% of total water use within many of the most stressed water resources, there are increased pressures to facilitate water transfers from rural to urban areas to meet the increased demand for water from other sectors of the economy including the environment. This report analysis the values and attitudes that rural and urban households not involved in irrigated farming hold toward the environment, and how they influence their opinion about water reallocation and the conditions under which they should take place. The report further analysis whether such values and attitudes varies between people living a big city and people living in smaller towns depending on irrigation and whether these two groups prefer different policy solutions. Our study investigated 1,170 responses from Lethbridge and smaller surrounding towns largely dependent upon irrigation. The questionnaires collected information on rural and urban status, socio-demographic data and a wide range of value statements (40 in all) and policy statements (ten in all). In general, urban respondents agreed more strongly with the questions regarding Environmental Water Values; River management; and one question in Water Conservation. Rural respondents agreed more strongly with questions regarding Human-Centred Water values and River livelihood. For the views on policy statements, urban respondents see a much larger role for the government in water policy, while rural respondents agree more strongly with policy statements that assert irrigators' water rights. Less divergence in opinions is seen for the set of policy statements related to protecting the "Environment's Right".

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## **1. Introduction**

Southern Alberta has experienced increasing water scarcity over the last two decades. This resulted in the emergence of new legislation with the revision of the Water Act in 1999 and the Irrigation District Act in 2000. In 2001 the government started a process of developing long-term provincial water management strategy which resulted in the Water for Life strategy in 2003. This document confirms that water resources in the South Saskatchewan River Basin are fully or over committed and that demand for water will continue to increase due to continued economic and population growth as well as increased recognition of the need to leave more water in the streams. The Strategy identifies improved efficiency and productivity of water as the most important source of water to meet new demand. It emphasizes that existing water licenses will be respected and that new demand should be met by voluntary transfers between existing licence holders and new water users. Such transfers were made possible with the revised Water Act in 1999. Finally it states that economic instruments will be used as necessary to achieve policy outcomes.

The largest water users in Alberta are irrigators controlling 75% of all water. Hence, if new demand is going to be met reallocation out of agricultural will necessarily play an important role. The need for such reallocation was emphasized in 2005 when the Minister announced that no further applications for water licenses would be accepted. However, experiences over the last 10 years suggest that water markets have not been very active and are not readily supported by the irrigation sector (Bjornlund et al., 2007). Further, recent conflicts over the first major water transfer from Western Irrigation District to support a new development of a Mall, casino and race track at Balzac as well as attempts

to amend district licenses to enable them to supply water for non-agricultural uses, clearly indicate that there are wide community concern over such arrangements (Bjornlund et al., 2009). Further, there are limited understanding of why this is the case.

Water transfers from rural to urban areas is not only an Alberta concern, it present challenges for many governments around the world. There is the straightforward realisation that water scarcity and the problems related to it can only become more acute in the future, given worldwide population growth projections. As previously mentioned, the main use of water resources in the past was agricultural. However, this has changed over time and contemporary uses include not only irrigation or environmental activities, but also recreational activities related to rivers (Howard 2007). Others recognise that communities are interested in conservation and awareness of water management issues have been increasing over the years (Hatfield-Dodds et al. 2006; 2007).

While the issue of water transfers has become a key research area in some countries, there are other countries which still lag behind. Gleick (1998) notes that some parts of the world, particularly developing countries, have yet to adopt systematic studies of water transfers between rural and urban sectors as they are still struggling to ensure sufficient water access for their basic needs. In Canada the debate over the Balzac transfer and the amendment of Irrigation District Licenses clearly illustrate that water transfers out of irrigation and how such transfers should conducted are very sensitive issues and evoke emotional debate in the wider community.

A review of the literature reveals that while there is a quite substantive literature on rural to urban water transfer and the potential impacts within the regions exporting the water,

but there is a need for research answering questions such as: what are the factors influencing successful rural to urban water transfers? What role do social characteristics, values and attitudes play? And, how do various groups in society respond differently?

This report presents an overview of past studies in order to identify key concepts, findings and gaps in the issues surrounding water transfers between rural and urban sectors, with particular focus on the characteristics of the groups involved. The review covers all disciplines of study. The gaps that emerge from this review suggest possible directions for future research.

This report communicates the overall findings from a survey of rural and urban households not involved in irrigated farming. The survey investigated how these households perceive a number of issues related to water management, the use of water as well as a number of policy statements regarding how water should be managed and shared between irrigation and other needs such as urban, industrial and the environment. It is important to understand that this is not a survey of the population as such, but of households. As such the respondents are not representative of the population living in this area with respect to age and gender, but it is representative of the households living in the area. This report discusses the overall findings with respect to differences between rural and urban residents and also explores how demographic characteristics influence such differences.

## **2. Literature Review**

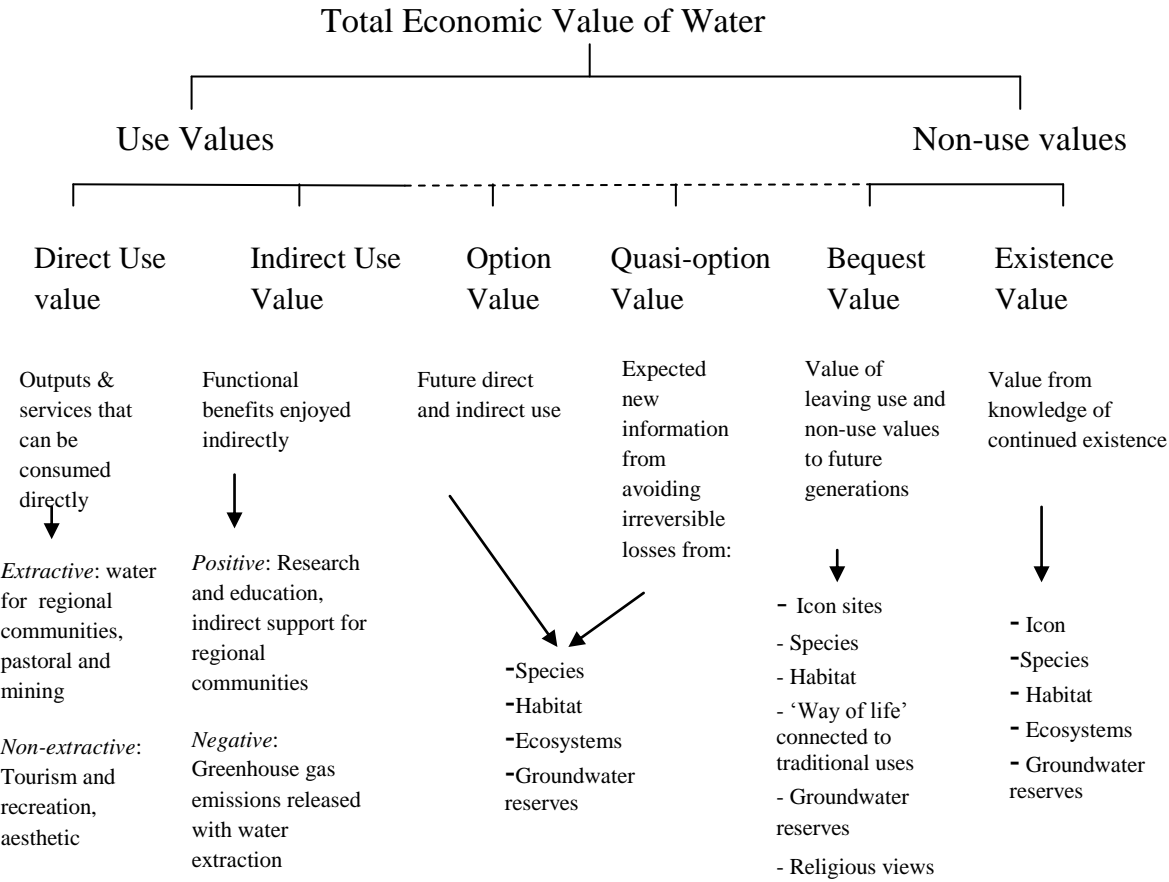
This literature review looks at some of the values associated with water, how these values can affect people's behaviour regarding water management, and the differences between urban and rural populations in this regard. As the specific literature on water in this area is very limited we have also reviewed the literature with respect to wider environmental, natural resource management and agricultural issues.

### **2.1. Values Associated with Water**

There are many values associated with water. The total economic value of water is made up of direct and indirect use values, and values accrued on-farm and off-farm. *Direct use values* are benefits that directly accrue to individuals who use the resource. There are different types of direct use, such as consumers directly using water for household purposes and irrigators using water to produce crops, while recreation users may derive benefits from the resource but do not actually consume it. Where there is no direct contact with water, the community may benefit indirectly from the economic activity of irrigators, this is known as *indirect use values*. *Non-use values* to society from water arise either through humans knowing that ample water is there and that there is the potential for future use. Non-use values are divided into *option values*, *quasi option values*, *existence values* and *bequest values*. Option values are values for use in the future, existence values are values for knowledge of their presence and bequest values arise from wanting to preserve the public good for future generations. Non-use values can be derived without any actual current human contact with the resource (Rolfe, 2008).

Figure 1 below illustrates the different concepts of water values and how they make up total economic value of water. Illustrative examples of each type of water value are provided. Although it is beyond the scope of this report, there are a wide range of methodologies that can be used to estimate water values; these include choice experiments, contingent valuation, hedonic pricing, travel cost method and contingent ranking.

**Figure 1: Values of Water**



**Source: Adapted from Rolfe (2008; p. 18)**

The many values and uses of water as illustrated in Figure 1 highlight the management issues that arise if the social, environmental and recreational uses of water are ignored. A variety of studies have discussed these problems (i.e. Syme et al. 2008, Savenije 2002, Batten 2007).

Syme & Nancarrow (2008) developed a visual representation of social aspects in water management. The first three spheres are utilitarian - health, wealth, prestige and social identity. The rest are humanitarian needs - social cohesion, recreation, aesthetics, moral, cultural and spiritual.

Health is directly related to basic water needs and examples of this are drinking, cooking, washing, cleaning and healthcare uses (Syme et al. 2008). It is clear that water for health is a right of every human being and the quality and quantity of water is a critical issue for survival and health. This right is related to other human rights such as food provision, hygiene, right to practice cultural activities (Syme et al. 2008). Water provision is therefore directly related to human well being.

Wealth is a key aspect of economic development and water can be used for generating employment and income in direct and/or indirect ways (Syme et al. 2008). Examples include agriculture, fisheries, aquaculture, tourism, recreational purposes, industrial products, power generation and so on (Wallace et al. 2003). The most fertile land is often situated along watercourses and on flood plains. Other economic activity such as sewerage disposal, transport, research and education are also linked with water (Pollard 2002).

The prestige and social identity aspects of water are familiar to those who deal in real estate. Bourassa et al. (2003) and Askew and McGuirk (2004) note that views of water can increase the price of properties in certain locations (cited by Syme, et al. 2008). Ownership of a boat is a sign of social prestige (Syme et al. 2008) and we often associate

marinas with wealth. Howard (2007) observes that property prices are influenced by proximity to rivers due to the lifestyle associated with recreational activities such as fishing, canoeing, water-skiing, etc. These activities are not only associated with leisure but also with the possibility of generating improvements in human health and the harmony of social development (Ewert 2003). Water amenities, whether natural or artificial, are also positively associated with tourism (Howard 2007). People prefer places with water as part of the landscape and the attractiveness of rivers, lakes, waterfalls and fountains is universal (Syme et al. 2008).

Another important aspect is social cohesion, which is related to how the community faces water issues (Pepperdine 2001). This is an important consideration for our analysis, because water scarcity, access and allocation issues can be a major factor behind tensions and conflicts that arise between communities (Syme et al. 2008). Festivals and religious ceremonies where water plays a main role illustrate how communities value water for more than just basic needs. Syme et al. (2008) therefore proposed an integrative assessment which includes significant social variables such as morals and perceptions of spirituality.

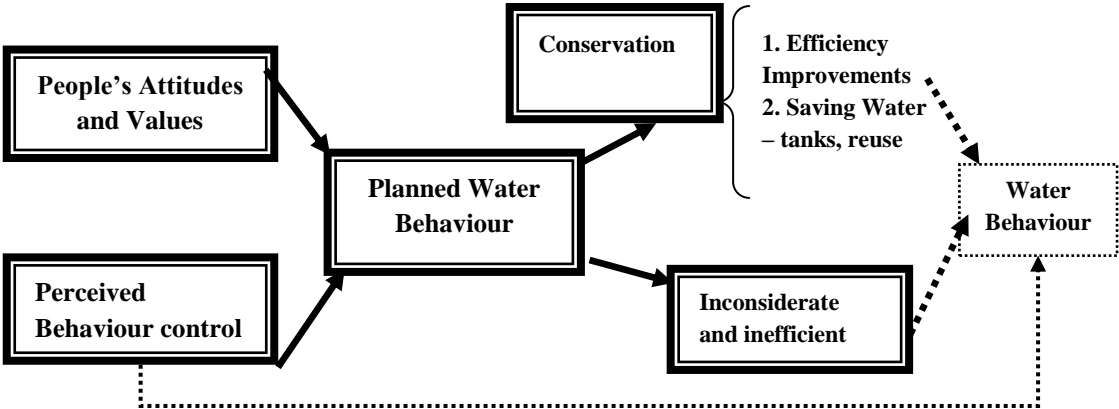
Water therefore has many other dimensions beyond its utilitarian purposes. To effectively manage this resource, we must also consider its humanitarian aspects. In order to do this, the community's beliefs, perceptions and values must be taken into consideration in policy making.

## **2.2. Behavioural Intentions and Values**

An individual's intentions about various types of behaviour can be predicted from their attitudes towards that behaviour; the theory of planned behaviour links a person's values

to their beliefs, which in turn heavily influence their attitudes. Along with subjective norms and perceived behavioural control (which refers to a person’s perception of how easy or difficult it is to perform a given behaviour), attitudes are a large factor in influencing a person’s behavioural intent, which in turn leads that person to perform a certain behaviour (Ajzen 1991). Planned behaviour is the intention to undertake a certain action, though of course this behaviour can only occur if the individual has complete control to perform or not perform the action (Ajzen 1991). While the intention to undertake a certain action is not the same as actually doing it, it is likely to be the best possible indication of the intended path for an individual. There is a considerable literature on what influences the behaviour of individuals. It is generally accepted that values drive attitudes, which in turn influence behavioural intentions and then behaviour (Rokeach 1979, Fishbein and Ajzen 1980, Ajzen 1991, McFarlane and Boxall 2003). Figure 2 incorporates the theory of planned behaviour; which describes a person’s perceived behavioural control in regards to water and the extent to which their perceptions and confidence influence their decision to undertake certain courses of action, in the context of people’s future plans for water use.

**Figure 2: Theory of Planned Water Behaviour**



**Source:** Adapted from Ajzen (1991).

What concepts does the term “value” encompass? De Groot and Steg (2008, p. 331) offer us a four-part description. First, a value “reflects a belief on the desirability of a certain end-state.” Second, they are “rather abstract and transcend specific situations”. Third, they “serve as a guiding principle for selecting or evaluating behaviour, people and events”. Finally, values “are ordered in a system of value priorities”. The authors explain that this implies that when people find themselves in a specific situation where the relevant values may compete with or contradict each other, choices are made based on which values take priority.

It is possible to evaluate, using social values, the fairness of an applied policy and gain a better understanding of how to transfer or allocate water in a manner such that the benefits to society exceeds costs (De Groot and Steg 2008). Values therefore play a significant role in decision making and explaining the similarities and differences between various demographic groups, as well as between different cultures and nations (Rokeach, 1973). Although they are relatively stable, they do evolve over time (Kennedy 1985).

Syme et al. (2008) call attention to the lack of social analysis in public decision making and cite this as the reason why sustainable natural resource management has yet to be fully realised. They point out the necessity of a framework which considers social aspects such as basic needs, cultural aspects, environmental aspects such as quality and quantity (including human and environmental requirements) and economic aspects such as income and employment generation. Policy makers may initially find it difficult to include the subjective well being that people get from access to water resources in their evaluations,

but the authors feel that the inclusion of such variables is critical to the realisation of a sustainable water management approach.

### **2.3. Urban vs. Rural Water Issues**

As noted in the introduction, there are growing disputes over sharing water between urban and rural communities. Demand for water is expected to grow rapidly especially for urban and industrial uses as well as demand to leave more water in the rivers to secure water quality needed for human, environmental and economic uses. These demands will be met increasingly with water transfers out of irrigated agriculture, and in part through new technology applied to irrigation systems and infrastructure. Rosegrant and Ringler (1999, p. 39) underline the importance of water policy when they state that “the management of this reallocation could determine the world’s ability to feed itself.” If the demand side is not properly managed, the prices of agricultural commodities could rise, which will result in more adversity for the poor in low-income countries.

Meinzen-Dick and Appasamy (2002) and Celio et al. (2010) also attribute increased water demand to rapid urban expansion. Worldwide, cities added 2 billion people to their populations from 1950 to 2000 and are expected to add the same amount during the first 25 years of this century. The provision of water and the treatment of water-borne wastes are the principal challenges, and this will require substantial investments in urban infrastructure for water supply, treatment, and disposal. But demand cannot be left unchecked and must be managed at all levels (Meinzen-Dick & Appasamy 2002).

Other researchers acknowledge that water supply in some parts of the world is inadequate to meet current urban, environmental and agricultural needs (Ramirez et al. 2009). Ducrot et al. (2004, p. 86) points out that rapid urbanisation means that “population densities no

longer allow for unlimited access to safe water.” As noted by Showers (2002, p. 645), “urban areas are consuming disproportionate amounts of water and contaminating groundwater, rivers and coasts.” The challenge for water resource managers and policy makers is to find how to assign a scarce resource that has increased demand (Ward 2007). At the same time, the process needs to be inclusive of all stakeholders, communities and groups at both regional and national levels in order to ensure equal access to water for those that need it (Cai 2008).

Molle (2004) and Bastakoti and Shivakovi (2008) point out that increasing water demand from different sectors often generates conflicts. Molle (2004) states that it is necessary to review water rights between stakeholders and government. Conflicts which have arisen between different sectors for water allocation are well documented (Bastakoti & Shivakoti 2008), as are the negative effects that have emerged as a consequence of water transfer between rural and urban sectors and the attempts to mitigate them (Rosegrant & Ringler 1999). In some instances, these transfers have already placed undue stress on communities. Commenting on water transfers between rural and urban areas in Northern China, Cai warns that “some actions are needed right now to avoid serious social instability” and urges the government to prohibit transfers that deplete farmers’ water supply below what is required for their basic needs and to undertake transfers that ensure basic requirements of urban residents during drought periods are met (Cai 2008, p. 24). Deeper analysis of conflicts and social instability that can arise from water scarcity is, however, beyond the scope of this present study.

A consequence of the wide variety of uses that water serves in the modern world is growth in the number of stakeholders involved in the distribution process. A more

integrated and collaborative perspective for water management systems has therefore become necessary. The transfer process has to try and satisfy different sectors, and adaptive systems for effective water management which consider climate and socioeconomic changes are required (Craps et al. 2007).

Levine et al. (2007) notes that water transfers from farmer to farmer and municipality to municipality are a familiar phenomenon. However, they cite others such as Lund, Israel & Kanazawa (1992) who point out that water transfers between rural and urban sectors is a relatively new phenomenon. Levine et al. (2007) summarized three different types of water transfer based on the nature of the transaction: market, quasi- market and fiat. The first scenario is where few buyers and sellers interact, resulting in a non competitive situation resulting in inefficiencies in allocation. The second type involves a competitive buyer side but with a fixed price on the seller side. Finally, the fiat type depends on government power. Levine et al. concluded that a surplus of water through irrigation improvements can facilitate water transfer.

Howe & Goemans (2003) remarked on the importance of water transfer from lower value uses to higher value uses, and also the importance of increasing water market flexibility. Molle et al. (2008) points out that there are some places in the world, e.g. Jordan, which show a mismatch between water required for food production and the contribution to national income.

Ramirez et al. (2009) analysed the relevant characteristics related to the development of policies for water transfers. They find that the price for selling or renting water or water rights is expected to be different across age ranges. Although it is expected that older farmers set lower prices than younger ones, sometimes this relationship works in an

inverse way because of the opportunity cost. These authors also analysed the impact of water restrictions in irrigation sectors on employment and income. They found that many of the people living in farming areas in Jordan have income from farming activities and are generous enough to transfer water to cities for that reason. The price of water is another variable to be considered in the process (Ramirez et al. 2009).

Quiggin (2005) highlights what many Australian urban residents are experiencing - water restrictions due to scarcity. He proposed, as an option, the transfer of water used for irrigation to urban areas. A possible option is the creation of a National Water Market where urban areas can purchase water. But various economists, policy makers and ecologists have put forward arguments both for and against such a market for water transfers. A point in favour of water transfer between rural and urban sectors is economic efficiency in consumption, where a difference of prices between these sectors can benefit both, as water is allocated to those who are willing to pay the asking price. Production efficiency can be raised based on new technology and innovations spurred on by the market. Some of the points against trading are related to the irrigation infrastructure not allowing users to readily transfer water to other sectors. Modifying existing infrastructure may increase the costs to some current users, thus decreasing economic efficiency. Another point against the transfer of water between rural and urban areas involves perceptions of the “wastefulness of some forms of urban water use” (Quiggin 2005, p.11). Quiggin concludes that “in the long run, water should be allocated to its most highly valued use, and the standard way of doing this is through market transactions.”

Hatfield-Dodds et al. (2007, p. 47) find “ample evidence that the community has the capacity to contribute handsomely to the water reform process”. They note that there is

growing interest in water conservation among urban residents, but “consistent differences” between various segments of that community. Awareness of water management models and alternatives within the rural community is far less than what they expected. We can therefore gain considerable insight into a community’s preferences regarding rural to urban water transfers by gathering information about their values and perceptions related to the topic. This framework can aid us in explaining the similarities and differences between rural and urban residents’ preferences about water transfers.

### **2.3.1. The Literature on Urban and Rural Resident Values**

What has the past literature found in regards to differences between rural and urban use? It may be that there are no major differences between rural and urban attitudes towards water management. For example, Hatfield-Dodds et al. (2007) state that research indicates that when it comes to water culture, disparate groups with different interests actually have more similarities than differences. However, Berenguer et al. (2005, p. 135) found that urban residents are more environmentally concerned than those living in rural areas, but rural residents have a “more well developed sense of moral obligation to care for the environment” and actually “behave more responsibly”. They attribute the greater concern regarding environmental issues in urban areas to higher education levels and better access to information compared to rural areas, but it is actually rural residents that behave in ways that are more favourable to the environment. Wachenheim & Rathge (2002) undertook a study on perceptions in twelve states across the North Central region of the United States, with a total usable sample of 594 households. They focused on issues related to the environment and farming. They found differences between rural nonfarm, farm and city residents on their perceptions about existing environmental

regulations, farmers, farm consolidation and the role of government aid to the farming sector. Compared to those residing on a farm or in a town or city, rural nonfarm residents were more convinced of farmers' positive impact on the local economy, but were less concerned about the effect of farm consolidation

Pumphrey et al. (2008) conducted a study of urban and rural attitudes about water conservation policies in a semi-arid region of Texas where communities depend on both surface and groundwater sources for their municipal supplies. They tried to test which policies would be most acceptable to these groups, but found no distinct difference between urban and rural attitudes towards any one set of conservation measures among their sample of 829 interviewees. They do, however, acknowledge possible problems with the design of their study that may have led to its results being inconclusive and that there was a need for future research.

Several studies have highlighted the variations between groups with regards to environmental concerns and have attempted to explain these through demographics and other factors such as location of residence (Buttel and Flinn 1974; Van Liere and Dunlap 1980; Sharp and Adua 2009). Van Liere and Dunlap (1980) used demographic variables such as age, social class, residence, political beliefs and gender to explain varying levels of environmental concerns. They find that variables such as being young, well educated, and having liberal beliefs can influence a person's level of environmental concern. They also find correlations with other variables such as private property rights; laissez-faire government and economic growth. They conclude that it is important to analyse demographic and socio-economic variables in order to explain changes in people's environmental concerns; however, they note that their coefficients for these variables

were very low, which could explain the limited success of other researchers in establishing links between these variables and environmental concerns.

Jones et al. (1999) found that urban residents are more concerned about environmental matters than rural and a positive relationship exists between certain demographic characteristics and levels of environmental concern. From 1,239 telephone interviews, they found that younger people, those with higher educational levels and liberal political orientations tend to have higher levels. But critically, they found no significant rural-urban differences on several indicators of environmentalism. Morrissey & Manning (2000, p.21) conducted a similar study on racial identity and location of residence with a sample size of 478 survey respondents, but they state that “relatively few differences in environmental values and ethics were found between African American and white, and rural and urban subgroups.”

Some theories that link differences in environmental concern to residence in a rural or urban area include deprivation theory (Lowe & Pinhey 1982) and extractive-commodity theory (Jones et al. 1999). Deprivation theory states that when people feel deprived of a natural resource of good quality, their environmental concerns are heightened. Based on this theory, Sharp & Adua (2009) reported Tremblay & Dunlap’s (1978) study which theorized that the urban populace will have greater environmental concerns due to the relatively poor quality of their environment (e.g. air, water and noise pollution) compared to rural locations. On the other hand, the extractive-commodity theory states that those employed in industries related to the extraction of natural resources (which are more prevalent in rural areas) tend to be less environmentally concerned than those employed in other sectors.

Van Liere & Dunlap (1980) found that urban residents have higher environmental concerns than people who live in rural areas. However, Lowe & Pinhey (1982) did not find support for environmental degradation theory in urban areas. Moreover, they report that both the size and place of residence determined how people experienced and viewed different environmental conditions; the larger these variables, the higher their concerns. Farmers were slightly less concerned with regards to environmental protection. Therefore, some differences between groups are not completely explained by the aforementioned theories (Lowe & Pinhey 1982).

Other studies looked at differences based on the location of residence. However, this research is scarce and/or inconsistent (Arcury & Christianson 1990). Sharp & Adua (2009, p. 59) find that “the presence or absence of differences may vary according to the nature of the environmental concern as well as contextual attributes of the urban or rural region.”

Sharp and Adua (2009) conducted a study on links between rural-urban location, participation in recreational activities and attitudes towards the environment, particularly regarding environmental concerns related to agriculture. From a sample size of 4,031 completed surveys, they find a strong relationship between location and concern about agriculture and the environment, but this relationship disappears once proximity to agriculture is accounted for. However, they do find a strong relationship between participation in rural recreational activities and levels of concern.

It is therefore difficult to determine whether location or other factors are the main influence on people's levels of concern about water resource management and the environment. Any study which seeks to investigate links between communities and their views on water management must take into account a number of factors including location, demographics, recreational activities and occupation.

### **2.3.2 Water transfer impacts and mitigation**

The water transfer process has both positive and negative effects and externalities for the parties involved (Howe et al. 1990). For example, a reduction of water quality is a negative externality, while increased profits from the transfer is positive. In conclusion, Howe et al. suggest that "...states should not fear water transfers: transfers will not wreck basins of origin nor state economies. The results do imply, however, that transitional assistance is warranted to help those parties suffering uncompensated externalities and indirect displacement by transfers". (p. 1203)

From a survey of 317 community leaders in water-trading areas throughout the states of Arizona, New Mexico and Texas in the United States, Charney and Woodard (1990) find that there is a perception that certain groups gain while others lose when water is transferred. The respondents perceived government officials, water utilities, and various experts as gainers, while private well owners, indigenous groups, future generations and small farms were seen as losers. They also point out that transfers do have significant impacts, though they are "not devastating". However, these impacts tend to be highly concentrated, as purchases tend to be clustered around particular areas where water is available for transfers. Therefore, those areas may need to be compensated in some way.

Rosegrant and Ringler (1999, p. 40) arrive at a similar conclusion when they state that “comprehensive reforms are required to mitigate the potentially adverse impacts of water transfers for local communities.”

## **2.4 Summary**

This literature review focused on water transfers, values, beliefs and behaviours underlying the water transfer process, and water management systems and associated factors. Water resources are not just associated with agriculture or basic needs but have many socio-economic and cultural aspects to their availability and usage. Further research is necessary to find out which demographic and socio-economic factors can lead to people holding different views about water transfers, and how this information can be utilised to form effective sustainable water management policies. These policies can go a long way in preventing future tensions that may arise as a result of competition for scarce water resources, and they can also help to mitigate the negative impacts of water transfers.

### **3. Study area, data and methodology**

The analyses in this report are based on a mail out survey, 3,000 questionnaires were sent to residents in Lethbridge, Alberta (urban water consumers) and to 3,000 households in Taber (MD), Magrath, Raymond and Stirling (small towns around Lethbridge largely dependent upon irrigation). Each of the forward sortation areas (FSAs) that served the five sample locations were determined and mailing addresses for the 6,000 surveys were purchased from a list broker (West List Co.). The samples for each of the populations (rural and urban) were chosen by selecting every tenth mailing address to ensure that all households within the FSA had an equal opportunity to be sent a questionnaire. Two reminders were sent and incentives were offered (i.e. cash prizes) to encourage respondents to participate. A total of 1,165 valid surveys were returned and 429 were returned due to incorrect addresses, nonqualified responses and other reasons. Therefore, the response rate is 21 percent for our survey which is considered reasonable. After removing survey records with incomplete information, particularly for the demographic and socio-economic questions,<sup>1</sup> 1,066 interviews were included with 609 and 457 in the urban and rural areas respectively. 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 rural and urban status, socio-demographic data and a wide range of value statements (40 in all). The value statements used a one to five Likert rating scale and collected information about family, economics, lifestyle, the environment, water rights, economic issues, and water transfer issues. There were also

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<sup>1</sup> The records with incomplete information are also examined and it indicates these records are missing at random. Therefore dropping out these records will not bias our further analysis.

ten policy questions asked of respondents, to collect their views on government's role in water policy, the market's role and the various rights of the environment/irrigators/public users.

In the findings sections the responses to all questions are discussed under the headings: 1) demographics; 2) value statements; and 3) policy statements. Descriptive statistics are reported and significance tests used to identify differences between the rural and urban sample. The statistical methods used in the findings sections are:

- Wilcoxon-Mann-Whitney test and the two independent Sample t-test; (Since the value statements are measured in a five level (from 1=strongly disagree to 5=strongly agree) Likert scale, which could be treated either ordinal outcomes or normal outcomes, the Wilcoxon-Mann-Whitney test (for ordinal outcomes) and the two independent Sample t-test (for normal outcomes) are appropriate to test for any significant differences in the value/policy statements between rural and urban residents. The two independent Sample t-test is also appropriate to test for any statistical differences in age and household income between rural and urban residents.)
- Pearson Chi-square test; (The test is appropriate to test the association between two categorical variables or between one categorical and one ordinal variable, such as between gender and residence, between education and residence, between value statement and education, etc.)
- Multivariate test on means; (This test is applicable when comparing the averages from multiple samples, such as the average age by each level of the likert scale of the policy statement. This test is in the form of an F test.)

- Spearman's rank correlation coefficient; (The coefficient is used when one or both the variables are ordinal, such as between the value statement and the policy statement.)

## 4. Findings

### 4.1. Findings – Demographics

For the purposes of descriptive analysis, the respondents were divided into two groups, namely rural and urban, based on the classification of their postal codes.

**Table 1: Number of respondents surveyed according to location of residence**

Location of residence	Complete sample	
	No.	%
<b>Rural</b>	499	42.6
<b>Urban</b>	671	57.4
<b>Total</b>	<b>1170</b>	<b>100%</b>

Rural responses accounted for 42.6 percent (n = 499) while urban respondents accounted for 57.4 percent (n = 671) (Table 1). Females accounted for 27.1 percent of the sample in rural areas and 30.9 percent in urban areas, while males comprised 70.5 percent in rural areas and 69.1 percent in urban areas (Table 2). The gender composition in the rural and urban samples does not differ statistically.

**Table 2: Respondents according to gender**

		Complete sample		Rural sample		Urban sample	
		No.	%	No.	%	No.	%
<b>Gender</b>	<b>Male</b>	804	68.7	352	70.5	452	69.1
	<b>Female</b>	337	28.8	135	27.1	202	30.9
	<b>Missing data</b>	29	2.5	12	2.4	17	2.5
	<b>Total</b>	<b>1170</b>	<b>100%</b>	<b>499</b>	<b>100%</b>	<b>671</b>	<b>100%</b>
Pearson Chi-squared test statistic: 1.35. p-value=0.25("Missing data" category excluded)							

People aged 50 and above accounted for 74.4 percent of the entire sample. This is higher in the rural sample (77.4 percent) and lower in the urban sample (72.3 percent). Respondents who were retired or close to retirement age at 60 years or above were 45.7

percent of the entire sample, 46.7 percent in rural and 45 percent in urban areas (Table 3).

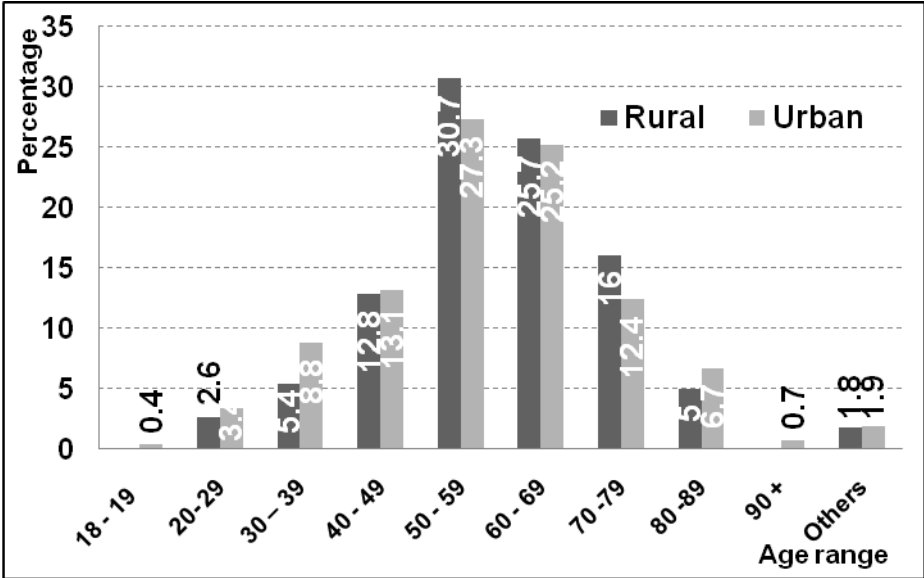
We can see from Figure 3 that most of the respondents in both rural and urban areas are between the ages of 50 to 69. There is no significant difference in the average age of the rural and urban sample.

**Table 3: Respondents categorized by location of residence and age**

		Complete sample		Rural sample		Urban sample	
		No.	%	No.	%	No.	%
Age	18 – 19	3	0.3	0	0	3	0.4
	20 – 29	36	3.1	13	2.6	23	3.4
	30 – 39	86	7.4	27	5.4	59	8.8
	40 – 49	152	13	64	12.8	88	13.1
	50 – 59	336	28.7	153	30.7	183	27.3
	60 – 69	297	25.4	128	25.7	169	25.2
	70 – 79	163	13.9	80	16	83	12.4
	80 – 89	70	6	25	5	45	6.7
	90 +	5	0.4	0	0	5	0.7
	Others	22	1.9	9	1.8	13	1.9
<b>Total</b>		<b>1170</b>	<b>100%</b>	<b>499</b>	<b>100%</b>	<b>671</b>	<b>100%</b>

Two sample t-test statistic: 1.30, p-value = 0.19. ("Others" category excluded)

**Figure 3: Distribution of respondents by location and age**



Income distribution varies significantly between the urban and rural sample (Table 4).

People who received \$50,000 or more in household annual income were 63.7 percent of

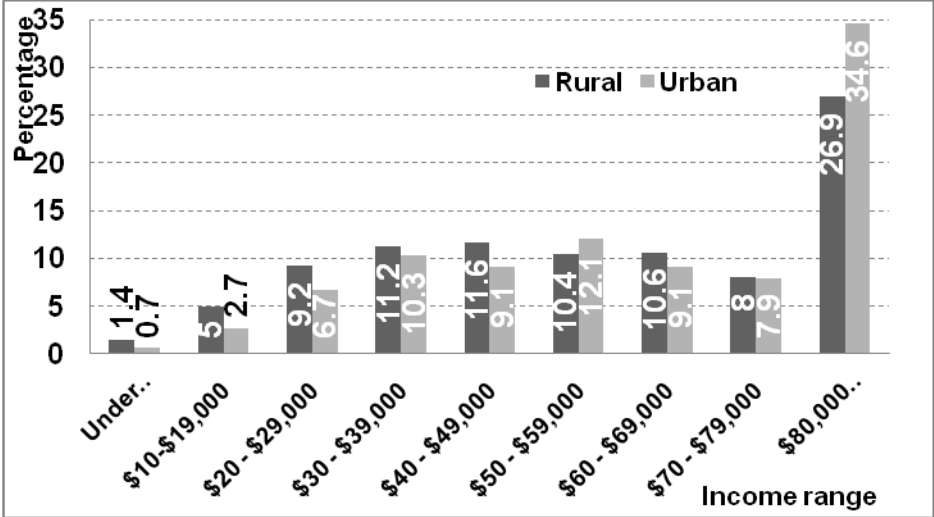
the urban and 55.9 percent of the rural sample. It must be noted that this is mostly due to the dominance of urban residents in the highest income range \$80,000+ (Figure 4). The percentage of rural households is higher in all ranges except the \$50-59,000 range (10.4 percent compared to 12.1 percent) and the \$80,000 and above range (26.9 percent compared to 34.6 percent). This is likely due to the higher prevalence of well-paid occupations in cities.

**Table 4: Respondents categorized by location of residence and household**

		Complete sample		Rural sample		Urban sample	
		No.	%	No.	%	No.	%
Household Annual income	Under \$ 10,000	12	1	7	1.4	5	0.7
	\$ 10,000 - \$ 19,000	43	3.7	25	5	18	2.7
	\$ 20,000 - \$ 29,000	91	7.8	46	9.2	45	6.7
	\$ 30,000 - \$ 39,000	125	10.7	56	11.2	69	10.3
	\$ 40,000 - \$ 49,000	119	10.2	58	11.6	61	9.1
	\$ 50,000 - \$ 59,000	133	11.4	52	10.4	81	12.1
	\$ 60,000 - \$ 69,000	114	9.7	53	10.6	61	9.1
	\$ 70,000 - \$ 79,000	93	7.9	40	8	53	7.9
	\$ 80,000 and over	366	31.3	134	26.9	232	34.6
	Missing data	74	6.3	28	5.6	46	6.9
<b>Total</b>	<b>1170</b>	<b>100%</b>	<b>499</b>	<b>100%</b>	<b>671</b>	<b>100%</b>	

Two sample t-test statistic: -3.50. p-value=0.0005.  
 Pearson chi-squared test statistic; 16.5417. p-value= 0.035 ("Missing data" category excluded)

**Figure 4: Distribution of respondents by location of residence and household income**



Education level varies significantly between urban and rural areas (Table 5). Rural areas have a greater percentage of people without any educational certificate (10.6 percent

compared to 8 percent for urban), or with a high school degree (25.1 percent compared to 18.3 percent for urban). On the other hand the urban population has a significantly higher proportion of people with college or university degrees at the Bachelor, Masters and PhD level.

**Table 5: Respondents categorized by location of residence and level of education**

		Complete sample		Rural sample		Urban sample	
		No.	%	No.	%	No.	%
<b>Level of Education</b>	<b>No certificate, diploma or degree</b>	107	9.1	53	10.6	54	8
	<b>Secondary (high) school diploma or equivalency certificate</b>	248	21.2	125	25.1	123	18.3
	<b>Registered apprenticeship or trades certificate</b>	144	12.3	58	11.6	86	12.8
	<b>College, CEGEP, or other non-university certificate or diploma</b>	295	25.2	114	22.8	181	27
	<b>University - Bachelor's Degree</b>	186	15.9	66	13.2	120	17.9
	<b>University - Certificate or Diploma above Bachelor Level</b>	41	3.5	20	4	21	3.1
	<b>University - Master's Degree</b>	90	7.7	42	8.4	48	7.2
	<b>University - Degree in Medicine, Dentistry, Veterinary or Optometry</b>	15	1.3	5	1	10	1.5
	<b>University - Doctorate</b>	18	1.5	5	1	13	1.9
	<b>Missing data</b>	26	2.3	11	2.3	15	2.3
	<b>Total</b>	<b>1170</b>	<b>100%</b>	<b>499</b>	<b>100%</b>	<b>671</b>	<b>100%</b>

Pearson Chi-squared test statistic: 17.72. p-value=0.023. ("Missing data" category excluded)

Sector of occupation varies significantly between urban and rural respondents (Table 6). As expected, the primary industry sector has a significantly higher share of rural residents employed (8.4 percent compared to 3.0 percent for urban), while occupations related to finance, natural and applied sciences, art and health all have higher shares in urban areas.

**Table 6: Respondents categorized by location of residence and occupation**

	Complete sample		Rural sample		Urban sample	
	No.	%	No.	%	No.	%
<b>Management</b>	100	8.5	47	9.4	53	7.9
<b>Business, finance or administration</b>	110	9.4	40	8	70	10.4
<b>Natural and applied sciences</b>	48	4.1	14	2.8	34	5.1
<b>Health</b>	105	9	42	8.4	63	9.4
<b>Social science, education or</b>	178	15.2	79	15.8	99	14.8

<b>government service</b>						
<b>Art, culture, recreation or sport</b>	15	1.3	4	0.8	11	1.6
<b>Sales and service</b>	109	9.3	46	9.2	63	9.4
<b>Trades, transport or equipment operator</b>	159	13.6	74	14.8	85	12.7
<b>Primary industry</b>	62	5.3	42	8.4	20	3
<b>Missing data</b>	27	2.3	11	2.2	16	2.4
<b>Total</b>	<b>1170</b>	<b>100%</b>	<b>499</b>	<b>100%</b>	<b>671</b>	<b>100%</b>

The sources of water for domestic use vary significantly for rural and urban residents (Table 7). A slightly higher percentage of urban residents (97 percent) obtain their water from the municipal water supply compared to rural residents (92 percent). In all other categories of water sources, rural residents show a higher percentage than urban.

**Table 7: Respondents categorized by location and source of water for domestic uses**

		Complete sample		Rural sample		Urban sample	
		No.	%	No.	%	No.	%
<b>Source of water for domestic uses</b>	<b>Municipal water utility</b>	1110	94.9	459	92	651	97
	<b>Private well</b>	15	1.3	12	2.4	3	0.4
	<b>Surface water</b>	11	0.9	7	1.4	4	0.6
	<b>Storage on-site</b>	18	1.5	13	2.6	5	0.7
	<b>Other</b>	3	0.3	3	0.6	0	0
	<b>Missing data</b>	13	1.1	5	1	8	1.2
<b>Total</b>		<b>1170</b>	<b>100%</b>	<b>499</b>	<b>100%</b>	<b>671</b>	<b>100%</b>
Pearson Chi-squared test statistic: 17.74. p-value=0.000 ("Other" and "Missing data" category excluded)							

Many recreational activities are linked, either directly or indirectly, with bodies of water such as lakes and rivers. Five activities have a higher percentage of participants in rural areas compared to urban: fishing, canoeing and boating, waterskiing, hunting and other unspecified activities (Table 8). Four activities have a higher percentage in the urban sample - bird watching, bushwalking, swimming and camping. A significantly higher proportion of the urban residents participate in bushwalking while the other 'non-consumptive' uses do not differ significantly between the rural and urban residents. On the other hand a significantly higher proportion of the rural sample participate in the more utilitarian or extractive activities of fishing and hunting.

**Table 8: Respondents categorized by recreational activities**

		Complete sample		Rural sample		Urban sample		Pearson Chi-squared statistic
		No.	%	No.	%	No.	%	
<b>Recreational activities</b>	<b>Fishing</b>	417	35.6	208	41.7	209	31.1	13.96***
	<b>Bird watching</b>	198	16.9	82	16.7	116	17.3	0.14
	<b>Canoeing/Boating</b>	328	28	151	30.3	177	26.4	2.21
	<b>Camping</b>	14	1.2	3	0.6	11	1.6	1.18
	<b>Waterskiing</b>	95	8.1	46	9.2	49	7.3	1.43
	<b>Bushwalking</b>	262	22.4	92	18.4	170	25.3	7.75***
	<b>Hunting</b>	99	8.5	60	12	39	5.8	14.35***
	<b>Swimming</b>	318	27.2	129	25.9	189	28.2	2.61
	<b>Other</b>	114	9.7	54	10.8	60	8.9	0.74

Note: table shows only positive answers. \*\*\* indicates significance at 1 percent confidence level

Interesting patterns emerge from the responses of rural and urban residents to the questions of whether they lived their lives mainly in a rural or urban area and where they had been raised (Tables 9 and 10). We found that 52.3 percent of the rural sample and 14.5 of the urban sample had mainly lived in rural areas, while 46.5 of the rural sample and 83.8 of the urban sample had mainly lived in urban areas (Table 11).

**Table 9: Respondents categorized by area (rural or urban) where they had lived most of their lives**

	Rural sample		Urban sample	
	No.	%	No.	%
<b>Mainly lived rural</b>	261	52.3	97	14.5
<b>Mainly lived urban</b>	232	46.5	562	83.8
<b>Missing data</b>	6	1.2	12	1.8
<b>Total</b>	499	100	671	100

Pearson Chi-squared test statistic: 192.36. p-value=0.000. ("Missing data" category excluded)

Analysing the question related to where the respondents were raised (Table 10), we found that 60.5 percent of the rural sample and 42.9 of the urban sample had been raised mainly in rural areas, while 37.7 percent of the rural sample and 54.5 percent of the urban sample had been raised mainly in urban areas.

**Table 10: Respondents categorized by area (rural or urban) where they were mainly raised**

	Rural sample		Urban sample	
	No.	%	No.	%
<b>Raised mainly in rural area</b>	302	60.5	288	42.9
<b>Raised mainly in urban area</b>	188	37.7	366	54.5
<b>Missing data</b>	9	1.8	17	2.5
<b>Total</b>	499	100	671	100
Pearson Chi-squared test statistic: 34.72. p-value=0.000. ("Missing data" category excluded)				

While these findings clearly indicate that rural residents are significantly more likely to have lived longer in, and have been raised in, rural areas and conversely with urban residents, the findings still strongly suggest that the adult population currently living in Lethbridge has strong rural ties. Similarly, a large proportion of rural residents have ties with urban areas. This supports parts of the literature indicating that the urban/rural divide on environmental issues has been blurred since the 1970s with an increased fluidity between urban and rural populations. This is also likely to influence our findings in this study.

To get an idea of how long they had been in the region, residents were asked if they had lived in Southern Alberta prior to 2001 (Table 11). The results indicate that almost everyone surveyed had been resident in Southern Alberta prior to 2001 and there is no difference between the rural and urban samples in this regard.

**Table 11: Residency in Southern Alberta prior to 2001 (percentage)**

		Rural sample		Urban sample	
		No.	%	No.	%
<b>Residency in Southern Alberta prior to 2001</b>	<b>Yes</b>	461	92.38	616	91.80
	<b>No</b>	34	6.81	48	7.15
	<b>Missing data</b>	4	0.80	7	1.04
	<b>Total</b>	499	100	671	100
Pearson Chi-square test statistic: 0.06. p-value=0.81. ("Missing data" category excluded)					

The final two questions deal with respondents’ memberships in groups involved in water management and environmental or conservation matters. We found that 1 percent of rural and 2 percent of urban residents were members of a WPAC or watershed stewardship group (Table 12) while 7 percent of both rural and urban respondents were members of an environmental or conservation group (Table 13). There are no significant differences between urban and rural residents with respect to their active involvement in NGOs associated with water management and environmental conservation issues.

**Table 12: Memberships in WPAC or watershed stewardship group**

Membership in a WPAC or watershed stewardship group	Rural sample		Urban sample	
	No.	%	No.	%
Yes	5	1	13	1.9
No	489	98	651	97
Missing data	5	1	7	1
<b>Total</b>	499	1	671	100
Pearson Chi-square test statistic: 1.66. p-value=0.198 ("Missing data" category excluded)				

**Table 13: Membership in an environmental or conservation group**

Membership in an environmental or conservation group	Rural sample		Urban sample	
	No.	%	No.	%
Yes	37	7.4	49	7.3
No	459	92	615	91.7
Missing data	3	0.6	7	1
<b>Total</b>	499	100	671	100
Pearson Chi-square test statistic: 0.00. p-value=0.959. ("Missing data" category excluded)				

**4.2. Findings – Value statements**

This section compares the answers provided by the rural and urban respondents to the 40 attitudinal questions related to their personal values regarding water.

The values statements were separated into six groups based on their characteristics. The first group is entitled “Environmental Water Values”; it includes all statements related to water and its role in the natural ecosystem (as opposed its role in human activity). Such questions give priority to the environmental needs for water (Table 14). The results show

significant differences between rural and urban respondents for statements A1, A13, A18, A23, A28 and A31 (indicated by stars in the first column), suggesting that urban respondents are more likely to agree with statements suggesting that the environment have higher priority than human and consumptive uses when it comes to water allocation and management.

**Table 14: Environmental Water Values**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>A1:</b> A healthy, functioning aquatic environment should always take priority over human uses of water***/ ***	7.6	30.1	18.4	33.1	10.6	3.6	25.3	18.2	38.8	13.4
<b>A6:</b> Healthy aquatic ecosystems add to the quality of life in the province of Alberta**	0.4	1.2	5.8	61.9	28.3	0.9	0.9	4.6	55.7	34.6
<b>A10:</b> Water in a river has value simply because of all of the benefits and services it gives to us	1.4	12.0	8.2	57.1	18.8	3.3	11.9	7.5	51	23
<b>A11:</b> Rivers tie communities together	1	8.2	22.9	53.3	12	0.6	8.6	18.9	55	13.6
<b>A13:</b> New subdivisions should not be allowed in this region if supplying the water they need would cause harm to the environment***/**	1.2	11.6	2	47.9	15.4	1.6	10.1	15.1	49.9	19.8
<b>A18:</b> I would feel a sense of pride if I knew that this region had a healthy natural ecosystem**/**	0.2	2.2	10.6	61.7	24.7	0.5	1	7.5	59.8	30.7
<b>A23:</b> The environment's needs for water should be met before water is used for human economic purposes such as industry and agriculture***/**	5.2	27.9	26.3	33.3	7.2	3	21.3	25.9	39.5	9.5
<b>A28:</b> I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now**/**	0.8	6.6	18.6	57.3	16.2	0.5	2.8	16.5	60.2	19.2
<b>A31:</b> I would get satisfaction from knowing that enough water was in the river to support natural ecosystems even if I didn't use the river for recreation***/**	0.4	2	8.6	66.7	17.8	0.6	1.3	5.2	62	25.5
*** p<0.01, ** p<0.05. * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

The second group has a set of statements related to people’s attitudes towards water, the environment and people’s livelihoods, hence the title “General Attitudes”. Most of the values show no difference between rural and urban respondents, apart from statements A16, A37 and A38 (the last of which is directly related to agriculture). Rural respondents are more likely to agree with statements that they can use water as they see fit, and that the aquatic environment is healthy and that irrigated agriculture produces locally grown, healthy food (Table 15). These findings suggest that rural people places higher importance on economic or utilitarian use of water which confirms the findings in Table 16.

**Table 15: General Attitudes (water, economic, environment)**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>A2:</b> The environment is important to me because of its natural beauty	1.2	5	8	61.9	23.7	0.6	4.2	8.2	60.2	26.5
<b>A8:</b> I’m more concerned about my livelihood than I am about the environment*	10.6	35.1	25.5	24.5	2	10	41.7	23.4	18.5	3.1
<b>A16:</b> I am entitled to use as much water as any other resident of the province of Alberta***/**	4.2	23.7	20.8	38.1	10.8	6.3	27.9	22.2	32.9	7.5
<b>A21:</b> I use water more carefully than most of my neighbours.	0.4	6.4	46.5	37.3	8.8	0	5.1	47.7	36.1	10.4
<b>A24:</b> I live in a drier environment than most Canadians.	0.6	5.4	13	59.3	21.4	0.6	4.8	9.8	63.9	20.3
<b>A35:</b> I only use water for domestic purposes such as washing, cooking and cleaning	4	46.1	10.6	27.9	7	3.1	42.9	10.3	32	6.3
<b>A37:</b> The aquatic environment of southern Alberta is healthy***/**	3	17.8	36.3	36.9	1.6	2.4	21.9	41.3	26.8	2.1
<b>A38:</b> Irrigated agriculture produces locally grown, healthy food for me and my family***/**	0.2	4.6	7.4	65.1	18.2	0	5.4	13.1	65.7	10.4
<b>A39:</b> I have a better understanding of how water in southern Alberta is managed than do most of my neighbours	0.6	13	50.1	25.1	6.8	0.5	15.2	51.1	20.1	7.8
*** p<0.01, ** p<0.05. * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

The third group includes statements related to the use of water for human activities (in contrast to the “Environment Water Values” reported in Table 16) it is therefore named “Human-centred Water Values”. Significant differences are seen for statements A7, A22, A27 and A32 (Table 16). Agreement with these statements means that respondents value the use of water for gardens and public places as well as economic needs higher than environmental uses. The findings suggest that rural residents are significantly more likely to agree with these statements.

**Table 16: Human-centred Water Values**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>A5:</b> Domestic uses of water such as washing, cooking and cleaning should take priority over the needs of the healthy aquatic environment	4.8	39.3	22.7	26.1	4.8	5.8	40.4	25.9	21.2	3.4
<b>A7:</b> Using water to create green and lush public spaces adds more to my quality of life than leaving the water in the river*/**	5.4	35.1	24.5	29.7	3	8.5	36.8	22.7	27	1.8
<b>A12:</b> Knowing that I have a safe and reliable supply of water for my family’s basic needs is important to me	0	0	0.6	34.3	62.7	0.6	0	0	35.9	60.2
<b>A17:</b> I use water for washing my vehicle even if doing so may harm the river where the water comes from	15.4	48.7	23.5	9.6	0.4	18.5	43.4	19.5	14.3	1
<b>A22:</b> People have the right to modify the natural environment to meet their economic needs**/**	11	41.9	22.7	22.7	1.6	12.7	47.5	20.3	17.1	1.8
<b>A27:</b> Water should be made available for economic uses before the environment***/**	11.4	41.5	32.3	13.4	1.2	13.6	51.4	23	10.1	1.2
<b>A30:</b> Water from rivers should be used to provide benefits to the whole community, not just to those who can afford to buy a water license	1.2	1.4	4.2	57.7	35.3	0.6	1.3	3.9	56.9	36.7
<b>A32:</b> 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**/**	9.2	51.9	22.4	10.8	1	13	53.2	17.4	10.3	0.8
<b>A40:</b> I use rivers and their surrounding areas on a regular basis for recreation.	7.2	37.7	17	28.5	5	7.5	36.5	16.5	27.6	6.6
*** p<0.01, ** p<0.05. * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

The fourth group includes statements related to household income generated from activities that utilise water from rivers and is therefore named the “River Livelihood” group (Table 17). There are significant differences for statements A14, A19 and A26, agreement with which imply that the respondents feel agricultural uses for water should take priority. Our findings suggest that rural residents are significantly more likely to agree with these statements.

**Table 17: River Livelihood**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>A3:</b> At least some of my household income depends directly on an activity that uses water from the river	15	24.3	17	32.7	11	15.4	27	16.6	29.1	11.8
<b>A4:</b> I think that water is a commodity that individuals and private groups should be able to buy and sell	40.9	35.5	11.4	11	1	43.5	37	8.6	9.4	1.3
<b>A14:</b> Irrigated agriculture is the most economically profitable use of water in southern Alberta***/**	1.4	11.8	25.1	44.5	14.8	3	13.6	30.6	42.3	7.3
<b>A19:</b> Buyers and sellers of water licenses should be the ones who decide the price of water**/*	30.9	43.7	16.2	8	1	37	41.1	12.5	6.9	1.9
<b>A26:</b> I would rather see Alberta’s economy grow through more irrigated agriculture as opposed to having more water in the rivers**/**	6.6	37.1	27.7	25.5	3	8.4	38.2	31.3	17.7	3.4
*** p<0.01, ** p<0.05. * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test 1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

The fifth group (Table 18) includes statements related to how and who should manage rivers and ensure suitable outcomes, this group is therefore titled “River Management”. Statements A25, A29 and A33 all show significant differences. Only for one statement A36, which gauges people’s trust in the government’s water management, do rural and urban views not differ significantly. As was found for Environmental Values, urban residents are significantly more likely to agree with these statements.

**Table 18: River Management Values**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>A25:</b> The way we manage water in our rivers in Alberta is outdated and not in line with society's current values***/**	1.8	23.1	43.5	25.5	6	1.8	13.7	44.9	32	6.7
<b>A29:</b> I'm concerned that aquatic habitats in southern Alberta are not receiving enough protection**/**	2	17.6	25.9	41.3	13	1.5	11.9	25.5	46.5	14
<b>A33:</b> The government should be responsible for ensuring that water quality and quantity are good enough to ensure a healthy environment.**/*	1	2.8	8.6	57.1	26.1	0.5	3.3	6	52.6	32.3
<b>A36:</b> I trust the government to manage water in ways that are best for the environment	10	27.1	20.8	32.3	5.4	10.6	32.8	15.7	30	5.5
*** p<0.01, ** p<0.05. * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

The final grouping includes statements which reflect how the individual perceive water conservation in their household and their community, it is therefore titled “Water Conservation” (Table 19). We see a significant difference for statement A15, which concerns the planting of trees, shrubs and flowers in public places that require less water relative to other varieties, urban residents are significantly more likely to agree with this statement.

**Table 19: Water conservation Values**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>A9:</b> Respect for the environment influences my willingness to conserve water	0	3.2	5.6	69.1	19.6	0.5	2.4	5.8	65.6	22.5
<b>A15:</b> I would like public spaces to be planted with trees, shrubs and flowers that need less water***/**	0	2.4	10.4	66.5	18.2	0.8	1.2	7.2	59	28.6
<b>A20:</b> I use water carefully in ways that protect the environment	0.6	1.6	8.8	73.6	15	0	3.9	12.5	65.3	17.4
<b>A34:</b> The amount of water I use in and around my home would change depending on how much I had to pay for it	3.2	19.4	13.8	50.1	8.8	3	22.7	11.5	46.7	10.7
*** p<0.01, ** p<0.05. * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

**4.3. Findings - Policy statements**

**4.3.1 Government Role**

This section compares the responses to the policy statements provided by the rural and urban respondents and also investigates whether any other demographic variables are associated with policy statements. The first set of policy statements deals with government regulation of water resources (Table 20). The differences of opinion between rural and urban are unanimous and significant for all policy statement. Urban respondents see a much larger role for the government in water policy.

**Table 20: Government Role by rural and urban sample**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>B1:</b> The government, rather than market forces, should decide who gets to use Alberta's water***/**	3.2	15.8	24.1	45.1	11.6	3.4	12.7	19.8	49.9	13.9
<b>B4:</b> If water is to be traded among irrigation districts and/or municipalities, the government should set the price***/**	4	21.8	29.5	40.1	4.2	3.3	17.1	24.9	48.9	5.7
<b>B6:</b> 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**/**	7.8	29.7	14.8	39.3	7.8	3.9	23.9	18.6	44.4	9.1
*** p<0.01, ** p<0.05. * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

Looking at how the role of government is perceived by people raised in urban and rural areas (Table 21) or whether they have mainly lived in rural and urban areas (Table 22) the differences on are less obvious . People raised in urban areas are only significantly more likely to agree with policy B4 while people who have mainly lived in urban areas are significantly more likely to agree with both policy statements B4 and B6. Thus peoples' current residence seems to have the greatest influence, however where people are raised

and have mainly lived also have an influence. Urban people brings there values with them when they move to the country.

**Table 21: Government Role by place people are raised**

	<i>Raised in rural area (% of responses)</i>					<i>Raised in urban area (% of responses)</i>				
	1	2	3	4	5	1	2	3	4	5
B1: The government, rather than market forces, should decide who gets to use Alberta's water	3.3	15.8	22.9	44.1	13.9	2.9	12.4	19.8	52.8	12.2
B4: If water is to be traded among irrigation districts and/or municipalities, the government should set the price ***/**	4.2	22	28	41.2	4.6	2.8	14.7	28.2	49.2	5.1
B6: 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	7.1	25.1	18.3	40.1	9.3	4.1	25.9	16.9	44.9	8.2
*** p<0.01, ***/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

**Table 22: Government Role by place people mainly lived**

	<i>Mainly lived in rural area (% of responses)</i>					<i>Mainly lived in urban area(% of responses)</i>				
	1	2	3	4	5	1	2	3	4	5
B1: The government, rather than market forces, should decide who gets to use Alberta's water	3	15.4	24.9	43	13.9	3.3	13.4	20	50.6	12.7
B4: If water is to be traded among irrigation districts and/or municipalities, the government should set the price **/**	4.1	21	29.9	41.7	3.3	3	17.5	26.9	46.9	5.7
B6: 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 ***/**	9.5	27.2	18.1	37	8.3	3.9	24.4	17.5	45	9.2
*** p<0.01, ** p<0.05. ***/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

We further explored whether age and household income are likely to be associated with people’s opinions on these policy statements (Tables 23 and 24). Generally people’s agreement with the Government role is associated with both age and household income. Older people are both more likely to either strongly disagree or agree with B1 ‘The government, rather than market forces, should decide who gets to use Alberta's water’ and more likely to disagree with B4 ‘If water is to be traded among irrigation districts and/or municipalities, the government should set the price.’

**Table 23: Average age by Likert scale agreement of the Government role policy statements**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
B1: The government, rather than market forces, should decide who gets to use Alberta's water ***	61.8	54.9	56.8	58.9	59.7
B4: If water is to be traded among irrigation districts and/or municipalities, the government should set the price ***	62	55.7	57.2	59.4	57.9
B6: 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	59.3	56.5	58.3	59	57.4
*** p<0.01. ***: Multivariate test on equal means.					

People with higher incomes are significantly more likely to agree with B6 ‘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’, while for B1 and B4 the findings indicate that people on lower incomes are more likely to be neutral (Table 24).

**Table 24: Average household income (in thousands) by Likert scale of the Government role policy statements**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
B1: The government, rather than market forces, should decide who gets to use Alberta's water ***	58.1	62.5	54.4	58.6	59.9
B4: If water is to be traded among irrigation districts and/or municipalities, the government should set the price **	61	62.4	55.9	58.1	58.5
B6: 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 ***	53.5	56.3	57.7	59.5	63.5
*** p<0.01, ** p<0.05. ****: Multivariate test on equal means.					

Finally we investigate whether people's education level is associated with their agreement on the Government role policy statements. The evidence is relatively weak as only agreement on Statement B1: 'The government, rather than market forces, should decide who gets to use Alberta's water' is statistically associated with people's education levels. It appears that a higher proportion of people would agree with Statement B1 in the university degree levels than in the lower education levels.

#### **4.3.2 Environment's Right**

Less divergence in opinions is seen for the second set of policy statements which are grouped as "Environment's Right", a category which has policies that, if implemented, would increase the supply of water available to the environment (Table 25). Only in statement B10, which sets limits for the minimum flow of water in all rivers and allows only quantities above those limits for economic purposes, do we find a significant difference between urban and rural, with urban respondents much more likely to agree

that minimum flows should be set, reflecting the significant differences on the value statements.

**Table 25: Frequency of Environment’s Right by rural and urban sample**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>B2:</b> Private individuals and groups should be able to hold water licenses for environmental protection	7.8	24.1	28.1	35.1	4.8	6.4	24.3	26.5	36.7	5.2
<b>B8:</b> Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers	3.6	21.4	24.8	43.7	5.8	2.5	19.5	24	46	7.6
<b>B9:</b> The government should buy water from current water license holders, such as irrigation districts, so that more water can be left in the river for the environment	5.6	30.3	32.5	29.1	2	3.9	25.5	37	29.5	4
<b>B10:</b> 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***/**	1.6	12.8	21	50.3	13.6	1.3	6.9	15.4	55.9	20.4
*** p<0.01, ** p<0.05. * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test 1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

The differences on these policy statements between people raised in rural and people raised in urban areas are very weak (Table 26). Only Statement B10 is statistically significant. Regarding the differences between people mainly living in rural and people mainly living in urban areas, none of the statements are statistically different (Table 27).

**Table 26: Frequency of Environment's Right by place people are raised**

	<i>Raised in rural area (% of responses)</i>					<i>Raised in urban area (% of responses)</i>				
	1	2	3	4	5	1	2	3	4	5
B2: Private individuals and groups should be able to hold water licenses for environmental protection	8.6	22.2	29.7	34.3	5.3	6.1	25.5	25.7	37.5	5.3
B8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers	2.9	21.3	24.2	44.1	7.5	3.3	17.7	26.3	46.9	5.9
B9: The government should buy water from current water license holders, such as irrigation districts, so that more water can be left in the river for the environment	5.7	29.1	34.4	27.5	3.3	3.9	26.3	35.9	31.4	2.6
B10: 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 ***/***	1.5	11.2	19.1	50.9	17.4	1.4	6.7	15.5	57.3	19.2
*** p<0.01, ***/***: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

**Table 27: Frequency of Environment's Right by place people mainly lived**

	<i>Mainly lived in rural area (% of responses)</i>					<i>Mainly lived in urban area(% of responses)</i>				
	1	2	3	4	5	1	2	3	4	5
B2: Private individuals and groups should be able to hold water licenses for environmental protection	10.1	22.2	29.3	34	4.4	6.1	24.6	27	36.6	5.8
B8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers	3.9	21	24.9	44.4	5.9	2.8	19	25.2	45.5	7.5
B9: The government should buy water from current water license holders, such as irrigation districts, so that more water can be left in the river for the environment	6.2	29.6	32.5	30.2	1.5	3.9	27.2	36.6	28.7	3.7
B10: 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	3	10.4	20.7	51.5	14.5	0.8	8.4	15.3	55.3	20.1
None of the Wilcoxon-Mann-Whitney test/two independent Sample t-test is significant.										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

Generally peoples' level of agreement with environmental policy statements differs significantly depending on age and income (Tables 28 and 29). Younger people are

significantly more likely to agree with statement B2 ‘Private individuals and groups should be able to hold water licenses for environmental protection’ and B10 ‘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’ (Table 28), both related to private NGOs and current users paying for the environmental rights.

**Table 28: Average age by Likert scale of the Environment’s Right Policy Statements**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
B2: Private individuals and groups should be able to hold water licenses for environmental protection ***	61.7	61.7	57.3	55.9	55.7
B8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers	57.1	58.5	57.9	58.6	55.2
B9: The government should buy water from current water license holders, such as irrigation districts, so that more water can be left in the river for the environment	59.1	58.2	58.3	57.8	56.4
B10: 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 ***	69.4	59.6	56.5	58.8	56
*** p<0.01. ***: Multivariate test on equal means.					
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.					

People with higher income are significantly more likely to agree with policy statement B2 ‘Private individuals and groups should be able to hold water licenses for environmental protection’ and B10 ‘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’. These are the statements related to current water holders and private NGOs funding the environmental rights. On the other hand they are significantly less likely to agree with statements B8 ‘Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers’ and B9 ‘The government should buy water from current water license holders, such as irrigation districts, so that more water can be left in

the river for the environment'. These are the statements related to the taxpayers funding the environmental rights.

**Table 29: Average household income (in thousands) by Likert scale of the Environment’s Right Policy Statements**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
B2: Private individuals and groups should be able to hold water licenses for environmental protection ***	55.8	56	56.5	61.2	63.9
B8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers *	66.7	60.5	56.9	58	56.8
B9: The government should buy water from current water license holders, such as irrigation districts, so that more water can be left in the river for the environment ***	61.2	61.5	59.1	54.5	54.8
B10: 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 ***	49.7	55.8	53.3	59.1	63.1
*** p<0.01, ** p<0.05, *p<0.1. ***: Multivariate test on equal means.					
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.					

There is some evidence that education level is associated with the agreement on the statements related to Environment’s rights (Tables 30, 31 and 32). Higher levels of education are associated with a higher level of agreement with three of the four policy statements. B2 ‘Private individuals and groups should be able to hold water licenses for environmental protection’ (Table 30), B8‘Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers’ and B10 ‘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’

**Table 30: Two-way table (row frequency) of education and B2 (Private individuals and groups should be able to hold water licenses for environmental protection)**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
no certificate/diploma	7.1	39.4	28.3	24.2	1
certificate/diploma	8.1	22.5	28.5	35.5	5.4
university bachelor	6	24.2	23.1	40.1	6.6
university bachelor above	5.7	19.1	29.9	38.9	6.4
Pearson chi2(12) = 24.7035 P = 0.016					

**Table 31: Two-way table (row frequency) of education and B8 (Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers)**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
no certificate/diploma	4	21.2	19.2	51.5	4
certificate/diploma	3	17.4	23.5	49.6	6.5
university bachelor	2.2	22	29.1	35.2	11.5
university bachelor above	3.9	24.8	30.6	35.7	5.1
Pearson chi2(12) = 28.9938 P = 0.004					

**Table 32: Two-way table (row frequency) of education and B10 (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)**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
no certificate/diploma	2	8.1	23.2	54.6	12.1
certificate/diploma	1.4	10.6	15.2	55.8	17
university bachelor	2.2	2.8	20.9	53.9	20.3
university bachelor above	0.6	11.5	16.6	46.5	24.8
Pearson chi2(12) = 26.0719 P = 0.010					

### 4.3.3 Irrigators' Rights

The third set of policies involves the rights of irrigators to water (Table 33). Policy statements B3 and B7 show significant differences. B3 states that all water licenses must be honoured regardless of the circumstances around their issuance, while B7 states that water saved through more efficient practices should be allocated to economic activity. Not unsurprisingly, rural respondents are significantly more likely to agree with these statements than urban respondents. This again reflect the differences in value statements

reported in the previous section and likely reflects their different level of dependence on irrigation as the creator of jobs and business.

**Table 33: Frequency of Irrigators' Water Rights by rural and urban sample**

	<i>Rural Sample (% of respondents)</i>					<i>Urban sample (% of respondents)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>B3:</b> All water licenses, no matter when they were issued or for what purpose, must be honoured***/***	4.4	36.9	23.7	29.9	5	8.9	43.5	23.3	20	4.2
<b>B5:</b> Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient	7.8	32.3	11.8	41.3	6.2	8.1	29.4	15.4	41.6	5.5
<b>B7:</b> Water that is saved through improved water use efficiency should be used to increase economic activity***/***	2.8	19.8	27.5	43.9	5.4	3.1	28	29.5	35.2	4
*** p<0.01.***/***: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

The level of agreement with these policy statements does not differ a lot between people raised in rural and urban areas (Table 34). There is only a significant relationship with statement B7 where people raised in rural areas are significantly more likely to agree.

**Table 34: Frequency of Irrigators' Right by place people are raised**

	<i>Raised in rural area (% of responses)</i>					<i>Raised in urban area (% of responses)</i>				
	1	2	3	4	5	1	2	3	4	5
<b>B3:</b> All water licenses, no matter when they were issued or for what purpose, must be honoured	6.6	39.9	24.7	24.5	4.2	8.2	41.4	22.9	22.6	4.9
<b>B5:</b> Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient	7.3	33	13.6	40.3	5.9	8.2	28.6	15.5	41.4	6.3
<b>B7:</b> Water that is saved through improved water use efficiency should be used to increase economic activity ***/***	2.8	21.3	27.7	43	5.3	3.5	29	30	33.1	4.3
*** p<0.01. ***/***: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

The differences between people mainly living in rural and urban areas are stronger with statistically significant differences for statements B3 and B7 showing that people who have mainly lived in rural areas are significantly more likely to agree with these

statements. Both findings in Tables 34 and 35 suggest that the closer the relation to the rural community the stronger the agreement with the policy statements related to the rights of irrigators.

**Table 35: Frequency of Irrigators' Right by place people mainly lived**

	<i>Mainly lived in rural area (% of responses)</i>					<i>Mainly lived in urban area(% of responses)</i>				
	1	2	3	4	5	1	2	3	4	5
B3: All water licenses, no matter when they were issued or for what purpose, must be honoured **/**	6.2	37	24.9	27.2	4.7	8.1	42.6	23.5	21.4	4.4
B5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient	6.8	31.7	12.1	42	7.4	8.3	30.2	15.6	40.6	5.4
B7: Water that is saved through improved water use efficiency should be used to increase economic activity **/**	2.1	20.4	26.9	44.7	5.9	3.9	27	29.7	35.2	4.3
*** p<0.01, ** p<0.05. **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test										
1=strongly disagree, 2 = disagree, 3=neutral, 4=agree, 5=strongly agree.										

Generally people's agreement with the statements related to Irrigators rights varies significantly with age (Table 36) but not household income (Table 37). Older people are more likely to agree with policy statement B3 'All water licenses, no matter when they were issued or for what purpose, must be honoured' and B7 'Water that is saved through improved water use efficiency should be used to increase economic activity'.

**Table 36: Average age by Likert scale of the Irrigators' Right policy statements**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
B3: All water licenses, no matter when they were issued or for what purpose, must be honoured *	57.1	57.9	57.9	57.9	63.8
B5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient	58.6	58.1	58.5	58.5	54.1
B7: Water that is saved through improved water use efficiency should be used to increase economic activity **	55.9	56.1	57.9	59.9	56.9
** p<0.05, * p<0.1. *: Multivariate test on equal means					

**Table 37: Average household income (in thousands) by Likert scale of the Irrigators' Right policy statements**

	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
B3: All water licenses, no matter when they were issued or for what purpose, must be honoured	61.9	58.9	56.3	58.6	57.8
B5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient	55.3	59	55.6	59.6	57.5
B7: Water that is saved through improved water use efficiency should be used to increase economic activity	56.9	58.9	59.9	57.3	56.7
None of the multivariate test on equal means is significant.					

Education level and its association with the Irrigators' right policy statements is relatively weak as only statement B7 'Water that is saved through improved water use efficiency should be used to increase economic activity' is statistically associated with a lower educational attainment (Table 38).

**Table 38: Two-way table (row frequency) of education and B7 (Water that is saved through improved water use efficiency should be used to increase economic activity)**

	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
no certificate/diploma	1	15.2	31.3	47.5	5.1
certificate/diploma	2.9	24.1	25.8	41.8	5.4
university bachelor	5	29.1	32.4	29.1	4.4
university bachelor above	4.5	28.7	33.8	29.9	3.2
Pearson chi2(12) = 27.025 Pr = 0.008					

#### 4.4. Value statements vs Policy statements

This section explores how people's perception of value statements relates to their policy statements. Specifically, we will test correlations between: i) the statements related to the Government role and the River management values (A33 and A36<sup>2</sup>); ii) the statements related to the Environment's right and the Environment water values (A1, A10, A13, A23, A28 and A31) and the Water conservation values (A9, A15 and A20); and iii) the

<sup>2</sup> Only the value statements that have relevance for the respective policy are selected for testing.

statements related to irrigator’s water right and the Human centred water values (A22, A27 and A30) and the River livelihood values (A4, A14, A19 and A26).

The relationships between each of the Government role statements (B1, B4 and B6) and A33 are statistically significant at the 0.01 level. Regarding A36, it is significantly related to B1 and B4. Hence the correlation between people’s value on river management issues and their opinion on the government’s role in managing water is relatively strong. Specifically if people trust the government and believe the government should be responsible for ensuring enough water for a healthy environment, they are also more supportive for the government to decide water allocation and water price.

**Table 39: Spearman correlation between Government role policy statements and River management values**

	B1: The government, rather than market forces, should decide who gets to use Alberta's water	B4: If water is to be traded among irrigation districts and/or municipalities, the government should set the price	B6: 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
A33: The government should be responsible for ensuring that water quality and quantity are good enough to ensure a healthy environment	0.29***	0.20***	0.12***
A36: I trust the government to manage water in ways that are best for the environment	0.07**	0.14***	-0.001
*** p<0.01, ** p<0.05.			

Similarly, people who value water for its environment and conservation aspects are more agreeable with the policy statement related to Environment’s right (Table 40).

**Table 40: Spearman correlation between Environment’s right policy statements and Environment water values/ Water conservation values**

		B2: Private individuals and groups should be able to hold water licenses for environmental protection	B8: Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers	B9: The government should buy water from current water license holders, such as irrigation districts, so that more water can be left in the river for the environment	B10: 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
Environment water values	A1	0.12***	0.22***	0.20***	0.23***
	A10	0.03	0.07**	0.0285	0.01
	A13	0.13***	0.23***	0.16***	0.22***
	A23	0.16***	0.28***	0.23***	0.30***
	A28	0.18***	0.28***	0.29***	0.24***
	A31	0.10***	0.20***	0.18***	0.26***
Water conservation values	A9	0.08***	0.13***	0.12***	0.18***
	A15	0.10***	0.13***	0.11***	0.22***
	A20	0.01	0.10***	0.07**	0.07**
*** p<0.01, ** p<0.05.					
<p><b>A1:</b> A healthy, functioning aquatic environment should always take priority over human uses of water. <b>A10:</b> Water in a river has value simply because of all of the benefits and services it gives to us. <b>A13:</b> New subdivisions should not be allowed in this region if supplying the water they need would cause harm to the environment. <b>A23:</b> The environment’s needs for water should be met before water is used for human economic purposes such as industry and agriculture. <b>A28:</b> I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now. <b>A31:</b> I would get satisfaction from knowing that enough water was in the river to support natural ecosystems even if I didn’t use the river for recreation. <b>A9:</b> Respect for the environment influences my willingness to conserve water. <b>A15:</b> I would like public spaces to be planted with trees, shrubs and flowers that need less water. <b>A20:</b> I use water carefully in ways that protect the environment.</p>					

With one exception (between A30 and B3) we can see that people who value water for its use value are also more agreeable with the Irrigators’ right policy statements (Table 41).

**Table 41: Spearman correlation between Irrigator’s right policy statements and Human centred water values / River livelihood values**

		B3: All water licenses, no matter when they were issued or for what purpose, must be honoured	B5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient	B7: Water that is saved through improved water use efficiency should be used to increase economic activity
Human centred water values	A22	0.24***	0.06*	0.27***
	A27	0.25***	0.04	0.35***
	A30	-0.14***	0.01	-0.05
River livelihood values	A4	0.24***	0.08***	0.18***
	A14	0.19***	0.10***	0.25***
	A19	0.27***	0.08***	0.20***
	A26	0.25***	0.11***	0.36***
*** p<0.01, * p<0.1.				
<p><b>A22:</b> People have the right to modify the natural environment to meet their economic needs. <b>A27:</b> Water should be made available for economic uses before the environment.</p> <p><b>A30:</b> Water from rivers should be used to provide benefits to the whole community, not just to those who can afford to buy a water license. <b>A4:</b> I think that water is a commodity that individuals and private groups should be able to buy and sell. <b>A14:</b> Irrigated agriculture is the most economically profitable use of water in southern Alberta. <b>A19:</b> Buyers and sellers of water licenses should be the ones who decide the price of water.</p> <p><b>A26:</b> I would rather see Alberta’s economy grow through more irrigated agriculture as opposed to having more water in the rivers.</p>				

## 5. Discussion

From our results, we can see some distinct patterns emerging on how rural and urban communities view water resources. We divided the water attitudinal statements up into six groups: Environmental Water Values; General Water Attitudes; Human-centred Water Values; River Livelihood; River Management; and Water Conservation. With regards to “Environmental Water Values”, urban residents are more likely to agree more strongly with statements which put priority on the role of water in the environment over its role in human activity. This is seen in six out of nine statements. This could be seen as an affirmation of the findings Jones et al. (1999) who found higher levels of concern regarding the environment among urban residents. It is also consistent with Lowe and Pinhey’s (1982) deprivation theory (that is, urban residents who are deprived of a natural environment tend to value it more). However, it could also be due to the fact that urban residents have more access to information regarding contemporary environmental issues, a reflection of their higher education levels, as noted by Benreguer et al (2005).

For “General Water Attitudes”, we see rural residents generally tend to agree more strongly with only three of the statements (out of nine). They agreed more strongly: that they have as much right to use water as anyone else in Alberta; that the province has a healthy aquatic environment; and that irrigated agriculture provides them with food that is healthy and locally grown. However, on the majority of the statements, we see no significant differences.

More differences arise in the “Human-centered Water Values” group, where we find that rural residents tend to agree more strongly on four out of nine statements. Rural residents

appear more inclined to agree that using water for public places adds more to their quality of life than leaving it in the river. They are more in favour of having a nice lawn or garden even if the water needed for that purpose ends up depriving the ecosystem. In their view, economic uses of water take precedence of the needs of the environment and people have a right to modify the environment to meet these needs. The proximity of rural residents to agriculture may be a factor behind these differences in views and might also be reflected in the fact that rural residents are significantly more likely to engage in more utilitarian or extractive recreational activities related to the river namely fishing and hunting.

The preference of rural residents for economic over environmental uses of water is once again reflected in the “River Livelihood” group, where they tend to agree more strongly with three out of five statements. Irrigation for agriculture, in their view, should take precedence over water left in the river for the ecosystem. By now, the differences between rural and urban residents’ views appear to be mainly on the use of water for irrigation and the maintenance of lush, green public spaces. It may be that the proximity of rural residents to agricultural activity and involvement in extractive-commodity industries leads them to favour economic uses of water over environmental uses. As Lowe and Pinhey (1982) found, farmers were slightly less concerned with regards to environmental protection.

The higher level of concern of urban residents regarding the ecosystem is once again apparent when we look at their responses to the “River Management” and “Water Conservation” groups of value statements. In the former group, urban residents are more in agreement with three out of four statements. They tend to agree more strongly that current water management is outdated, protection for aquatic habitats is inadequate and it is the government’s responsibility to ensure that water quantity and quality for

environmental needs is adequate. In the latter group, they tend to agree more strongly that public places should be planted with greenery that needs less water.

From our results to policy statements, we see that urban residents tend to agree more strongly on enhanced government regulation of water markets, since all policy statements in the group entitled “Government Role” had higher agreement among urban respondents. They are also more in favour of setting a limit for minimum flows of water in rivers, above which water may be used for irrigation. This was the only statement from the “Environment’s Right” group of policy statements that urban residents agreed more with.

Rural residents tend to agree more strongly with two of the policy statements in the “Irrigators Right” group. They feel more strongly than urban residents that all water licenses should be honoured and that water saved through increased efficiency should be directed to economic uses.

Our findings seem to indicate that there is indeed a greater concern among urban residents regarding the use and availability of water for ecosystems; while rural residents are more inclined to agree that water should be used for economic purposes and its availability for agriculture and lush, green public spaces supersedes environmental requirements.

The urban rural differences in the perception of both value and policy statement is likely to be blurred due to significant migration between rural and urban areas in recent time. Analysing the combined dataset of urban and rural residents there are significant relationships between place of upbringing and place mainly lived reflecting those of current residence. This confirms the findings of Sharp & Adua (2009). There are also significant relationship between value statements and policy statements suggesting that

people with stronger environmental and river management values are more in agreement with government influences while those aligned more strongly with extractive or utilitarian values agree more strongly with private rights and the rights of irrigators.

However, further research is needed to more fully explore what drives people's values. Although there seems to be some differences identified between urban and rural residents, a more sophisticated analysis is needed to take into account a wide range of possible influences on people's values. Do deprivation theory and the fact that urban residents tend to have higher education levels and incomes account for this difference? Does different recreational use of water lead to differing values? Does direct links with agriculture for livelihood lead to different water values? What about age, gender and membership of environmental groups? All these questions remain for future research on this topic.

## **6. Conclusion**

The report has investigated the differences in attitudes towards water issues between the urban and rural populations in Alberta, Canada and the extent to which these differences has been influenced by recent migration between rural and urban areas. As economic growth and changing community values with respect to water and the environment contribute to escalate demand on water resources, water transfers from rural to urban areas present challenges for many governments around the world, and the existing literature has found that differences in perceptions, attitudes, environmental behaviours and demographic characteristics all contribute to a wide variation in attitudes towards water transfers. The total economic value of water is made up of direct and indirect use values, and values accrue on-farm and off-farm. Some literature suggests that although urban residents are more environmentally concerned than those living in rural areas (which has been attributed to education, access to information, income, occupation and ‘deprivation theory’), rural residents may behave more environmentally responsibly. Other literature has found no evidence of differences between urban and rural attitudes towards conservation issues.

Our study investigated 1,170 responses from Lethbridge and small towns around Lethbridge largely dependent upon irrigation. The questionnaires collected information on rural and urban status, socio-demographic data and a wide range of value statements (40 in all) and policy statements (ten in all). In the demographics of our samples, we found the following statistical differences (at least at the ten per cent level): the urban sample has more females; was younger; had higher average income; was more educated;

more likely to work in finance, natural and applied sciences, art and health rather than the primary sector; obtain their water from municipal water supply; more likely to bird watch, bushwalk, swim and camp and less likely to fish, canoe, boat, water-ski and hunt; and more likely to have lived mainly in an urban area. In regards to their attitudes towards water, it seems there are statistically differences between urban and rural residents in regards to a number of values. In general, urban respondents agreed more strongly with the statements reflecting Environmental Water Values; River management; and one question in Water Conservation. Rural respondents agreed more strongly with statements regarding Human-Centred Water values and River livelihood. For the views on policy statements, urban respondents see a much larger role for the government in water policy than rural respondents, while rural respondents agree more strongly with policy statements that assert irrigators' water rights. Less divergence in opinions is seen for the set of policy statements which are grouped as "Environment's Right".

Our findings seem to indicate that there is indeed a greater concern among urban residents regarding the use and availability of water for the ecosystem; while rural residents are more inclined to agree that water should be used for economic purposes and its availability for agriculture and lush, green public spaces supersedes environmental requirements. However, further sophisticated research will be needed to more fully explore the drivers of people's values – this is forthcoming under this research project.

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