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Fairness Principles In Allocating Water: Integrating Views Of Different Agents

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ABSTRACT

The allocation, or re-allocation, of water to achieve environmental sustainability in farming communities can be a source of considerable conflict. “What’s fair” when sharing water between different agents and the environment becomes paramount in people’s decision making. Issues such as self interest; efficient uses of water; business investments; viable communities and prior rights to water all play a part in the ways people view the fairness of the allocation decision. The different agents will form their fairness rules in different ways. For example, the small family farmer will not want to be disadvantaged by the greater economic capacity of the corporate farmer. Those who have not used their allocations in the past may not consider it fair if they stand to lose their allocations, in the interests of achieving environmental sustainability, to those who have previously used their allocations and been a part of the over-allocation problem. What role can economic instruments play in achieving fair water allocation? When does the environment have greater rights over individual and societal needs? This paper draws on a number of case studies in rural Australia to see if allocation rules can be framed for the different community groups in deciding what’s fair in water allocation. More importantly, we explore whether investigation of these rules can contribute to gaining community consensus and suggest that Agent Based Modelling may be a useful tool for assisting in this.

KEY WORDS: social justice; fairness; water allocation; environmental sustainability; consensus.

1.0 INTRODUCTION

Currently, in Australia, negotiations between community and government are continuing on issues related to ensuring environmental sustainability while allowing for economically and socially resilient rural communities. “Fair” ways of balancing the self-interests of different groups and agents and accommodating those of the environment have yet to be incorporated in policy formulation and decision making despite escalating community conflict. It is not enough for the governments to espouse the policy of “equitable allocation” if the determinants of equity are unclear. There is a need to understand how people interpret equity, justice and other principles when the outcomes of decision making affect them personally. This will enable better prediction of judgements about the “fairness” or otherwise of government decision making, as well as addressing the likely impacts on the affected communities.

In deciding which measure of justice most clearly reflected the ways in which people judged justice, equity or fairness, a number of preliminary studies were conducted [Syme, Nancarrow and McCreddin, 1999]. We (and other authors) found that there seemed to be a large degree of overlap and correlation between people’s views on procedural and distributive justice and the role of equity considerations within these judgements [e.g. Folger, 1996]. For this reason the concept of the fairness heuristic [e.g. van den Bos et al, 1997], which allowed for this interaction, was adopted. We found as Peterson [1994, p99] suggests “once an impression of fairness has been produced it becomes extremely resistant to change because it provides a cognitively available summary judgement. People use their summary fairness judgement in lieu of a more complicated analysis of policy each time they are asked”.

Fairness in the Syme *et. al.* [1999] studies was measured at two levels “*universal*” and “*situational*”. In the *universal* sense, we

developed lay philosophies, or the principles and values that people wanted to see articulated in general terms in water allocation policy. *Situational fairness* judgments were made when respondents were asked to assess fairness of specific contexts, such as the development re-allocation policies in a particular river basin.

It was found that *universal* fairness judgements were remarkably similar over a variety of surface and groundwater allocation problems in a variety of states and with a diverse range of respondents over a number of years. On the other hand, specific *situational* fairness judgements varied between case studies, but were still able to be categorized under broad universal fairness principles. Furthermore, one latter study tended to suggest that consensus could be reached in a community on a fair way to proceed which catered not only for self-interest but also for the social well-being of the community. Given the significance of this finding it was important to replicate it across further studies in current and “real” water allocation conflicts.

In this paper we provide a summary of the findings of the developmental studies as well as the application of the theory developed to case studies where decision makers and water users were faced with the requirement to re-allocate water to provide for environmental sustainability. We further suggest where Agent Based Modelling (ABM) may have assisted in the decision making processes.

2.0 THE STUDIES

Australia is one of the driest continents on earth. As a result of a century of poor environmental practices; the regulation of rivers that reverse natural systems to provide water to irrigate agriculture in summer; increased populations and better scientific knowledge, it has become evident that the rivers and the groundwater have been over-allocated and in many cases over-used and current practices are not sustainable. Case studies abound in Australia where there are arguments as to how the water will be reallocated between competing consumptive (eg. irrigation; urban water supply; industry) and non-consumptive (eg. environment; recreation) uses. These have provided the opportunity for both the developmental and applied studies mentioned previously. Figure 1 shows the locations of these studies that have been conducted since the early 1990s.

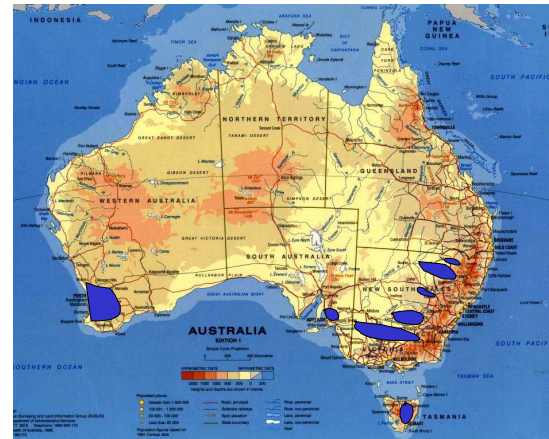


Figure 1: Map of Australia depicting the locations of the developmental and applied studies.

3.0 RESULTS OF UNIVERSAL FAIRNESS JUDGMENTS

Over a number of years and through a variety of qualitative and quantitative methods, a series of about thirty-five statements was developed that represented communities’ over-arching, lay philosophies of fairness when allocating water to multiple uses. These statements had been derived from Wenz’s [1988] review of the philosophy of environmental justice [see Syme and Nancarrow, 1996]. These included attitudes towards water as a common good, environmental rights, efficiency of use considerations, moral obligations between groups of water users, and economic rationalism through to virtue theory (those who already have the resource are inherently deserving) and different formulations of benefit/cost analysis. In addition, items relating to short and long term planning and procedural and distributive justice were embedded in them.

Measurement of these universal fairness principles through a questionnaire format on a five point agree/disagree Likert scale showed consistent results over more than 10 years and in a variety of water allocation decisions across Australia. It was shown that there is consistent strong (dis)agreement (>80% of study samples) on a number of universal principles such as:

- environmental management for future generations;
- the right of all sections of the community to have a say on how water will be allocated;
- the rights of the environment;
- the need for efficient water use;

and consistent disagreement on:

- prior rights or history of use determining future allocations; and
- the use of water trading markets to determine how water should be allocated.

However, it was also shown that these principles, although held at the universal level, may change given specific situations. For example, while prior rights to water may not be supported at the universal level of fairness, they can be supported in certain situations when the circumstances of those holding the rights are known.

A cluster analysis of the ratings of these universal fairness principles was conducted to determine whether there were identifiable, general philosophical stances taken by differing groups of people. This too resulted in consistent findings across multiple studies. Two identifiable groups constantly emerged from this analysis and a discriminant analysis was conducted to better understand the them. With minor queries, the groups in all studies could be labelled “public good” allocators and “private good” allocators. That is, one group was more inclined to a “social” emphasis on fair water allocation while the other was more “individually” focused on fairness. This is somewhat supportive of Rasinki’s [1987] two factor model of equity. These two groups each accounted for approximately half the respondents in each study and their identification provided a mechanism for demonstrating whether the specific solutions to water allocation challenges at a local level were considered to be fair by people with alternative universal fairness judgements. Working towards this end would provide the fair solutions at a society level that were being advocated by planners.

4.0 RESULTS OF SITUATIONAL FAIRNESS JUDGMENTS

Discussions with the range of agents associated with the applied studies, revealed many and wide-ranging criteria that were being promoted to resolve their specific re-allocation problems. Some examples included:

- irrigators using approved water efficient irrigation and re-use systems should not have their allocations reduced;
- only those who have caused the problem should have their allocations cut;
- *all* licence holders should have allocations cut proportionally, according to the amount of water actually used (ie. small cut for small users, and larger cuts for larger users).
- reduce the annual irrigation season;

- irrigators using approved water efficient irrigation and re-use systems should not have their allocations reduced.

While these criteria at first seemed to be highly diverse, closer examination revealed that they could be categorised under five broad universal fairness themes. These were:

- Equality of opportunity
- Reward for hard work and investment
- Allocation through historical water use
- Allocation through water trading markets
- Promotion of water efficient management.

Of particular interest was the consistency across the studies in people’s general acceptance of some of these themes as approaches for solving their specific water allocation challenges. Similarly there was consistency in the perceptions of the unacceptability of the other approaches. Tables 1 and 2 show the acceptability of some approaches as measured in the surveys and the percentages of respondents who considered other approaches to be totally unacceptable across four studies.

Table 1: Mean standardised ranking scores for acceptability of the five general approaches to solving the groundwater problems in four studies

Possible Approach	Mean Standardised Acceptability Rank			
	#1 N=287	#2 N=257	#3 N=65	#4 N=46
Efficiency & management	25.0	23.3	25.3	22.2
Equality of opportunity	24.9	25.2	25.7	23.0
Reward for hard work & investment	20.2	22.2	24.7	22.5
Historical use	16.2	14.5	16.4	17.8
Water Markets	13.7	14.8	13.8	14.5

Table 2: Percentage of respondents who considered the general approaches to problem solving to be *totally* unacceptable in four studies

Possible Approach	% of Total Sample			
	#1 N=287	#2 N=257	#3 N=65	#4 N=46
Historical use	35	19	14	22
Water markets	31	18	31	28
Reward for hard work & investment	17	9	12	2
Efficiency and Management	11	7	6	20
Equality of opportunity	9	7	11	15

Respondents were also asked to rate the acceptability of the individual situational criteria, grouped under the themes, for re-allocating the irrigation water. Again, the difference between universally held beliefs and situational circumstances was shown. While “history of use” was not supported as an acceptable approach to resolving the allocation conflict, in one of the studies, situational criteria under this approach were supported. Respondents’ understanding of the particular circumstances allowed them to support the criteria.

Analyses were then carried out to ascertain the least number of situational criteria that could be used to develop a re-allocation solution that would ensure that the needs of everyone in the sample of respondents were included in at least one of the criterion. For example, one of the studies resulted in a “four item solution” that provided for 96% of the sample, as shown in Figure 2.

- *Any reductions in allocations should provide protection for the “family farm”.*
- *A viability base should be set, and license holders with allocations less than that base should not receive cuts.*
- *Irrigators who are fully active, and have invested in their properties, should not have their allocations reduced by more than those who have little or no investment in their properties.*
- *Allocations should be reduced and the amount of water allowed to carry-over to the next year should be increased for a longer period of time.*

Only six percent of the survey sample did not have at least one acceptable criterion incorporated in the solution. On inspection, it was found that

these six respondents had not answered the particular question in the questionnaire. As they could not be attributed to any particular demographic group, it was assumed that the solution was not marginalizing any specific group of agents..

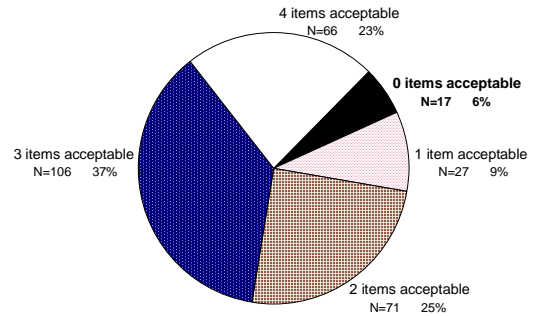


Figure 2: Percentages of respondents who nominated different numbers of situational criteria as acceptable in developing a solution to the water over-allocation problem.

As the four items show above, and in all of the studies, examination of the criteria that made up the situational solutions revealed that most respondents were promoting criteria that not only catered for their own self-interest, but also catered for other groups in the community. That is, people were making their decisions based on not only their own personal needs, but also the requirements for ensuring the ongoing viability of their communities.

5.0 WHAT NEXT?

The above results illustrate the complexity of people’s fairness judgements when it comes to deciding how to allocate or re-allocate water to ensure environmental sustainability. People hold particular values at the universal level and these can carry through to specific situations in that people are very clear about acceptable and unacceptable management approaches. We identified two groups in society whose values in this regard are generally opposing.

We have also shown that people can provide a range of situational fairness criteria for developing solutions to the allocation problem, and these can be reduced to an operable number which still includes everyone in the solution.

We have also shown that rational choice plays little place in people’s decision making in that they are as much concerned about the viability of

the whole community's future as they are about their own.

In one of the studies, this point was reached and a way forward was recommended to the government department dealing with the problem. This entailed taking the four situational fairness criteria above and working with the community to develop a range of futures that incorporated these criteria and to come to a negotiated final decision on the fairest solution. This, we advised, would take about eighteen months, given the difficulty of the problem, the extent of conflict, and the potential hardship for many of the irrigators.

We were advised that, given the political agenda and the looming election for the state government, a solution was required in about four months and that they would have to find another way. We were dismissed.

It now seems to us that ABM may have provided the tool whereby this fairness process could have been completed and a negotiated solution achieved in the required time frame. Being social scientists, our understanding of the intricacies of ABM is limited, however, reading Kurz and Snowden [2003] reinforced our thoughts in this regard.

This article challenges the three basic assumptions in organizational decision support: those of order; rational choice and intent. Kurz and Snowden's (2003) discussion on the realities of contextual complexity and un-order epitomises much of what we have described above. A goal of their contextualized framework "... to enable clients to achieve self-awareness rather than to provide "expert" advice" would be a highly valuable tool to use with Australian farmers who constantly provide derisive comments about the value of "experts" and the usefulness of their advice. In using their justice criteria as "rules" for evaluating different water sharing scenarios, people would be able to see their values influencing the decision making process. ABM could provide the vehicle to do this.

We assume there are other ABM and network frameworks that may be useful in this case, but this demonstrates that there may be some potential for a decision support system to finally be useful in the complex social arena. Achieving social justice in natural resources management is something that many government decision makers grapple with and the research described in this paper shows that it will not be easily understood by other than a social scientist. If ABM can provide an easy tool to assist lay people to achieve social justice, one could begin to expect

its routine inclusion in NRM decision making and hence more cooperation by farmers in achieving environmental sustainability that is becoming more and more urgent worldwide.

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