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

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

Keywords: water transfers; values; policy preferences; rural-urban continuum; environmental concern

INTRODUCTION

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

Since irrigation accounts for 72% of the water allocated in the SSRB, it is inevitable that reallocation will move water out of agriculture. The expected consequences of such reallocation vary widely: significant direct and indirect economic effects have been identified (Howe et al. 1990) and other social and environmental effects of varying significance may result (Gould 1988). In the Balzac transfer, the largest and most widely publicized transfer to date in Alberta, significant public opposition has been based on a wide variety of perceived issues (D'Aliesio 2007). Likewise, the attempt to amend irrigation district licences to allow them greater flexibility in transferring portions of their water allocations to non-irrigation users is coming under heavy scrutiny (Droitsch 2007). Although the idea that water must be reallocated to align with society's changing needs and values is widely accepted by scholars and policymakers alike (Baron et al. 2002; Alberta Environment 2008; Bjornlund 2010), how this reallocation should take place is still under debate (Brewer 2008). In particular, the use of markets for reallocating water is seen as problematic by some (Christensen and Droitsch 2008), a feeling which has gained significant support within the wider community (Percy 2005; Brewer 2008).

Concerns over resource allocation are not exclusive to Alberta, nor are they specific to water. Governments around the world are facing the same issues related to all manner of natural resources. Water reallocation in Southern Alberta, however, provides an excellent case study for considering resource management and allocation between competing rural and urban uses and the environment. This paper will communicate the preliminary findings from an extensive survey of urban and rural households not directly involved in irrigated agriculture. The survey investigated residents' level of agreement with a variety of policy proposals related to water management in addition to a wide variety of value and attitude objects, social factors, and socio-economic indicators expected to influence policy preferences. The City of Calgary and the Town of Strathmore were chosen as case studies due to their differing social and physical proximity to irrigated agriculture.

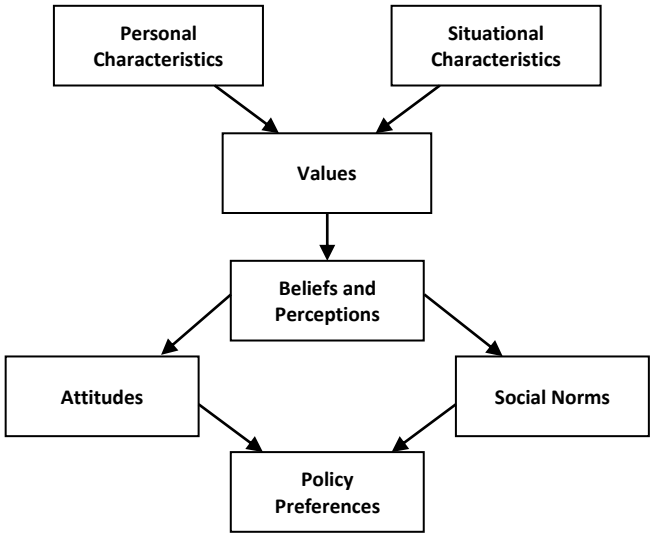
CONCEPTUAL MODEL

Canadians overwhelmingly rank fresh water as the country's most important natural resource (Nanos 2009); however, the general public is neither assumed nor expected to have a strong understanding of the intricacies of water resource management on which to base their water policy preferences (Dolnicar et al.2010). Instead, individuals' decisions to support or oppose particular policies are likely to be based on psychological variables such as their values, beliefs, attitudes, and social norms (Routhe et al. 2005). If necessary water reallocation is to gain sufficiently wide acceptance to be politically feasible, we must develop an understanding of how these domains influence preferences for water management policy.

Notable research in the field of values and attitudes was undertaken by Rokeach (1968), who argued that the situation-transcendent and ranked nature of values allowed for decision making in a wide variety of scenarios. This allows people to form attitudes toward value objects with which they are only minimally informed. The link between values, beliefs and attitudes was further established by other authors (Fishbein 1967; Stern et al. 1999), and extended to include behavioural intention and behaviour (Fishbein and Ajzen 1975). Likewise, social norms are expected to have a significant influence on policy preferences. In particular, social and physical proximity to irrigated agriculture may influence agro-environmental concern and thereby have an impact on policy choices (Sharp and Adua 2009).

The Theory of Reasoned Action (TRA) provides a model for understanding behaviour as a function of behavioural intent, which is determined by attitudes and subjective norms (Fishbein and Ajzen 1975). Since end behaviours were not measured in this study, however, we will halt our analysis at the level of intent, understood to be the conative expression of preferences (Dunlap and Jones 2002; Routhe et al. 2005). By linking the TRA to value orientations, beliefs and the socioeconomic variables that influence them (Figure 1), we aim to better understand how individuals' water reallocation policy preferences are formed, as well as how they differ with varying social and physical distances from agriculture.

Figure 1: Conceptual framework for resource management preferences



METHODOLOGY

This paper is based on a mail-out survey sent to randomly selected households in Calgary and Strathmore, Alberta. The initial mail-out consisted of 3,000 surveys mailed to Calgary, which has a population of 1,071,515 in 414,185 occupied dwellings (Calgary 2010), and 2,338 mailed to Strathmore, with its population of 12,139 in 4,483 occupied dwellings (Strathmore 2010). A systematic random sample was selected from all available addresses for Calgary. For the Strathmore sample, all available addresses obtainable through a list broker were selected. The initial mailing included a cover letter explaining the project and requesting participation, the survey instrument, an entry form for a cash prize incentive and a postage-paid return envelope. Respondents were informed that the survey was voluntary and that it was expected to take 15 to 20 minutes of their time. Following the initial mail-out, three reminders were mailed at three week intervals to encourage respondents to participate (Dillman 2000). The final reminder included a web address at which respondents could complete the questionnaire online.

In total, 2,693 surveys were delivered in Calgary with the remainder returned as undeliverable due to incorrect address provided by the list broker. For the same reason, 2,216 surveys were delivered in Strathmore. Of the surveys delivered, 476 responses were received from Calgary and 347 from Strathmore, resulting in a response rate of 16.8%. After removing surveys with incomplete information as well as respondents who had self-identified as irrigators, 422 completed responses remained from Calgary and 302 from Strathmore. 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. As this study will utilize a case study methodology, the disproportionate sample sizes across cases is not of particular concern. Rather than performing a comparative analysis, the cases will be analyzed independently, with comparisons and conclusions drawn based on the individual cases.

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

A number of factor analyses were performed on the collected data to reduce the number of variables for analysis. Questions falling under the Policy Preferences domain of the conceptual model were reduced to a three factor solution (Table 1). A four factor solution was found for each of the four domains related to: Value Orientations (Table 2); Beliefs and Perceptions (Table 3); Attitudes (Table 4); and Social Norms (Table 5). In future studies, the resulting factor scores will be utilize as dependent and independent variables in a series of linear regression equations for each case.

FINDINGS AND DISCUSSION

The ten policy statements in the policy preferences domain collapsed into three factors (Table 1). The first of these comprises statements related to increased government control over water reallocation, ranging from government power over setting prices in a market-based system to direct government power over the redistribution of water rights including the right to appropriate allocated water that is going unused. Respondents who score highly on this factor are supportive of a greater government role in water reallocation and are likely to oppose policies advocating decreased regulation or an increased role of the market in water reallocation. The second factor comprised policy statements consistent with pro-environmental preferences, whether via market-based means or investment in efficiency improvements. Respondents who believe that water is most valuable when used to meet environmental needs will score most highly on this factor. The third factor includes policy statements consistent with pro-economic preferences and support for honoring all existing water licenses. Respondents scoring highest on this factor are those most likely to prefer strong individual water rights and see consumptive uses as the most beneficial and productive uses of Alberta's water supplies.

Table 1: Policy preference factor analysis

	1	2	3
Factor 1: Government control policy			
1. GOVT_SET_PRICE	**0.809**	0.081	0.103
2. GOVT_DISTRIBUTE	**0.780**	-0.068	-0.190
3. GOVT_EXPROPRIATE	**0.560**	0.106	-0.138
Factor 2: Environmental/conservation policy			
4. GOVT_BUY_FOR_ENVIRO	-0.022	**0.714**	0.141
5. EFFICIENCY_TO_ENVIRO	0.203	**0.650**	-0.079
6. PRVT_BUY_FOR_ENVIRO	-0.145	**0.589**	-0.094
7. PBLC_FNDS_EFFICIENCY	0.170	**0.469**	0.261
Factor 3: Economic/use policy			
8. SAVED_WATER_ECON	0.060	0.021	**0.773**
9. HONOR_ALL_RIGHTS	-0.242	0.143	**0.559**
10. NO_MIN_FLOWS	-0.278	-0.387	**0.469**
Statistics			
EIGENVALUE	1.807	1.690	1.299
VARIANCE EXPLAINED	18.1%	16.9%	13.0%
CUMULATIVE	18.1%	35.0%	48.0%

Extraction method: Principal Component Analysis.
Rotation method: Varimax with Kaiser Normalization.

1. If water is to be traded among irrigation districts and/or municipalities, the government should set the price.
2. The government, rather than market forces, should decide who gets to use Alberta's water.
3. 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.
4. The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment.
5. Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers.
6. Private individuals and groups should be able to hold water licences for environmental protection.
7. Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient.
8. Water that is saved through improved water use efficiency should be used to increase economic activity.
9. All water licences, no matter when they were issued or for what purpose, must be honoured.
10. Minimum flows of water should not be set for all rivers, and all water should be available for economic purposes such as irrigation.

The remaining psychological domains will serve, alongside personal and situational characteristics, as the independent variables in future analysis. The first of the four factors derived from the value orientation domain (Table 2) measures what is identified in the environmental psychology literature (Stern et al.1993; Snelgar 2006) as a biospheric value orientation. Those with a strong biospheric value orientation are more likely to identify environmental concerns as guiding factors in their lives. The second factor includes statements consistent with an egocentric value orientation. Respondents with a strong egocentric value orientation are primarily concerned with how a particular issue will affect them personally, as opposed to how it may affect the environment or others. Respondents scoring highly on the third and fourth factors are primarily concerned with effects on other people. Such a value orientation is frequently labeled 'altruistic' in the literature. In this survey, the altruistic value orientation was further split into an agricultural-altruistic orientation, in which respondents stressed the importance of agriculture; and a domestic-altruistic value orientation, concerned with basic human and domestic needs. In each case, a higher factor score corresponds with greater importance placed on that value construct.

According to value-belief-norm theory (Stern et al., 1999), perceptions and beliefs mediate the impacts of values on attitudes. The first factor in the belief and perception domain comprises statements linked to the belief that transfers will be harmful to the economy, the environment or farmers (Table 3).

Respondent scoring highly on this factor believe transfers will be more harmful than beneficial. The second factor consists of statements related to perceptions of farmers and irrigation. Respondents scoring highly on this factor widely perceive irrigated agriculture as benefiting them personally and the province in general. As a result, they are likely to express greater concern for irrigators' rights if water transfers are to take place. The third factor includes statements related to knowledge and awareness of Alberta's current water management framework and issues. Respondents with high factor scores on this factor perceive that they have greater knowledge about the water policy context in Southern Alberta. The final factor in the beliefs and perceptions domain groups statements related to awareness of the need for water reallocation, including specific environmental concerns and more general concerns related to the current system being out of line with wider society's values. Respondents scoring higher on this factor perceived the need for reallocation as more pressing.

Table 2: Value orientation factor analysis

	1	2	3	4
Factor 1: Biospheric value orientation				
1. FUTUR_ENVIRO	**0.727**	-0.102	0.016	-0.057
2. ECOSYS+QOL	**0.659**	-0.080	0.069	-0.080
3. NAT_BEAUTY	**0.630**	-0.064	0.122	0.089
4. ENVIRO>HMN	**0.568**	0.100	-0.123	-0.467
5. ENVIRO_FIRST	**0.551**	-0.372	-0.194	0.032
Factor 2: Egoistic value orientation				
6. WASH_VEHICLE	0.040	**0.704**	-0.214	0.032
7. GREEN_LAWN	-0.149	**0.678**	0.175	0.005
8. ENTITLEMENT	-0.057	**0.585**	0.112	0.056
9. LIVELIHOOD	-0.190	**0.519**	0.015	0.292
Factor 3: Agricultural/altruistic value orientation				
10. FRM_HERITAGE	0.132	0.074	**0.768**	0.052
11. AGRI+QOL	-0.043	0.036	**0.761**	0.102
Factor 4: Domestic/Altruistic value orientation				
12. BASIC_NDS>ALL	0.112	0.076	0.066	**0.836**
13. DMSTC>ENVIRO	-0.219	0.399	0.125	**0.547**
Statistics				
EIGENVALUE	2.128	1.908	1.351	1.337
VAR EXPLND	16.3%	14.7%	10.4%	10.3%
CUMULATIVE	16.3%	31.%	41.4%	51.7%

Extraction method: Principal Component Analysis.
Rotation method: Varimax with Kaiser Normalization.

1. I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now.
2. Healthy aquatic ecosystems add to the quality of life in the province of Alberta.
3. The environment is important to me because of its natural beauty.
4. A healthy, functioning aquatic environment should always take priority over human uses of water.
5. When I think about the potential consequences of water markets the impact on the environment is the first thing that comes to mind.
6. I use water for washing my vehicle even if doing so may harm the river where the water comes from.
7. 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.
8. I am entitled to use as much water as any other resident of the province of Alberta.
9. I'm more concerned about my livelihood than I am about the environment.
10. Alberta's traditional farming heritage is an important part of the province's identity today.
11. Overall, irrigated agriculture positively contributes to the quality of life in southern Alberta.
12. Water for basic human needs should have priority over all other water uses.
13. Domestic uses of water such as washing, cooking and cleaning should take priority over the needs of a healthy aquatic environment.

Table 3: Beliefs and perceptions factor analysis

	1	2	3	4
Factor 1: Believe transfers are harmful				
1. HARM_ENVIRON	**0.794**	0.001	-0.019	0.260
2. HARM_ECONOMY	**0.782**	-0.035	-0.046	-0.026
3. HARM_FARMERS	**0.732**	0.190	0.082	0.071
Factor 2: Perceive agriculture/farmers as good				
4. HEALTHY_FOOD	-0.082	**0.733**	0.002	0.097
5. FARMER+ECON	0.221	**0.650**	-0.036	0.003
6. AG_STEWARDS	-0.011	**0.641**	0.116	-0.307
7. IRRIGAT_PROFIT	0.022	**0.636**	-0.133	-0.161
Factor 3: Perceived knowledge of management issues				
8. AWARE_TRANS	-0.056	-0.027	**0.821**	-0.040
9. AWARE_AMEND	0.030	0.059	**0.777**	-0.037
10. UNDERSTANDING	0.020	-0.083	**0.688**	0.118
Factor 4: Perceived need for water reallocation				
11. AQ_ENVIRO_BAD	0.249	-0.245	-0.097	**0.678**
12. DRIER_AREA	-0.180	0.144	-0.004	**0.630**
13. SYS_OUTDATED	0.186	-0.188	0.055	**0.617**
14. AWARE_IMPACT	0.330	-0.101	0.377	**0.540**
Statistics				
EIGENVALUE	2.076	1.950	1.947	1.750
VAR EXPLND	14.8%	13.9%	13.9%	12.5%
CUMULATIVE	14.8%	28.7%	42.6%	55.1%

Extraction method: Principal Component Analysis.
Rotation method: Varimax with Kaiser Normalization.

1. I expect that an increase in water transfers will harm rather than benefit the environment.
2. I expect that an increase in water transfers will harm rather than benefit Alberta's economy.
3. I expect that an increase in water transfers will harm rather than benefit Alberta's farmers.
4. Irrigated agriculture produces locally grown, healthy food for me and my family.
5. Alberta's economy will suffer if the province continues to lose farmers.
6. Alberta's farmers are good stewards of land and water.
7. Irrigated agriculture is the most economically profitable use of water in southern Alberta.
8. I am aware that water licences can be transferred in Alberta.
9. I am aware of the conflict surrounding the amendment of irrigation district water licences.
10. I have a better understanding of how water in southern Alberta is managed than do most of my neighbours.
11. The aquatic environment in Alberta is unhealthy.
12. I live in a drier environment than most Canadians.
13. The way we manage water in our rivers in Alberta is outdated and not in line with society's current values.
14. I am aware that the majority of rivers in southern Alberta are environmentally impacted or degraded.

While values are more general constructs transcending different situations attitudes can be defined as situation specific evaluations about whether a particular attitude object is good or bad. The factor solution for the attitude statements resulted in four factors (Table 4). The first factor includes statements related to pro-environmental attitudes including limiting development and industrial or agricultural expansion if this would damage the environment. This factor also includes measures related to concern that aquatic habitats were not receiving enough protection. Respondents scoring highly on the pro-environmental factor were more likely to prioritize environmental uses of water over economic uses. The second factor in the attitude domain groups items measuring respondents' level of agreement with allowing buyers and sellers to set the price of water, and hence allow price to determine who gets the right to use water. This factor includes statements, which are supportive of an increased role of market-based systems in water allocation, so the respondents scoring high on this factor are those who exhibit pro-market attitudes.

Pro-use statements make up the third factor within the Attitudes domain, including questions concerned with making productive use of water resources as opposed to leaving water in the river. Respondents who score highly on this factor are more likely to feel that using water is more beneficial to themselves and society than keeping water in rivers for non-use purposes such as serving the environment. The final factor for the Attitudes construct relates to respondent's attitudes toward government trustworthiness and level of responsibility for protecting the environment. Respondents who score highly on this factor believe the government is both trustworthy and responsible for the health of the aquatic environment in Alberta. Respondents who perceived government as responsible but not trustworthy or vice versa scored moderately and those who saw the government as neither responsible nor trustworthy received low factor scores.

Table 4: Attitude factor analysis

	1	2	3	4
Factor 1: Pro-environmental attitude				
1. NO_DVLPMNTS	**0.761**	-0.049	0.019	0.033
2. HBTT_CNCRN	**0.733**	-0.155	-0.087	-0.083
3. ENVIRO>AGRI	**0.603**	0.055	-0.374	0.256
4. ENVIRO>ECON	**0.557**	-0.220	-0.464	-0.060
Factor 2: Pro-market attitude				
5. MARKET_PRICE	-0.076	**0.794**	0.106	0.119
6. MKT_CMMDTY	0.006	**0.758**	0.213	0.058
7. DISTRBT_PRICE	-0.218	**0.648**	-0.044	-0.261
Factor 3: Pro-use attitude				
8. PUBLIC_SPACES	0.032	0.102	**0.819**	0.026
9. IRRIGATION	-0.369	0.130	**0.665**	0.052
Factor 4: Pro-government attitude				
10. GOVT_RSPNSBL	0.205	-0.231	-0.069	**0.746**
11. TRST_GOV_ENV	-0.219	0.265	0.155	**0.663**
Statistics				
EIGENVALUE	2,070	1.853	1.565	1.162
VAR EXPLND	18.8%	16.8%	14.2%	10.6%
CUMULATIVE	18.8%	35.6%	49.8%	60.4%

Extraction method: Principal Component Analysis.
Rotation method: Varimax with Kaiser Normalization.

1. New subdivisions should not be allowed in this region if supplying the water they need would cause harm to the environment.
2. I'm concerned that aquatic habitats in southern Alberta are not receiving enough protection.
3. The environment's needs for water should be met before water is used for human economic purposes such as industry and agriculture.
4. Water should be made available for environmental uses before the economy.
5. Buyers and sellers of water licences should be the ones who decide the price of water.
6. I think that water is a commodity that individuals and private groups should be able to buy and sell.
7. Water from rivers should be used to provide benefits to those who can afford to buy water licences, not to the whole community.
8. Using water to create green and lush public spaces adds more to my quality of life than leaving the water in the river.
9. I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers.
10. The government should be responsible for ensuring that water quality and quantity are good enough to ensure a healthy environment.
11. I trust the government to manage water in ways that are best for the environment.

The Social Norm statements also reduce to four factors, the first measures social ties to agriculture (Table 5). Incorporated into this factor are items measuring frequency of social contact or conversation with farmers or farm families. Additional items loading on this factor include having friends or family employed in agriculture or related fields. Those scoring highly on the factor expect to be more concerned about the impacts of water transfers on farmers and exhibit greater support for policies protecting irrigator's rights. The second factor contains items related to contact with rural amenities including using rural areas, rivers, lakes and reservoirs for recreation or purchasing produce from a farmer's market or farm gate. Respondents who score highly on this factor are more likely to encounter rural people and places, which may influence their preferences for rural to urban water transfers.

Table 5: Social norm factor analysis

	1	2	3	4
Factor 1: Pro-environmental attitude				
1. NO_DVLPMNTS	**0.761**	-0.049	0.019	0.033
2. HBTT_CNCRN	**0.733**	-0.155	-0.087	-0.083
3. ENVIRO>AGRI	**0.603**	0.055	-0.374	0.256
4. ENVIRO>ECON	**0.557**	-0.220	-0.464	-0.060
Factor 2: Pro-market attitude				
5. MARKET_PRICE	-0.076	**0.794**	0.106	0.119
6. MKT_CMMDTY	0.006	**0.758**	0.213	0.058
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Factor 3: Pro-use attitude				
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11. TRST_GOV_ENV	-0.219	0.265	0.155	**0.663**
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CUMULATIVE	18.8%	35.6%	49.8%	60.4%

Extraction method: Principal Component Analysis.
Rotation method: Varimax with Kaiser Normalization.

1. New subdivisions should not be allowed in this region if supplying the water they need would cause harm to the environment.
2. I'm concerned that aquatic habitats in southern Alberta are not receiving enough protection.
3. The environment's needs for water should be met before water is used for human economic purposes such as industry and agriculture.
4. Water should be made available for environmental uses before the economy.
5. Buyers and sellers of water licences should be the ones who decide the price of water.
6. I think that water is a commodity that individuals and private groups should be able to buy and sell.
7. Water from rivers should be used to provide benefits to those who can afford to buy water licences, not to the whole community.
8. Using water to create green and lush public spaces adds more to my quality of life than leaving the water in the river.
9. I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers.
10. The government should be responsible for ensuring that water quality and quantity are good enough to ensure a healthy environment.
11. I trust the government to manage water in ways that are best for the environment.

The third and fourth factors aggregate items into groups representing social cohesion and social approval of water transfer. Items ranking on the social cohesion factor included those related to community agreement with respect to water policy, as well as the respondents' impression that society

expects them to support environmental causes. Respondents who score highly on this factor perceive their communities as being united with respect to water policy and environmental issues, and as such are likely to feel greater social pressure to conform their own views to those of their communities. The social approval factor reflects how the respondents perceive support for water markets among their communities and significant people in their lives. Respondents with high factor scores on the fourth factor feel that those around them support using markets to reallocate water. When combined, the social cohesion and social approval measures will result in an index of perceived social norms toward market-based water reallocation, which expects to influence respondents' policy preferences.

CONCLUSION

The findings presented here provide a valuable step toward gaining a better understanding of the policy preferences of non-irrigators for water reallocation. Links between various psychological variables and general environmental concern or behavior are well-established (Stern and Dietz, 1994), and similar links theorized with respect to resource management preferences. By identifying the relevant factors underlying these variables with respect to water reallocation we can draw links between related branches of the literature and better inform policy to ensure its widespread acceptance and adoption.

This study identified three principle policy orientations for future water reallocation, which were consistent with those identified by the key informants in interviews that informed the survey design process. Likewise, the attitude factors extracted were consistent with what many interviewees identified as likely to be important to the general population when it came to water reallocation. The factors extracted from the attitudes domain were also consistent with the primary concerns voiced by those opposing the Balzac transfers and the amendment of irrigation district licenses.

The remaining domains explored in this paper is not as specifically related to water reallocation, allowing for a more direct comparison with specific findings in the literature. This study confirms, for example, the biospheric, egoistic and altruistic value orientations identified as contributing significantly to environmental behavior (Stern et al., 1993; Snelgar, 2006). It extends the concept, however, by splitting the altruistic orientation into concern for agricultural users and concern for domestic users—a distinction that may be important to consider when the impacts of water reallocation schemes are presented to the public.

The breakdown of the beliefs and perceptions domain was also consistent with that proposed in the literature. Beliefs about the need for and effect of change were identified by Stern et al. (1999) as important mediators between values and norms, while Thorvaldson et al. (2010) found preferences for water policy to be conditional on knowledge of water supply, scarcity and variability, and the institutions governing water rights. Since it is necessary that water be transferred from rural to urban and environmental uses, perceptions of agriculture are also expected to influence preferences, as was found by Sharp and Adua (2009).

Sharp and Adua noted the difference between social and physical distance from agriculture in the formation of related environmental concern. Brehm et al. (2006) also noted the importance of the social aspects of community attachment as a predictor of environmental concern. The in-depth interviews conducted for this research also provided anecdotally evidence to support. These findings are consistent with the extraction of a factor measuring social ties to agriculture within the social norms domain and should influence policy preferences.

Policy makers and water managers should consider the insight into these constructs when designing and implementing new policies and mechanisms to reallocate water to new consumptive users or the environment. These findings could also influence social marketing tools used to inform and sway public opinion about necessary water reallocation, helping to reduce social conflict and leading to more predictable policy outcomes.

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REFERENCES

Alberta Environment. 2008. *Water for Life: A Renewal*. Edmonton.

Brehm, JM, BW Eisenhauer, RS Krannich. 2006. Community attachments as predictors of local environmental concern: The case for multiple dimensions of attachment. *American Behavioral Scientist* 50(2): 142-165.

Brewer, J, R Glennon, Ker, A and Libecap. G. 2008. Water markets in the West: Prices, trading, and contractual forms. *Economic Inquiry* 46(2): 91-112.

Baron, JS, NLR Poff, PL Angermeier, CN Dahm, P H Gleick, NG Hairston Jr, RB Jackson, CA Johnston, BD Richter and AD Steinman. 2002. Meeting ecological and societal needs for freshwater. *Ecological Applications* 12(5): 1247-1260.

Bjornlund, H. 2010. The competition for water: Striking a balance among social, environmental, and economic needs. *C.D. Howe Institute* (302): 1-28.

Calgary, City of. 2010. 2010 Civic Census Results. http://www.calgary.ca/docgallery/bu/cityclerks/2010_census_result_book.pdf

Christensen, R and D Droitsh. 2008. Fight to the last drop: A glimpse into Alberta's water future. 1-32.

D'Aliesio, R. 2007. Tapped out: Water woes, part one. *Calgary Herald*, December 1.

Dillman, DA. 2000. *Mail and Internet surveys—The tailored design method.* New York : John Wiley and Sons, Inc.

Dolnicar, S, A Hurlimann and LD Nghiem. 2010. The effect of information on public acceptance: The case of water from alternative sources. *Journal of Environmental Management* 91(6): 1288-1293.

Droitsch, D. 2007. Statement of concern regarding Eastern Irrigation District. Submitted to Alberta Environment, October 12.

Dunlap, RE and RE Jones. 2002. Environmental concern: Conceptual and measurement issues. In RE Dunlap and W Michelson (eds.), *Handbook of Environmental Sociology.* Westport, CN: Greenwood Press. 482-524.

Fishbein. M. 1967. Attitude and the prediction of behavior. In M. Fishbein (ed.), *Readings in Attitude Theory and Measurement.* New York: Wiley. 477-492.

Fishbein, M and Ajzen, I. 1975. *Belief, Attitude, Intention, and Behavior: An introduction to theory and research*. Don Mills, Ontario: Addison-Wesley Pub. Co.

Gould, G. 1988. Water rights transfers and third-party effects. *Land and Water Law Review* 23(1): 1–41.

Howe, CW. 1990. The economic impacts of agriculture-to-urban water transfers on the area of origin: A case study of the Arkansas River Valley in Colorado. *American Journal of Agricultural Economics* 72(5): 1200-1204.

Nanos, N. 2009. Canadians overwhelmingly choose water as our most important natural resource. *Policy Options*, July-August, 2009: 12-15.

Percy, DR. 2005. Responding to water scarcity in western Canada. *Texas Law Review* 83: 2091.

Rokeach, M. 1968. *Beliefs, Attitudes and Values: A Theory of Organization and Change.* San Francisco: Jossey-Bass Inc. Publications.

Routhe, AS, RE Jones and DL Feldman. 2005. Using theory to understand public support for collective actions that impact the environment: Alleviating water supply problems in a nonarid biome. *Social Science Quarterly* 86(4): 874-897.

Sharp, J and L Adua. 2009. The social basis of agro-environmental concern: Physical versus social proximity. *Rural Sociology* 74(1): 56-85.

Snelgar, RS. 2006. Egoistic, altruistic, and biospheric environmental concerns: Measurement and structure. *Journal of Environmental Psychology*. 26(2): 87-99

Stern PC, T Dietz. 1994. The value basis of environmental concern. *Journal of Social Issues* 50: 65-84.

Stern, PC, T Dietz and L Kalof. 1993. Value orientations, gender and environmental concern. *Environment and Behavior*. 25(5): 322

Stern, PC, T Dietz, T Abel, GA Guagnano and L Kalof. 1999. A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review.* 6(2): 81-98.

Strathmore, Town of. 2010. 2010 Census Results. http://www.strathmore.ca/mod/secfile/viewed.php?file_id=520

Thorvaldson, J, J Pritchett and C Goemans. 2010. Western households' water knowledge, preferences, and willingness to pay. *Canadian Journal of Agricultural Economics.* 8(4): 497-514.