
Some Perspectives on Managing Water Demand: Public and Expert Views

Raymond De Young¹ and James E. Robinson²

Abstract:

An investigation was undertaken to explore two aspects of water demand management strategies. The first aspect involved comparing and contrasting the public's and expert's perceptions of various water demand management techniques. The second part of the study involved an examination of people's attitudes, behaviours, motivations and satisfactions with regard to water conservation. A survey was conducted during the late spring of 1984 which collected data from a random sample of citizens in the communities of Kitchener and Waterloo, Ontario and from the participants in a symposium on water demand management. Data from the 39 public respondents and the 33 expert respondents were analyzed. The results of the comparative analysis indicated that the experts perceive rate structure strategies as being more effective than do the public. Although both groups rated education strategies significantly higher than other demand management options, the experts tended to underestimate the full extent of the public's belief in reduction. Data from the respondents were also subjected to dimensional analysis and relationships between the dimensions were examined. The results indicate that people hold not one but several conservation related attitudes and they report deriving a series of separate and distinct satisfactions from conservation behaviours. The satisfactions were not global concepts but were quite specific involving, for instance, frugality and participation. These findings have both practical and theoretical relevance. The practical benefits come from the potential to devise more effective demand management techniques. It would seem wise to avoid developing water demand programs which are based upon preconceptions of what the public thinks. It is more effective, and less embarrassing, to discover the differences between the public's and the experts' knowledge and preference structure during development of a program than to have these differences surface during implementation of one's plan. Our theoretical understanding of why people bother to conserve resources may be improved by investigating more than just attitude-behaviour consistency or the effects of extrinsic rewards. More research attention should be given to satisfactions derived from environmentally appropriate behaviour.

Résumé:

Dans une étude, on s'est penché sur deux aspects des stratégies à adopter en matière de gestion de la demande en eau. On a d'abord comparé la perception du public et celle des experts sur les diverses techniques utilisées dans ce domaine. Puis, dans un deuxième volet, on a examiné la réaction des gens à l'égard de la conservation des réserves d'eau, soit leur attitude, leur comportement, leur motivation et leur satisfaction.

Un sondage effectué au printemps de 1984 a permis de recueillir l'opinion de certains citoyens de Kitchener et de Waterloo, en Ontario, et de participants à un symposium sur la gestion de la demande en eau. On a analysé les réponses de 33 experts et de 39 citoyens. On a ainsi pu constater que les experts, comparativement au public, jugent les mesures liées à la tarification plus efficaces. Bien que les deux

¹ Research Fellow, School of Natural Resources, University of Michigan, Ann Arbor, Michigan.

² Assistant Professor, Department of Man-Environment Studies, University of Waterloo, Waterloo, Ontario.

groupes s'accordent à dire que l'éducation des gens donne de bien meilleurs résultats que les autres solutions, les experts tendent à sous-estimer toute l'importance que joue la conviction des gens face au besoin de réduire leur consommation. Les réponses ont aussi été soumises à une analyse dimensionnelle et les relations entre les divers paramètres évalués ont été étudiées. Cette analyse a révélé que les gens n'ont pas qu'une seule attitude à l'égard de la conservation des réserves d'eau mais bien plusieurs. Les individus semblent de plus tirer plusieurs satisfactions différentes lorsque'ils économisent l'eau, satisfactions sont le caractère n'est pas collectif mais plutôt individuel comme, par exemple, la satisfaction de faire des économies et celle de participer.

Les résultats obtenus s'avèrent pertinents tant sur le plan théorique que sur le plan pratique. Au point de vue pratique, ils permettent en effet de mettre au point des techniques de gestion de la demande plus efficaces. Il semblerait judicieux d'éviter d'élaborer des programmes en fonction d'idées preconçues sur la perception du public. Il est beaucoup plus efficace, et même moins embarrassant, de déceler les différences de connaissance et de préférence entre les experts de le public lors de la mise au point d'un programme que lors de sa mise en application. En ce qui concerne l'aspect théorique, on pourrait tenter de mieux comprendre ce qui sensibiliserait les gens à l'économie de l'eau en effectuant des études qui ne portent plus seulement sur la cohérence entre l'attitude et le comportement ou sur les effets des récompenses extérieures. On devrait faire davantage de recherches sur les satisfactions que le public peut retirer en respectant l'environnement.

Introduction

Water demand in North America has grown rapidly for both residential and industrial consumers. Most people consider water to be a cheap and unlimited resource and consider conservation a strategy appropriate only for crisis (Winkler, 1982). Unfortunately, at the current rate of water consumption, supplies that were once taken for granted may soon be unavailable. Ground water overdraft and inadequate supplies of surface water are already severe problems in many locations (EPA, 1980; Foster and Sewell, 1981). In addition, the water supply system is heavily energy dependent. From raw water intake to wastewater treatment, enormous quantities of energy are consumed. As an example consider the Regional Municipality of Waterloo in Waterloo, Ontario. Bond (1979) reported that water supply accounted for 34 percent of all energy use and 85 percent of all electricity consumed by all functions of regional government. It is also economically inefficient to continually augment water supply without consideration of alternatives which at less cost effectively reduce demand.

Because of current and projected water supply problems and the potential for energy and monetary saving, there is an interest in managing the demand for municipal and industrial water. A variety of demand management techniques have been developed including new rate structures, plumbing code revisions, retrofitting buildings with conservation devices (such as low-flow showers,

shower shut-off valves, faucet flow restrictors and toilet dams), as well as public education/information programs.

This paper examines two aspects of demand management strategies. First, we compare and contrast the public's and the experts' perception of various water demand management techniques. And second, we investigate the public's and experts' attitudes, behaviours and satisfactions with respect to reducing demand for water. This study represents one attempt to follow up the recommendation of MacIver (1970 pp. 143-144) for research to improve the balance of behavioural science inputs to water management decisions.

With respect to experts, it should be noted that professions with differing training and employment background are not homogeneous in their perception of a problem or its solution (Thomas, 1976). Part of the explanation for this was identified in research by Sewell (1971, p. 58): "It is clear that experts are not in favour of institutional change, especially if it means their own role will be altered." However, it has been found that looking at differing perceptions of a specific group of experts (resource managers) and of users has led to constructive proposals for substantially improved management practice (Lucas, 1964).

The focus on attitudes and behaviour may be familiar to the reader. Examining satisfactions derived from reducing one's demand is a new perspective. Reducing one's resource use, despite considerable publicity, remains

little practiced by the North American public. While attitude change (Weigel, 1983) and incentives (Cone and Hayes, 1980; Geller, Winett and Everett, 1982) might seem to be the appropriate means of dealing with this important issue, both have serious limitations (Olsen, 1981; Stern and Gardner, 1981; McClelland and Canter, 1981) and make alternative perspectives worth exploring. By studying satisfactions derived from ordinary, everyday conservation activities it might be possible to achieve insight into what would be required to make such activities satisfying to a larger population.

That such activities can be made satisfying to a larger population is indicated by the strong negative public reaction when the City of Kitchener in Ontario during 1984 considered dropping a waste recycling program which over five years would cost taxpayers several hundred thousand dollars more than straight landfilling. Despite the extra cost, a substantial proportion of the residents of that community supported the recycling program, and the City decided to continue it.

Some Comments on Being an Expert

The more complicated the planning process the more we come to rely on experts, people who function as professional problem solvers. One expects that these professionals, because of their experience and education, will approach problems in their area of specialty differently from the way members of the public would approach the same problem. Unfortunately, the experts' different view of a situation can also create problems.

During education and experience one's view gradually changes. New information replaces old as experience "adjusts" the original conception. One's understanding grows more compact. What was once obscure becomes obvious. What was once complicated becomes simple. The connections which once seemed hazy and jumbled now have clarity. Much of this learning process takes place unconsciously and we readily lose track of how it all looked in the beginning. The ability to perceive and think with clarity leads one to believe that it is the only way to see. It becomes easy to believe that one has always thought this way, that, in fact, everyone thinks this way. Thus the special way of perceiving makes the world *look* different, but it does not make the expert *feel* different (see Kaplan and Kaplan, 1982; Kaplan, 1977).

There is a price to be paid for all the facility. The efficiency of expert problem solving

depends heavily upon highly practiced perception, and such perception gains its efficiency through an astute ignoring of much that goes on in the environment. Although in one sense, experts see more than the public, in an important other sense they see less. This can be effective much of the time, but it can nevertheless create difficulties.

Sometimes solving a problem requires a new way of representing it, which in turn requires that one take in new information. At such times, the differential sensitivity of the highly skilled expert may become a serious handicap. Decisionmakers and other experts have been found to be highly selective in the new information they are willing to consider (Ingram and Ullery, 1977).

Another difficulty may arise out of the very efficiency afforded by the compactness of their knowledge: it can lead to a case of "hardening of the categories". It is not unusual for an expert to diagnose or label a problem too hastily, leading to the decision to proceed with the "right" solution—namely, the one that has been applied numerous times in the past. This tendency to choose the most familiar solution has been documented by MacIver (1970, p. 143) and by Sewell (1971, pp. 34-36). It can be a frustrating experience watching experts conducting business-as-usual when the world is undergoing radical changes. (Kaplan and Kaplan, 1982).

From this description one can conclude that most individuals can, over time, become an expert. Experts seem to depend more upon experience and rich knowledge structures than upon any special problem-solving techniques or thinking methods (Kaplan and Kaplan, 1982; Simon, 1983), or techniques for widening public input into their deliberations.

With these concerns in mind, the present study was designed to serve a number of purposes:

- a) to act as a pilot study of views, on water conservation and water management, of the public in the cities in the Regional Municipality of Waterloo, Ontario
- b) to compare these views to those of a group of water management experts, and
- c) to go beneath simple public reaction to look at four components—attitudes, behaviours, motivations, and satisfactions—of involvement with conservation programs.

Method

The Survey Instrument

The survey instrument included a two page questionnaire. A short introduction to the survey

was printed at the top of the questionnaire and respondents were provided with a telephone number to call if they had any questions. Most items used a 5-point rating scale. The specific labels for the points on these scales varied with the particular question being asked, but in all cases a rating of '1' was low endorsement and a rating of '5' represented the highest endorsement.

The respondents were asked to rate 8 water management strategies in two different ways. First, they were asked to indicate how effective they thought each strategy would be. Second, they were asked to predict how the other group would answer the same questions. That is, the public were asked what they felt the experts would say and the experts were asked to indicate what they felt the public's responses would be.

The questionnaire also included items that measured respondents' attitudes, motives, behaviour and satisfactions with respect to water consumption. There were 12 items which dealt with attitudes about water management and conservation. Included were items dealing with whether the respondent was bothered to see water wasted, whether conservation should be an integral part of our culture, and whether people should be allowed to use as much water as they could afford.

In an effort to examine people's reasons for reducing demand, 7 items were included which dealt with motivation. Items were developed which measured both extrinsic and intrinsic motivation. Included among 7 behaviour items were such activities as encouraging others to reduce their demand, not running the water continuously when washing things, and watering the lawn only during the evening. The 18 satisfaction items covered satisfaction gained from avoiding waste, finding new ways to reduce water use, having a chance to participate and being a member of an affluent society. Included at the end of the questionnaire were a series of background items. These items measured such things as age, income, house value, and years of schooling.

Questionnaire Distribution and The Sample

After pretesting, the final version of the survey was distributed to two separate groups referred to as the public and the experts. The public in this investigation were citizens of Kitchener and Waterloo, Ontario. Experts were those individuals who attended the Symposium on "Managing the Demand for

Municipal and Industrial Water" held at Waterloo, Ontario in June 1984. These individuals, from industry and the various levels of government, have a concern or responsibility for the management of water demand.

In the public group a total of 120 questionnaires was distributed by hand to private homes in six randomly selected locations in Kitchener and Waterloo. There is potential for respondents, who did after all agree to complete the survey, to be not fully representative of the general public. However, to reduce possible bias in this study, none of these homes were in the small area of Kitchener which had been involved in an intensive water fixture retrofit project.

The expert group of respondents included 52 individuals who attended the symposium on managing water demand. These individuals were provided with copies of the questionnaire and postage-paid return envelopes. They were asked to mail back the completed questionnaire as soon after the symposium as possible.

Of the questionnaires distributed to the public, 39 were returned and included in the data analysis representing a return rate of 33 percent. The public sample was comprised of 55 percent women, with 49 percent of the respondents between 30 and 50 years old. Almost all owned their own house (97 percent) and 62 percent had lived in the Kitchener-Waterloo area for over 20 years. Most (77 percent) indicated they would stay in the community for as long as they could. Annual incomes ranged from under \$15,000 to over \$71,000 with 45 percent reporting incomes between \$31,000 and \$50,000.

Of the questionnaires distributed to the symposium participants, 33 were returned and became part of the data analysis. This gives a return rate among the experts of 63 percent. This group was exclusively male with 69 percent between the age of 30 and 50. Over 83 percent of the experts owned their own house and 50 percent reported an income between \$31,000 and \$50,000. This group included 5 individuals from the Kitchener-Waterloo area, 22 from other cities in Canada and 2 from the United States.

Results and Discussions

The Perceived Effect of Various Water Management Strategies

The ratings of the 8 management strategies were compared for the public and expert respondents. Table 1 presents each strategy and each group's ratings.

TABLE 1

MEAN RATINGS OF WATER MANAGEMENT STRATEGIES

Water Management Strategy	Mean Rating	
	Public	Expert
1. Educate public of need for conservation during summer	4.38	4.03
2. Require all new buildings to have conserving devices	4.38	4.00
3. Educate public about need to conserve water	4.21	4.00
4. Alter charges to reflect cost of summer peak usage	2.76*	3.67*
5. Charge dearly for summer use above winter use	2.34*	3.33*
6. Pay incentive to install conserving fixtures	3.61	3.09
7. Require houses to retrofit with conserving devices	2.51	2.55
8. Construct new water facilities to meet all demands	2.85*	1.55*

* Difference between public and expert rating is significant at $p < .01$

Table 1 demonstrates the relatively high ratings both groups give to the two education strategies and the perceived effectiveness of requiring new buildings to have water efficient fixtures. A paired t-test analysis indicated that for each group these three strategies were rated significantly higher than each of the remaining five strategies (at $p < .02$).

The experts also reported a significantly higher score for the two rate structure items. The public indicated a significantly higher rating for a policy of building facilities to meet water demand.

The experts' preference for the rate structure strategies might be explained by greater familiarity resulting from the heavy emphasis on discussions of the effectiveness of such extrinsic incentives in many management plans and the research literature (see for instance Geller, Erickson and Buttram, 1983). On the other hand, such *rate structure* strategies are much less familiar to the public because they have not been implemented to a significant extent for public water consumption in Kitchener, Waterloo or nearby areas; and those *rate* changes that were made in the past ten years have been minor in constant dollar terms.

The experts' relative lack of support for constructing new facilities to meet demand may be attributed to the fact that they were a self-selected group. The participants in the symposium were in some sense interested in, familiar with, and committed to looking for innovative ways of managing, rather than just meeting, the demand for water.

A brief analysis was conducted of the experts' ability to predict the public's rating of each strategy. (The reverse was not considered due to possible problems found with the understanding of the term "expert".) The experts' estimate of the public's responses

were accurate except for item number one in Table 1. The experts significantly underestimated the public's rating for the effectiveness of education on summer water demand ($t=3.39$, $df=69$, $p < .001$). Although both groups highly rate the education strategies, the experts tend to underestimate the full extent of the public's belief in education.

It should be noted that an earlier study in the same Region found that public perceptions of official choices and the reverse were not very accurate (MacIver, 1970, p. 146).

Results of the Dimensional Analysis

This analysis involved two separate steps. First, the four distinct sets of questionnaire items (attitudes, motivations, behaviours and satisfactions) were processed through dimensional analysis and coherent dimensions were identified. In the second step the relationships among these dimensions were examined using standard statistical techniques.

The Dimensional Analysis Technique

Dimensional analysis is a way of examining the structure of a given data set. The emphasis is on identifying groups of questionnaire items that behave similarly and on understanding the basic concepts which are measured by small numbers of separate items. In this procedure the data are used to identify the particular groupings of items rather than having the dimensions formed a priori.

The procedure used to identify dimensions was a non-metric factor analysis program (Guttman-Lingoes Smallest Space Analysis III; see Lingoes, 1972). Kaplan (1974) has suggested three criteria useful in interpreting the output from this program. The criteria specify that: (1) any particular questionnaire item should be included in no more

than one dimension, (2) each dimension should "hang together" statistically (The Cronbach (1951) coefficient of internal consistency [Alpha] is used)* and (3) the dimensions should be meaningful to the researcher. With respect to the last item, if the dimensions are not interpretable, it may well be that the concepts in the study were not well measured.

The results of the dimensional analysis program were studied using the criteria mentioned above and only highly coherent and stable dimensions were selected for further analysis. By this strategy, three attitude dimensions, two motivation dimensions, two behaviour dimensions and three satisfaction dimensions were identified. These dimensions are discussed below.

Following the identification of these dimensions, scales were constructed for each by calculating a respondents' average rating of the separate items which form each dimension. This resulted in a single score on each dimension for each respondent. These scores were used in the second step of the analysis described at the end of this section.

The Attitude Dimensions

Table 2 shows the three attitude dimensions which emerged from the dimensional analysis. While the Alpha coefficient presented in Table 2 provides a measure of each dimension's internal cohesiveness, it is also useful to check how independent each dimension is

from the others. All intercorrelations among the three attitude dimensions were below .21 (less than 5 percent shared variance).

These findings demonstrate that rather than one attitude dimension there exist several independent aspects to people's thoughts on water conservation. These have been labelled Pro-Conservation, Perceived Difficulties, and Personal Choice. For instance, independent of any pro-conservation attitude, people may not always be sure just what is required to reduce their demand for water. Likewise, regardless of any pro-conservation attitude, people may consider how much water any one person consumes a matter of his or her personal choice. One might expect these different attitude dimensions to affect conservation behaviour differently. It should be useful when designing public education programs aimed at changing people's water use behaviour to know that there are not one but several independent conservation related attitudes.

To continue the examination of the differences between the public and the experts, a series of analyses were conducted on all dimensions. The public's mean score on each dimension was compared to the experts' mean score on that same dimension. There were no significant differences between the public's and the experts' score for any of the 11 attitude, motivation, behaviour and satisfaction dimensions.

TABLE 2
ATTITUDE DIMENSIONS

Dimension Name and Items Included	Mean	S.D.	Alpha
PRO-CONSERVATION: Bothered to see water go to waste Must teach ourselves how to use water more wisely Conserving water is necessary and essential Conservation should be an integral part of culture	4.19	.81	.81
PERCEIVED DIFFICULTIES: Never sure what to do to reduce water use Don't use enough water to make conserving worth it	2.06	1.04	.59
PERSONAL CHOICE: OK to use all the water one wants if none suffer If people can afford it they can use all they want	1.99	1.12	.62

* The coefficient alpha reflects the degree to which a collection of items "hang together". Since items that group together can be thought of as alternate measures of some abstract construct, the Alpha value can be thought of as a rough measure of construct validity (Nunnally, 1978).

The Motivation Dimensions

Two motivation dimensions developed from the dimensional analysis are presented in Table 3. These two dimensions are moderately related with a negative correlation of .42, indicating they have a common variance of 17.6 percent. One might conclude that these two forms of motivation are simply opposite poles of a single concept. However, the internal coherence of each dimension together with the modest shared variance supports the contention that extrinsic and intrinsic motives are independent concepts (see De Young, 1984). Nothing in these data prevents any given individual from scoring high in both the Extrinsic Motivation and Intrinsic Motivation dimensions—or, for that matter, low in both.

The Extrinsic Motivation dimension had an extremely skewed distribution for each group with a total of 29 out of 72 respondents marking the first category of the 5-point scale for both items which make up the dimension. The first category was labelled on the questionnaire as 'strongly disagree'. The Intrinsic Motivation dimension was similarly skewed although in the opposite direction (toward 'strongly agree') and to a lesser degree (12 out of 72).

The promise of monetary reward is not the only reason people decide to conserve. The relatively high mean score the respondents had on the Intrinsic Motivation dimension suggests this form of motivation plays a role in people's decision to conserve resources.

The Behaviour Dimensions

Only one behaviour dimension developed from the dimensional analysis. This dimension, Reduced Water Use, is shown in Table 4. One other item, Encourage Others to Conserve, did not enter into any stable dimensions in the analysis but is interesting in its

own right and, therefore, was retained. The intercorrelation between these two behaviour concepts is .25, indicating a shared variance of 6 percent.

A review of Table 4 suggests a distinct difference exists between a respondent's willingness to reduce his own water use and his desire to go out and actively convince others to do the same.

One must of course exercise caution when reviewing all of the survey results. For instance, what is being called behaviour might be labelled behavioural intent. People may intend to save water by taking a shower instead of a bath but end up taking a long shower, one that saves no water at all.

The Satisfaction Dimensions

One of the most interesting findings to come out of this investigation is the coherent, multidimensional nature of the satisfactions people derive from various activities. The analysis indicated there were three distinct satisfaction dimensions. These dimensions and the items included in each are presented in Table 5. The intercorrelations among these dimensions ranged from .20 to .53, indicating their common variance ranged from 4 percent to 28 percent. The largest relationship was between the Frugality and Participation dimensions.

The respondents report deriving not a single, global sense of satisfaction, but a variety of very specific satisfactions. For instance, the respondents report gaining satisfaction from frugality—defined as the careful use of things and the avoidance of waste. This is an interesting finding since the idea of frugality is closely tied to a conservation ethic. While one is sometimes reminded that a simple value like frugality can build character, the respondents seem to go beyond the utilitarian nature of this value to suggest that act-

TABLE 3

MOTIVATION DIMENSIONS

Dimension Name and Items Included	Mean	S.D.	Alpha
INTRINSIC MOTIVATION: I conserve because it feels right to do so I get good feelings from conservation activities Conserving is keeping with the natural order	4.00	.72	.66
EXTRINSIC MOTIVATION: It's reasonable for people to be paid to conserve I'd need a large monetary incentive to reduce use	1.86	1.02	.74

TABLE 4
BEHAVIOUR DIMENSIONS

Dimension Name and Items Included	Mean	S.D.	Alpha
REDUCED WATER USE: Don't constantly run water while washing things Water lawn only during the evening hours Water lawn only on permitted days	3.89	.95	.66
ENCOURAGE OTHERS TO CONSERVE: Encourage relatives, friends, neighbors to conserve	2.43	1.28	---

TABLE 5
SATISFACTION DIMENSIONS

Dimension Name and Items Included	Mean	S.D.	Alpha
PARTICIPATION: Doing things which matter in the long run Taking actions which can change the world Doing things which help make sense out of world Doing things which help bring order to the world	3.91	.88	.84
FRUGALITY: Finding new ways to save water Discovering ways to use things over and over Finding ways to avoid waste Using less water to do the same things Keeping things working long past the normal life	3.77	.79	.86
CONVENIENCES: Having large number of items to choose from Having new items to try, evaluate and buy Having luxury/conveniences of our society Knowing we are looked upon as an affluent society	3.44	.79	.72

ing in a frugal manner is also personally rewarding and fulfilling.

The satisfaction-from-Participation dimension reminds one that humans are not passive beings, willing to accept solutions from kindly others (e.g. experts), but rather are active, knowledge-generating and knowledge-utilizing creatures. This information-processing view of participation and the sense that humans are deeply concerned about this concept has gained wide support (see Kaplan and Kaplan, 1982). That humans would derive satisfaction from activities they are deeply concerned about has an intuitive credibility. The sense of being needed, of having a chance to influence how things are done, are not luxuries but necessary parts of our well-being. The respondents, like many before them, highlight the importance of a chance to be involved.

And finally, a satisfaction-from-Conveniences dimension emerged which

focuses on the pleasure gained from having the comforts of our modern society. It would seem to reflect people's satisfaction with living the good life. In a hasty analysis one might conclude that satisfaction gained from Conveniences is the polar opposite of the other satisfactions. Yet all three satisfactions have similar mean scores, all intercorrelations were positive and relatively low (a .30 correlation with Frugality and a .20 correlation with Participation). Thus, satisfaction from Conveniences is not the antithesis of satisfaction from Frugality or Participation.

Relationships Between Dimensions

The analysis of relationships between dimensions occurred in two steps. The first step used the behaviour dimensions as the dependent variables. In this step associations between the attitude and motivation dimensions and the dependent variable (behaviours)

were examined. In the second step the satisfaction dimensions were used as the dependent variable and relationships with the attitude, motivation and behaviour dimensions were investigated.

The results of this analysis further demonstrate a difference between the public and the experts. Significant relationships existed, for the most part, only for the public respondents. Only two barely significant associations existed for the expert respondents.

In the first series of analyses, no relationships between attitudes and motivations, and the considered dependent variables (behaviours) reached significance (at $p < .05$).

In the second series of analyses, where the satisfaction dimensions were the dependent variables, there were a number of significant relationships. Both the public and the experts reported significant positive associations between a Pro-Conservation attitude and satisfaction from Frugality ($t=2.14$, $df=36$, $p < .04$ and $t=2.19$, $df=30$, $p < .04$ respectively). The other relationships that reached significance involved only the public respondents. This group reported a positive relationship between a Pro-Conservation attitude and satisfaction gained from Participation ($t=2.23$, $df=36$, $p < .03$). There were positive relationships between both the behaviour dimensions: Reduce Water Use and Encourage Others to Conserve, and the Participation dimension ($t=2.07$, $df=36$, $p < .05$ and $t=2.72$, $df=33$, $p < .01$ respectively). In addition, this group reported a positive association between Encouraging Others to Conserve and the Frugality dimension ($t=3.57$, $df=33$, $p < .001$). And finally, the public demonstrated a positive relationship between Extrinsic Motivation and Conveniences ($t=2.10$, $df=36$, $p < .04$).

The general framework of relationships is not unexpected. It seems plausible that a positive attitude and behaviour with respect to reducing one's demand for resources would be associated with deriving satisfaction from such things as frugality and participation. But what one might not expect is that this rich network of relationships exists primarily for the public respondents.

The data do not provide a clear explanation as to why the expert respondents do not share the public's rich network of associations. One might conjecture but whatever the reason the experts' perception of a situation is once again shown to differ somewhat from the public's view.

Conclusion

The demonstration of similarities and systematic differences between public and expert perceptions should be of interest to policy makers. While some reinforcement of existing beliefs can be desirable, nothing is more frustrating or wasteful of time and effort as using most education efforts to convince the public of something they already know and believe.

Alternately, certain strategies that water management professionals may take for granted as effective in managing demand may not be fully understood by the public. One example especially noted in this study is the altering of rate structures. Such issues are the logical focus of an education program—a strategy that both groups feel is effective. Money and effort spent on such programs would seem to have the support of experts and public alike.

The findings reported here suggest it may not be wise to develop water management programs based upon preconceptions of what the public thinks or wants. Demand management programs can be improved in both effectiveness and acceptability by first understanding the knowledge structure of the public and how it differs from the experts' understanding. It is probably less embarrassing to discover these differences during development of a management program than to have them uncovered during implementation of one's plan.

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