COMMUNITY VALUES FOR GREEN PUBLIC OPEN SPACE IN PERTH, WESTERN AUSTRALIA – A CHOICE MODELLING ANALYSIS

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ABSTRACT

With a drying climate, Perth is facing difficult decisions about how to manage green public open space (POS) in the metropolitan area. At present, local councils irrigate POS with groundwater. But this resource is becoming depleted owing to reduced recharge, prompting the State government to consider reducing licensed allocations. In this study we use a choice modelling survey of 525 Perth households to assess whether community is prepared to pay for more expensive sources of irrigation water to keep POS green over summer or, alternatively, are willing to make compromises – e.g. less green space, replacing grass with native groundcover, or improving public park facilities. The aim of the study is to understand how local councils and government should best respond to reduced groundwater availability.

INTRODUCTION

To our knowledge, this is the first time that choice modelling has been used to evaluate community preferences and values for alternative attributes of green POS. The study focuses on how people value different management outcomes for public parks and median strips, including changes in the area of grass kept green over summer, increases in native groundcover, and improvements to park facilities (such as shade shelters, picnic facilities and playgrounds).

Groundwater is an important source of urban water supply for metropolitan Perth and is the primary source of irrigation water for public parks. But groundwater resources are coming under pressure. For example, the Gnangara groundwater system just north of Perth has come under increasing stress over the last 40 years or so as Perth's annual rainfall has progressively declined due to climate change. Further, the volume of groundwater abstracted has increased by more than 500% since the mid 1970s to meet the needs a growing population (Department of Water, 2009).

In the Gnangara groundwater area alone, about 46 gigalitres, equivalent to 16% of all abstraction from the Gnangara groundwater system, is used for watering public parks (Department of Water and Environmental Regulation, 2018).

Due to concerns about the long term sustainability of the groundwater resource, the WA state government is considering a range of measures to reduce groundwater use. Cuts to council water allocations for watering POS may be one element of a broader package of options. However, if this policy results in the area of green POS being reduced, it is unclear what costs this would impose on the community. These costs are difficult to quantify because they are non-market impacts – e.g. reduced enjoyment from using a park.

Previous economic valuation studies indicate that urban communities do value the benefits of green POS. For example, a study by Morrison and Mathieson (2008) found that the net social benefits of a 5% increase in green open space were worth between $1.4 million and $1.7 million ($2015-16) for the Ashfield and Mosman local government areas in Sydney, respectively. The benefits valued were environmental services, increased property values and reduced health issues such as obesity and depression. The CRC for Water Sensitive Cities (2017) has used a hedonic pricing approach and estimated that Australian households are willing to pay between 9% and 16% more for a house that has access to POS.

However, less attention has been paid to understanding what features of POS are valued by the public, their willingness to substitute irrigated grass for other forms of landscaping, and how values change 'at the margin' when POS is altered from its current form. Hedonic analysis is a relatively weak tool for understanding these marginal values and tradeoffs because it relies on establishing a statistical relationship between observed property prices and proximity to POS. Choice Modelling (CM) is a more suitable approach because it is specificallly designed, through a controlled experimental framework, to assess how people make trade offs

between alternatives and the attributes (or features) that make up the alternatives. Further, it offers control over how alternatives are presented to people for valuing, and enables future 'what if' scenarios to be assessed.

METHODOLOGY

CM is is a well-established technique for valuing non-market benefits. It typically involves asking people a series of up to eight questions, each providing the respondent with a description of three alternatives and asking them to select the one they prefer. One of these alternatives, which is offered in each choice question, describes the outcomes under an existing management system (the 'base case' scenario). The other two alternatives describe outcomes resulting from management changes. Each alternative represents a package of outcomes defined in terms of 5 to 6 attributes. The attributes describing the management change alternatives vary from question to question in accordance with an experimental design, allowing the impact of different levels of outcomes to be tested.

The observed choices of alternatives are pooled across all respondents and a multinomial logit model is used to explain the statistical relationship between the choices and the attributes (together with other explanatory variables such as respondent demographics).

Base case scenario

In this study, the base case scenario was defined as having the following attributes:

- a 20% reduction in the proportion of green POS able to be kept green through summer (which is considered to be a plausible outcome given the scale of groundwater allocation cuts being contemplated);
- no conversion of grassed areas to native groundcover,
- two parks each year receive upgraded facilities (representing current practice); and
- no increase in council rates.

Other alternatives

We explained to respondents that instead of the base case, councils could maintain or increase the area of irrigated grass by switching to a different water source (e.g. scheme water or recycled water) or by investing in water efficiency technologies. Alternatively, councils could replace some grassed areas with native groundcover that needs less water. Another response could be to 'compensate' for losses in grassed area with additional investment in facility upgrades (BBQs, shade shelters, playgrounds etc.). Respondents were advised that, unlike the base case, all of these options would involve a specified increase in council rates.

An example of how these choices were presented to respondents is contained in Figure 1.

Different combinations of choice alternatives were defined by specifying particular levels for each of the attributes (see Table 1).

Supplementary questions

Outside the CM framework, we also asked survey participants a number of supplementary questions about the things they most liked about their suburb; features they most liked about their local park; and changes that would make their local park more appealing. These questions help to contextualise the choice information gathered through CM.

Survey administration

The survey was administered as a web-based questionnaire, with recipients recruited through an internet panel. Eligible recipients for the survey were screened as follows: They had to live in the Perth metropolitan area, be aged 18 years of age or over, and own the home they live in, with or without a mortgage. The data was weighted to ABS statistics for age, gender, tertiary education and full-time employment status, within the Greater Perth Statistical Division, filtered to be representative of owner occupiers.

RESULTS AND DISCUSSION

Responses to supplementary questions

Almost half of the respondents (47%) rated public parks and gardens in their top five factors that they 'most like' about their suburb. In relation to the most liked features of local parks, the most common response was 'open grassy areas' (41% of respondents ranked this factor in their top five). While it is clear that grass is well-liked, we were interested to know more about peoples' preferences for how this grassed area is managed.

In a follow up question about what changes to existing park features would *improve* the appeal of parks, we found that the most common preference was 'more regular upgrading of existing facilities' (34% of respondents ranked this in their top five). Just 10% ranked 'keeping *more* grassed areas watered over summer' in their top five.

When asked what features would *reduce* the appeal of parks, 21% thought that parks would become less appealing if less grassed area was kept green over summer. Most respondents were not opposed to converting some grass to native groundcover. Only 15% appear to hold the view that this would make parks less appealing. Among the top-ranked concerns for most respondents were the removal of trees, increased litter, and less well maintained facilities.

Willingness to pay for green space

Values for green POS were estimated using responses to the choice questions (ie CM). Just over a third of respondents (38%) selected the base case option across all choice questions. We infer that this is the proportion of the community that prefer to let some green POS go brown over summer, as opposed to paying extra money through their rates to maintain watering levels. When these respondents were asked why they had selected the base scenario, the majority gave reasons suggesting that the benefits of maintaining watering of POS throughout summer were not sufficiently high to justify any of the rate increases presented to them.

Figure 2 summarises the willingness to pay (WTP) values for each of the attributes tested[1]. The results show that on average, Perth households are WTP $1.00 per annum to avoid a 1% reduction in the area of green POS in their local area. Thus, if councils responded to a licence reduction by reducing the area of green POS by 20%, the cost of lost amenity to the community is estimated to be $20 per year (the marginal value is linear over the entire range). When extrapolated to the 800,000 households in Greater Perth, we assess the total WTP for avoiding a 20% loss to be $16 million per annum.

The $1.00 per 1% loss estimate is an average value across all households. When the choice model is re-estimated for just those households living in high density suburbs, the valuation increases to $1.48 per 1% change, which suggests that people living in these suburbs place a higher value on green POS, possibly because they only have a small garden on their own property, or none at all if living in an apartment.

In the case of other attributes examined, on average people are WTP $0.87 for every 1% increase in the area of grass converted to native groundcover (suggesting that groundcover is a close substitute for grass over the range tested). Upgrades to park facilities are valued highly at $4.16 per year for each additional park that is upgraded. A value for public road verges and median strips kept green through summer is not shown because this variable was not statistically significant in explaining choices.

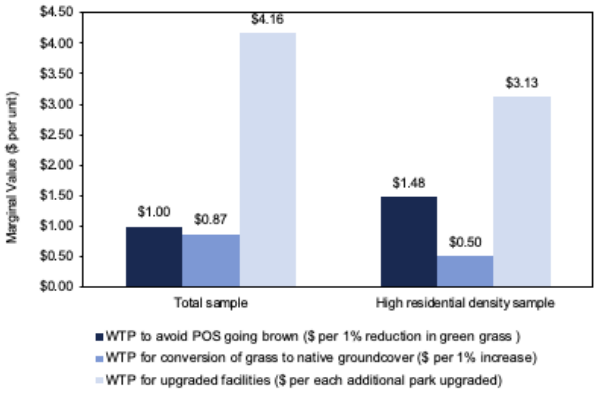

Figure 2: Willingness to pay for POS attributes

CONCLUSION

This study has shown that, on average, the Perth community does value the maintenance of green POS over summer using current levels of watering, but the values are lower than might be expected, based on previous literature. The results demonstrate that people are prepared to trade-off green grass with substitutes such as native groundcovers and improved park facilities.

That being said, the study was confined to testing values for a relatively minor reduction in the area of green grass over summer (just 20%). A higher WTP to avoid losses may have been evident had a more significant reduction been tested.

The valuation results do help to inform policy decisions about the community impact of groundwater allocation cuts in Perth's Gnangara area. About 154,000 households reside in this area, which collectively are estimated to be WTP $3.08 million to maintain POS in green condition over summer. If groundwater use for POS was restricted by 10 to 20 per cent in Gnangara region, this would imply a loss of between 4600 and 9200 megalitres (ML) for irrigation. If the consequent impact of this action meant that councils reduced their irrigated area by 20%, based on our findings the community value for irrigation water (as a means of maintaining green POS over summer) would range between $0.33 to $0.67 per kilolitre (kL), depending on the volume restricted. This would be the indicative amount community would be prepared to pay for an alternative water source. We note that this value is significantly lower than the current long run marginal cost of potable water in Perth, which is around $2.40/kL.

[1] The parameter estimates for the choice model are shown in Table 2. The model was estimated using choices from 425 respondents (100 were removed from sample as 'non-usable')

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Outcomes	Base Case	Alternative B	Alternative C
% of local parks and gardens kept green over summer	20% reduction	10% reduction	5% increase
% of public road verges and median strips kept green through summer	20% reduction	Same as current	10% reduction
% of grass converted to native plants	None	5%	10%
Number of local parks and gardens receiving upgraded facilities each year	About 2 parks per year (current rate)	About 3 parks per year	About 4 parks per year
Additional annual cost per household in rates	$0	$50	$100

Figure 1: Example choice set

Table 1: Attribute levels

Attribute	Base Case	Alternatives
Change in the proportional area of parks and gardens kept green over summer	20% reduction	-15%, -10%, -5%, no change, + 10%
Change in the proportional area of public road verges and median strips kept green through summer	20% reduction	-20%, -15%, -10%, no change, + 10%
Proportion of grass converted to native plants	None	5%, 10%, 15%, 20%
Number of local parks and gardens receiving upgraded facilities each year	About 2 parks per year	2 parks/yr 3 parks/yr 4 parks/yr 6 parks/yr
Additional annual cost per household in rates	$0	$40, $80, $120, $180, $250

Table 2: Parameter estimates for the choice model

	Total Community		
Variable Description	**Coefficient**	**z**	**Izl>Z**
Attribute 1: % local parks & gardens kept green	.01286*	1.84	0.066
Attribute 1: Indicator of 'increase 10% level'	-0.17635	-1.2	0.230
Attribute 2:% of public road verges & median strips kept green	-0.00233	-0.73	0.465
Attribute 3:% grass converted to native plants	.01123*	1.84	0.065
Attribute 4:# local park/gardens with upgraded facilities / year	.05358**	2.36	0.018
Attribute 5: Additional annual cost per household in rates	-.01288***	-21.31	0.000
Alternative specific constant for 'Do nothing scenario'	3.51058***	12.26	0.000
Gender (Male =1; Females=0)	.34486***	4.16	0.000
Age in years	-.01185***	-3.76	0.000
Attachment to neighbourhood green spaces	-.25816***	-13.11	0.000
Visual appeal of local median strips	-.17727***	-4.96	0.000
Residential density	-1.26491***	-3.63	0.000
Tertiary (1 if have degree, 0 otherwise)	-.23612***	-2.73	0.006
Small open grassed area	-.51743***	-5.62	0.000
Increased appeal if water parks not currently watered	-.54343***	-5.09	0.000
Reduced appeal if less watering of grassed areas over summer	-.16299*	-1.7	0.089
Have children under 15			
Choice observations		3400	
Log likelihood		-2431.36	
AIC/N		1.44	

***, **, * denotes statistical significance at 1%, 5%, 10% level.