Stakeholder values and attitudes towards water markets across northern Australia

W. Nikolakis, R.Q Grafton & H. To [a]

August 2010

TRaCK
Tropical Rivers and Coastal Knowledge

Crawford School of Economics and Government
The Australian National University

(Photo taken by William Nikolakis)

Australian Government
Department of Sustainability, Environment, Water, Population and Communities
National Water Commission
Fisheries Research and Development Corporation

NAILSMA

Disclaimer

TRaCK has published the information contained in this publication to assist public knowledge and discussion and to help improve the sustainable management of Australia's tropical rivers and coasts. Where technical information has been prepared by or contributed by authors external to TRaCK, readers should contact the author(s), and conduct their own enquiries, before making use of that information. No person should act on the contents of this publication whether as to matters of fact or opinion or other content, without first obtaining specific independent professional advice which confirms the information contained within this publication.

While all reasonable efforts have been made to ensure that the information in this publication is correct, matters covered by the publication are subject to change. Charles Darwin University does not assume and hereby disclaims any express or implied liability whatsoever to any party for any loss or damage caused by errors or omissions, whether these errors or omissions result from negligence, accident or any other cause.

Copyright

TRaCK brings together leading tropical river researchers and managers from Charles Darwin University, Griffith University, the University of Western Australia, CSIRO, James Cook University, the Australian National University, Geoscience Australia, the Environmental Research Institute of the Supervising Scientist, the Australian Institute of Marine Science, the North Australia Indigenous Land and Sea Management Alliance, and the Governments of Queensland, the Northern Territory and Western Australia.

TRaCK receives major funding for its research through the Australian Government's Commonwealth Environment Research Facilities initiative; the Australian Government's Raising National Water Standards Program; Land and Water Australia; the Fisheries Research and Development Corporation and the Queensland Government's Smart State Innovation Fund.

Nikolakis, W., Grafton, R.Q. and To, H. (2010).Stakeholder values and attitudes towards water markets across northern Australia. Charles Darwin University, Darwin.

For further information about this publication:
William Nikolakis, Australian National University
Email: william.nikolakis@anu.edu.au

Or to find out more about TRaCK

Visit: http://www.track.gov.au/
Email: track@cdu.edu.au
Phone: 08 8946 7444

ISBN: 978-1-921576-25-6
Published by: Charles Darwin University
Printed by: Charles Darwin University

Contents

Tables and Figures

Tables

Figures

Summary

This report is the second of three reports and part of a two year project entitled *Establishing water markets in northern Australia: a study to assess feasibility and consequences of market-based mechanisms of water delivery* undertaken through the Australian National University's Crawford School of Economics and Government. The Tropical Rivers and Coastal Knowledge (TRaCK) hub funded this project under Theme 6.1 "Sustainable Enterprises". This research is also being done in collaboration with the North Australian Indigenous Land and Sea Management Alliance (NAILSMA). This second report provides analysis of stakeholder attitudes and values and their implications for the design of water markets across tropical Queensland, Northern Territory and Western Australia, (with focus on the Gulf, Timor and North East drainage divisions). The study utilised a mixed qualitative and quantitative approach, employing a survey with closed ended (5 point Likert scales and multiple choice) and open ended measures.

In Task 2 we surveyed 120 people from government, Indigenous, industry and recreational user groups and present a range of values and attitudes related to markets and we discuss the general implications for market design in the north. Analysing data from open ended measures involved coding and grouping data into categories, then identifying patterns and themes. While statistical analysis involved ordered probit models, using *robust* standard errors and also controlling for lack of independence within each group using *cluster*. Preliminary findings were sent out to respondents for their feedback and where appropriate changes made. From this the final report was produced.

Our findings highlight that sustainability; environmental protection; social justice and equity; and economic development were important values to respondents in relation to water markets. Respondents emphasised the importance of robust water planning frameworks that support ecological values and irrigator and Indigenous livelihoods, and respondents overwhelmingly disagreed with the trade of environmental and cultural flows. There was also significant support for the preservation of certain catchments and aquifers for their unique values (particularly among Indigenous respondents). Social justice and equity were important to respondents, with a sentiment to include Indigenous people in water reform and in water markets. Indigenous respondents felt that current arrangements were not equitable. As well, respondents from government, Indigenous and recreational groups felt that consultation and water policy fail to adequately address the needs and interests of Indigenous Australians. Indigenous respondents showed support for water markets, the development of water based enterprise (such as agriculture and horticulture) and believe strongly that the benefits of water trading will be significant. These views were tempered by some concerns that Indigenous people may be alienated from markets and that the ecological impacts from markets could be significant.

Respondents felt that water management was sustainable in their region, but at the same time they did not believe water management to be efficient. This may be related to perceptions that certain systems are not over-allocated to consumptive users. A little over half of respondents agreed that water markets help sustainable water management and that water should be a tradable commodity, and respondents that

were male and had a higher education were more likely to agree to these statements. Support for separating land and water title (unbundling) was mixed, with Indigenous respondents less likely to agree to a separation. There is a sentiment that is opposed to water transfers among respondents. Those respondents that considered themselves to have a high level of understanding of water management in their jurisdictions were more likely to agree to water transfers. There was unanimous support for government involvement in water markets, with overwhelming support for government as regulator.

Literature highlights that importance of integrating values and attitudes in resource management frameworks. We identify four general implications for the design of water markets from our findings. The first is that Indigenous involvement in water markets and reform is important as one way to address Indigenous disadvantage and to support Indigenous livelihoods. This involvement could range from water management and planning, to the recognition of customary and commercial rights. Second, respondents thought that the general community should have greater involvement in water management and planning. This would require education programs to improve awareness of reform and increased support for stakeholder input into reform, particularly where language barriers and cultural differences exist. Third, given the importance of sustainability and environmental protection, it is recommended that markets develop within a planning framework, with robust but simple trading rules to protect ecological and customary values. Fourth it was emphasised by some respondents that there should be minimal red tape and costs associated with markets given the marginal operating conditions for producers across the north.

Further research could build on this exploratory work to improve understanding of how to involve Indigenous interests in water markets, and examine the attitudes and values of a broader range of stakeholders across the north (such as examining women's attitudes and values to water markets across the north).

Acknowledgements

The researchers would like to thank respondents for taking time to participate in this study. We are also grateful for the support of NAILSMA and staff, CEO Joe Morrison, Hugh Wallace Smith and Michael Storrs, as well as Indigenous Community Water Facilitators Tonia Murray, Sonia Leonard and Peter Pender. Finally we would like to thank Sonia Akter for providing advice on the surveys.

Abbreviations

COAG	Council of Australian Governments
CTH	Commonwealth
MDB	Murray Darling Basin
NAILSMA	North Australian Indigenous Land and Sea Management Alliance
NT	Northern Territory
NWC	National Water Commission
NWI	National Water Initiative
QLD	Queensland
TRaCK	Tropical Rivers and Coastal Knowledge network
WA	Western Australia

Glossary

Aboriginal Freehold:	Land designated under the Aboriginal Land Rights Act (1976) (Northern Territory) for Indigenous traditional owners in the Northern Territory.
Aquifer:	An underground geological formation which can yield quantities of groundwater for extraction.
Consumptive Pool:	The actual volume of water made available for consumptive use, which generally set out in a water plan for the specific resource.
Consumptive Use:	Water made available for private use, for both commercial and personal activities.
Cultural Flow:	An allocation of water to be managed by Indigenous peoples to meet their unique customary aspirations in their traditional territories.
Efficient:	Does not involve wastage of resources.
Environmental Flow:	The amount of water necessary to maintain the health of a waterway and dependent ecosystems.
Equitable:	All relevant parties are treated equally and fairly.
Native Title:	Those rights and processes accorded under the Native Title Act (1993) (Commonwealth) to Indigenous Australians.
Sustainable:	The responsible management and allocation of water resources, guided by the aim of balancing all the competing needs for water.
Tradable Commodity:	Something which is sold simply as a good and price is determined by supply and demand.
Unbundling:	Is part of the water reform process that separates water from land title and converts it into a water access entitlement or water allocation.
Water Access Entitlement:	An ongoing entitlement to exclusive access to a share of water from a specific consumptive pool defined in a water plan.
Water Allocation:	The amount of water provided in a licence to use or for water access entitlements in a given period as identified in the rules of the specific water plan.
Water Market:	Allows water trading to occur.

Water Trading:	Involves the buying and selling of water access entitlements, also often called 'water rights'.
Water Plan:	A statutory plan or government endorsed water allocation plan for both surface and groundwater systems which is developed using scientific assessment and done in consultation with stakeholders to support sustainable water use.
Wild Rivers:	Declarations to preserve a river system under Wild Rivers Act (2005) (Queensland) which limits development

1. Project Overview

This study, entitled "*Establishing water markets in northern Australia: a study to assess feasibility and consequences of market-based mechanisms of water delivery*," is a two year project, funded through, theme 6.1 of TRaCK. There are three tasks for this project:

1. Analyse current institutional arrangements and constraints for establishing water markets across Queensland, NT and Western Australia,[1]
2. Analyse key stakeholder attitudes and values relating to water trading and consideration of the implications for the establishment of markets,
3. Assess the costs and benefits of introducing water trading to northern Australia ensuring consideration of efficiency, effectiveness and equity criteria. This assessment should include consideration of
    - Likely adoption rates
    - Administrative and transaction costs
    - Environmental consequences
    - Political feasibility
    - Social justice issues relating to Indigenous (non-market) livelihoods
    - Alternate non-market approaches to meeting north Australia's water allocation needs.

This report, Task 2, examines stakeholder attitudes and values to water markets and how these may inform the design of markets across the north.

[1] Task 1 examined institutional arrangements for water markets across northern Australia and the constraints present, this report is available at: http://www.track.gov.au/publications/registry/772

2. Introduction

This study examines stakeholder values and attitudes to water markets across northern Australia (see Figure 1 for map of area). Stakeholders are taken to comprise individuals from the following groups: industry, Indigenous, government and recreational users. The findings from this study may improve understanding on how markets are to be structured, as well as inform the rules and processes relating to equity and the environment.

Northern Australia is made up of three jurisdictions: the two states of Queensland and Western Australia (WA), and the Northern Territory (NT). The north Australian region makes up a quarter of the country's land base, but only 2 percent of Australia's population reside here (approximately 310,000 people), and approximately 110,000 people are Indigenous Australians, an estimated 16 percent of the nations total Indigenous population (Carson et al., 2009). Thirty percent of the north Australia's land base is owned by diverse Indigenous peoples (Altman et al., 2009). This land is owned under a variety of tenures, much of it communally in trust. About 94% of northern Australia's rainfall occurs from November to April, and many of the 55 river basins spread across the north are culturally and ecologically significant (Creswell et al., 2009). Creswell et al. (2009) identify that most rivers are seasonal across the north and the connection between groundwater and surface water is highly important for dry season flows. The authors conclude that despite there being a relatively small amount of water committed to consumptive uses across the north, all water is fully utilised (much of it for non consumptive purposes such as the environment).

Figure 1: Map of northern Australia (Source: Tropical Rivers and Coastal Knowledge network)

Water has been the focus of national reform in Australia, with several jurisdictions pursuing the development of water markets and their institutional underpinnings to efficiently allocate water among users and facilitate an equitable adjustment (COAG, 1994; NWC, 2009a; NWI, 2004; Pigram, 1993; 2006). Water markets enable the purchase and sale of whole or part of transferable water access entitlements or allocations. The movement towards a system of water access entitlements requires the development of institutional arrangements to support the function of a trading

framework (such as for example the separation of water from land title). This reform has largely been driven by the National Water Initiative 2004 (NWI) which is a commitment by all jurisdictions in Australia to develop a water trading framework (among other reforms such as statutory water planning) (NWC, 2009b). The NWI is regarded as the most important reform of water resources in the nation's history (Connell, Dovers and Grafton, 2005).

This work aims to assess the values and attitudes of stakeholders across northern Australia towards water markets. Values are identified in the seminal work of Rokeach (1973; 1979) as being a preferred state of existence (such as for example equity and freedom) and for conduct in achieving this end state (e.g. respect and responsibility). Values are the standards by which we assess the behaviour of society, and individuals. Attitudes are seen as evaluative responses that are favourable, unfavourable or ambivalent to objects, issues or events (Eagly and Chaiken, 1993; Petty et al., 1997; Tesser and Shaffer, 1990). We use these definitions for values and attitudes in this report. The purpose of this research is not to test the strength of attitudes or to determine whether values are predictive of attitudes and behaviour— these would require different methods to bring understanding. Rather this study is exploratory aims to identify what attitudes and values are present among various stakeholder groups in each jurisdiction in northern Australia to water markets and supporting institutional and regulatory arrangements (i.e. unbundling, Indigenous access, statutory planning, consultative mechanism and other reforms as set out in the NWI 2004). To do this we use a mixed qualitative and quantitative approach, combining closed ended (such as 5 point Likert scales and multiple choice) and open ended measures which allow respondents to describe phenomenon in their own ways and in local contexts— we then compare data with existing documentation and literature to enhance the validity of findings (Jick, 1979).

Almost all water trading occurs in southern Australia (NWC, 2009a) and it is acknowledged in this report that given the lack of water markets and trading in northern Australia there may have been little direct exposure among the general population to water markets. In some instances this work shall assess stakeholders who may have had little or no interaction with water markets and trading. However, we purposely selected individuals who have some awareness of, or an interest in water reform. We then utilised a snowball approach to access further individuals. Also, across northern Australia Indigenous interests are prominent, there may be language and cultural differences which we actively addressed through the use of Indigenous Community Water Facilitator networks (facilitated through NAILSMA) and interpreters. Understanding Indigenous attitudes and values towards water markets comprises an important part of this study.

3. Literature Review

3.1 Introduction

Understanding and integrating stakeholder attitudes and values into resource management decision frameworks is identified as important in the literature (Beckley et al., 1999; Hermans et al., 2006; Syme and Hatfield-Dodds, 2007; Syme et al., 1999). First it is seen as important by ensuring institutions (and their decisions) are supported by stakeholders and viewed as legitimate (Hadjigeorgalis, 2009; Syme and Hatfield-Dodds, 2007. Second, by understanding values, it increases the ability of parties to resolve conflict by offering a range of alternatives to stakeholders involved in disagreement (Hermans et al., 2006). The need to understand stakeholder values is especially important for managing common pool resources (such as groundwater) which are difficult to exclude users from (Ostrom et al., 1994).[2] Most literature on stakeholder attitudes and values to market based mechanisms for water distribution is focused on the southern Australian context where functioning trading regimes operate (Tisdell and Ward, 2003; Tisdell et al., 2001). However, Straton et al. (2009) examined the use of water markets with irrigators in Katherine in the Northern Territory.

This section will review literature on water markets, stakeholder theory and attitudes and values.

3.2 Water Markets

Water planners, managers and policy makers have over the last three decades put more focus on demand side strategies to deal with water scarcity, part of this is considering the use of market based instruments to improve water use efficiency and productivity (Gleick, 2003). Creating transferable water use rights to facilitate trade has been successfully implemented to manage water in developed jurisdictions such as the United States (in some western states) and Australia to overcome scarcity in agricultural and urban water supplies. However, globally the use of markets to manage water resources remains insignificant (Hadjigeorgalis, 2009). The over-allocation of water resources and drought encouraged policy makers in Australia to consider markets as a tool to re-allocate water (Crase, Pagan and Dollery, 2004). Water trading is hoped to allow water to be allocated to its most valuable use (be it productive or environmental uses) and is a central tenet of National Water Initiative (NWI) led national water reform (NWC, 2008).

The Australian water market is composed of administratively and geographically defined areas for trade and there are a variety of water products, the two most commonly traded (i.e. leased, transferred or amalgamated) are water access entitlements followed by water allocations (NWC, 2009a). The largest segment of trade is that of entitlements, in 2008–09, the total volume in trade of entitlements was 1800 GL (a 95% increase from 2007–08) with a total value of $2.2 billion (NWC,

[2] In the north Australian context Straton et al. (2009) identify groundwater resources as a common pool resource which is important in the region—the authors identify management of this resource as a priority.

2009a). The estimated value of market turnover for entitlements and allocations shows an increase from $1.7 billion in 2007–08 to $2.8 billion in 2008–09. From market turnover value estimates nearly 98% of trade in entitlements and allocations occurs in the southern states of NSW (which has the bulk of trades) followed by Victoria and then South Australia (NWC, 2009a).

Institutional Arrangements

The ability to trade water has existed for some time in jurisdictions in southern Australia, where governments sought to unbundle land and water to facilitate trade two decades ago (Brooks and Harris, 2008). The Council of Australian Governments (COAG) (1994) proposed a common approach to the institutional arrangements for water markets in the Water Reform Framework. Several targets were identified in the COAG (1994) framework, important among them were: setting a path to establish a clear property right to water (unbundling title from land), encouraging market mechanisms and the potential for interstate trade, and the recognition of environmental flows. A National Competition Policy in 1995 built upon these COAG water reform commitments particularly around expanding tradable allocations and entitlements, cost recovery and pricing, environmental water, and improving stakeholder consultation and engagement (Pigram, 2006). In 2004, the NWI established an agreement among all state and territory governments to commit to reform. The aim of the NWI was to improve the management of water through enhanced and consistent regulatory and planning processes. NWI led reform essentially signalled a shift in southern Australia towards establishing a property rights approach to water management (Connell, Robins and Dovers, 2007). These property rights would recognise social, ecological and cultural considerations through a rigorous statutory water planning framework (Gentle and Olszak, 2007). Water trading is considered to be central to NWI reform (NWC, 2008). [3] As well the NWI (2004) sets the following targets:

- Best practice pricing (reflecting the actual cost of storage and delivery)
- To remove barriers to water markets and develop institutional arrangements to promote efficiency and trade in water (such as unbundling) (Clauses 58-63)
- To develop statutory water plans that recognise consumptive and non consumptive users
- Create a risk sharing framework to enable flexibility and adaptability in line with water availability
- Recognise Indigenous access to water and account for water used for native title or cultural purposes (Clauses 52-54)
- Create standards for water accounting, metering and monitoring to improve knowledge and efficiency

[3] The buying and selling of water access rights may occur temporarily or permanently. The NWC identifies a permanent trade as "transfer of water access entitlement from one legal entity to another, with or without a change in location" (NWC, 2008: xii). While a temporary trade is an "assignment of water allocation from one authorised user to another, or between water accounts held by the same water user, with or without a change in location" (NWC, 2008: xiii).

The National Water Commission (NWC) is charged with assessing the pace of water reform as prescribed by the NWI, and in its most recent assessment the NWC (2009b) argues that more work is required generally across Australia in unbundling of land and water title, that consistent reporting be adopted, and there be more information on third party impacts in water planning.

Benefits and Challenges of Markets

Water markets it is argued provide flexibility to agricultural producers to deal with change effectively, for example the ability to trade during the drought in southern Australia reduced the negative impacts on livelihoods (NWC, 2009b). Other benefits of water trading as a demand side solution to water scarcity include protecting in-stream flows and the environment, as well as supporting structural adjustment and encouraging efficient use through appropriate pricing (Hadjigeorgalis, 2009). Pigram (1993) offers that markets are useful in the effective allocation of water as well as reducing conflict among users, but he suggests that social, economic and political considerations must be reflected in markets through an appropriate mix of incentive and rule based approaches. Chong and Sunding (2006) outline that imperfect water markets can have effects such as externalities and third party impacts, particularly where there is groundwater and surface water connections (with impacts on the environment and downstream users) as well as transaction costs. The authors' state that water is not a regular commodity as quantity is only one consideration, water is highly variable and requires regulation of markets to ensure efficiency in allocation and use (Chong and Sunding, 2006). Some authors posit that markets may exacerbate ecological problems as all water is put to use (through the activation of sleeper entitlements) (Crase, Pagan and Dollery, 2004). For a water market to be effective, the NWC (2009b) offers that water should be freely tradable without constraints (other than to reflect hydrological and ecological considerations); there must be free market access with minimal transaction costs; there must be a diverse range of water products; and there should be no third party impacts (such as the on the environment and non consumptive users).

Syme and Hatfield-Dodds (2007) argue that Australia's water reform agenda has prioritised economic values (such as improving efficiency and productivity) over ecological and social values, instead of seeking to balance these competing objectives. McKay and Bjornlund (2001) suggest that markets create sustainability and social justice challenges which need to be addressed through community education and regulation. Syme and Hatfield-Dodds (2007) offer that structured community involvement in the implementation of NWI led reform, supported by community education and engagement programs would increase the pace of reform and potentially improve outcomes. Equity issues are of importance in the movement towards water markets, particularly for Australia's Indigenous peoples (Nikolakis 2010). There is a low level of awareness among Indigenous Australians of water reform according to Jackson (2007) and nor have Indigenous people been meaningfully involved in the reform agenda (Jackson and Morrison, 2007). There are concerns that the unique rights and interests of Indigenous people may become alienated as rights to water are allocated to users (Durette 2008). For example the Aboriginal and Torres Strait Islander Social Justice Commissioner articulates that:

> "I am concerned that as Australia becomes increasingly scarce of water due to climate change, long periods of drought, over-allocation to industry and agricultural stakeholders, and population growth and migration, the capacity for the recognition and security of Indigenous rights to water will become increasingly important and highly competitive" (HREOC, 2009: 171).

Craig (2007) argues that water markets should have a restorative element to protect and redress Indigenous rights and interests, as well such a position is consistent with broader policy measures to address Indigenous socio-economic disadvantage. Jackson and Altman (2009) highlight the renewed attention on agricultural development in northern Australia, and increased pressure on water sources may impact Indigenous people's customary values as well as groundwater dependent ecosystems, and these are often highly interdependent (Cooper and Jackson, 2008). Jackson and Altman (2009) regard Indigenous interests and aspirations around water being satisfied through water made available for commercial and 'enviro-cultural' purposes. Altman (2004) suggests that failing to incorporate customary rights may open up legal challenges to water allocations. Altman with Branchut (2008) in their study in a remote Indigenous community in northern Australia identify an aversion to unbundling land and water title, exposing differences between mainstream and Indigenous beliefs on land and water property rights. The authors argue that providing exclusive rights to water to Aboriginal land owners is important to support equity and economic outcomes (Altman with Branchut, 2008).

3.3 Stakeholders

The development of stakeholder theory occurred at the level of the firm, in the context of those with whom the firm should consider in management decisions. Freeman (1984) argues that the notion of a stakeholder and stakeholder theory is essentially the "principle of who or what really counts." Donaldson and Preston (1995) offer that stakeholder theory is normative, with stakeholders identified by the level and nature of their interests, and these interests of stakeholders are inherently seen as important. Stakeholder theory has developed to include the management frameworks of government, and in terms of natural resource management a stakeholder approach recognises that various groups or people have different interests to a particular resource, especially where resources or land are publicly owned—it could be argued that all citizens have a legitimate stake. In considering stakeholders in water management decisions stakeholders are often identified as formal users, such as irrigators (Tisdell and Ward, 2003) and some studies have identified the general populace as latent stakeholders given the use and existence value of water resources (Stoeckl et al., 2006). Gregory and Keeney (1994) identify stakeholders in relation to natural resource management as those affected who are affected by the policy decision. There is a growing movement towards greater public participation in resource planning to improve management outcomes (Koontz, 2005). The challenge for policy makers is to decide the weight to provide to different stakeholders in each given circumstance (Beckley et al., 1999).

The concept of a stakeholder in a north Australian context was explored by deKoninck (2007) who examined Indigenous and government stakeholder dynamics in Garig Gunak Barlu National Park in the Northern Territory. The author argues that

the concept of a 'stakeholder' serves to diminish Indigenous people's unique rights and interests to managing resources vis-à-vis government and other outside interests.[4] Water allocation planning aims to address the identification and incorporation of stakeholder values through direct methods such as stakeholder advisory committees (in the NT these are called Water Advisory Committees, in Queensland Community Reference Groups, or through stakeholder workshops and such as in WA). In relation to addressing Indigenous interests there are various mechanisms used such as the Daly River Aboriginal Reference Group in the NT and the Indigenous Reference Panel in Queensland. In WA indigenous interests were reflected in the Ord, the only finalised plan in northern WA through the Ord Final Agreement.

The use of stakeholder involvement and sound science is viewed in literature as increasing the quality and legitimacy of environmental and natural resource management policy decisions (Beckley et al., 1999). Literature also explains that identifying and integrating stakeholder values into resource management decisions can improve the quality of decisions by increasing the extent of information relied upon (Gregory, 2000). The author suggests however that broad public involvement does not necessarily translate into meaningful input, arguing rather for deeper stakeholder participation in resource decisions with account for costs and benefits framed in terms of economic, environmental and social outcomes (Gregory, 2000) After seeking public input policy makers often decide tradeoffs in isolation, and Gregory (2000) posits that a transparent and structured approach to objectively balancing stakeholder interests and determining economic, social and environmental tradeoffs is required.

3.4 Values and Attitudes

Values

Values are generally seen in social psychology literature as "criteria people use to select and justify actions and to evaluate people (including the self) and events" (Schwartz, 1992: 1). Values act as "guiding principles of what is moral, desirable or just" (Kempton et al., 1995: 12). Values identify that particular states of existence and conduct are preferred (Rokeach, 1973). Rokeach (1973) sees the end states as terminal values, often these are broad ranging ideals such as equity and freedom. While instrumental values are the conduct to achieve the desired end states (e.g. respect, transparency, accountability, responsibility) (Rokeach 1973). Leisorwitz et al. (2006) reflects that values as intangible ideals (such as freedom, development and sustainability) may at times be competing or conflicting within an individual. Once values are organised in terms of their importance a value system is formed (Rokeach, 1973).

Hubbard (1997) found that in evaluating institutions individuals rely on their values and value systems as a framework to asses both the content and structure of

[4] Stakeholder is defined generally by the various departments managing water in northern Australia as a member of community and/or interest groups. For example, the Catchment Advisory Committees in the Northern Territory are made up of members from Government, Industry and Community (includes Indigenous) groups, see: http://www.nt.gov.au/nreta/natres/landcare/rapidcreek/pdf/MembershipofRCCAC.pdf

institutions. Members of almost all cultures relate to values as guiding principles, reflecting cultural ideals, but no single value framework is universal—value structures may evolve with changing political, technological, and economic and security conditions (Schwartz, 1992).

Attitudes

Attitudes have a variety of definitions, but in conceptualising attitudes the literature generally sees 'evaluative responses' as fundamental to the basis and structure of attitude (Eagly and Chaiken, 1993; Petty et al., 1997; Tesser and Shaffer 1990). Petty et al., (1997) define attitude as "summary evaluations of objects (such as an issue) along a dimension ranging from positive to negative" (p.611). The attitudes of individuals may range from an evaluation of an object or issue, for example, that is favourable to unfavourable (or a may be mixed or ambivalent) (Eagly and Chaiken, 1993; Tesser and Shaffer, 1990). Attitudes may be influenced by experience and understanding according to Zanna and Rempel (1988), and there may be different evaluations of an object at the same time. Attitudes may change according to emotion, experience, and persuasion (Tesser and Shaffer, 1990). Some authors caution against considering attitudes as stable representations of an individual, they may vary from time to time (Schwartz and Bohner, 2001). Such an approach considers attitudes and measures of attitudes as dependent on context.

While there are a variety of definitions we consider attitudes to be evaluative responses of individuals.

Understanding Stakeholder Values and Attitudes in Resource Decisions

Understanding stakeholder attitudes and values in making decisions for natural resources is growing in importance (Beckley et al., 1999; Gregory, 2000; McDaniels et al., 1999). Identifying stakeholder values often occurs through community engagement and socio-economic assessment, these efforts may generate greater awareness on values, as well through involving stakeholders in decisions it may enhance transparency in making trade-offs (Baldwin and Ross, 2006). Gregory (2000) notes that in assessing stakeholder values what should be sought is insight not agreement, such that effective decisions can be made by identifying links as well as areas of conflict among stakeholders. Gregory and Keeney (1994) argue that the set and quality of stakeholder values are generally similar, stating that "nobody prefers more environmental damage, fewer jobs, higher priced products, or greater health risks" (p. 1037). Disagreements between stakeholders in resource allocations are often about valuing and prioritising economic, social and environmental objectives—Gregory and Keeney (1994) offer that policy makers should focus on clarifying stakeholder values and rely on these to arrive at an appropriate set of policy alternatives (with clearly defined tradeoffs). This can support dialogue among stakeholders to avert conflict and keep people focused on alternatives. Beckley et al. (1999) argue that "the existing suite of methods and techniques for assessing stakeholder values have, unfortunately, been underused by natural resource managers and decision makers" (p.19). They argue for natural resource managers (in this context forests in Canada) to look more closely to social sciences to understand

stakeholder values and thus overcome conflict or problems around resource management and allocation.

3.5 Values to Water in the North Australian Context

We explore in this section values to water in the north Australian context, examining those of the general community and those of the Indigenous population.

General Community

Stoeckl et al. (2006) identified a range of social and economic values across northern tropical rivers that evolve and develop with changes in economic activity and the landscape. These values described by the authors include environmental, aesthetic, bequest and option values, basic human need, direct and indirect uses, value of ecosystem services of tropical rivers (to fishing and tourism) as well as economic values to intensive water using industries (such as irrigators). Stoeckl et al. (2006) argue that there are a mix of market and non market values in the north, the more remote the area the increased importance of non market values.

Indigenous values and aspirations to water in Northern Australia

There has been a considerable amount of work undertaken across northern Australia which has focused on identifying Indigenous values to water (see Altman with Branchut, 2008; Cooper and Jackson, 2008; Jackson, 2005; Jackson and Morrison, 2007; Lingiari Foundation, 2002; NAILSMA, 2008; Toussaint et al., 2005; Yu, 2000). Jackson (2009) suggests that Indigenous values to water are distinct from western perspectives, and Venn and Quiggin (2007) found that Indigenous Australians are likely to have more use and non use values to water than their non Indigenous counterparts. Indigenous values to water across northern Australia encompass customary, spiritual, economic, social and recreational aspirations, and Indigenous people see land, water and sea as one living entity (Armstrong, 2008; NAIEWFF, 2009). Jackson (2005: 136) identifies that Indigenous values to water are "subjective, intangible and highly distinct" and the author argues that integrating these with formal environmental management regimes is complex. Jackson (2005) identifies generic Indigenous values to water, these include: viewing land and water holistically; linking social, ecological and biological systems with mythology and cultural practices; the importance of sufficient water for perceived health of 'country'; and, satisfactory water quality.

Cooper and Jackson (2008) found in Katherine, (NT) that the protection of sacred sites and the environment were important objectives for Indigenous people. In the Fitzroy River valley in northern Western Australia, Toussaint et al. (2005) describe the interconnectedness between water, land, mythology, ceremony, the past and present—the authors suggest that each cannot be viewed independently but are part of a whole which is rooted in the cultural context. Water is an integral component of Indigenous world view and a defining feature which shapes how water should be managed, shared and allocated (Cooper and Jackson, 2008; Jackson, 2005). Water has a utilitarian value as well as an important spiritual value which is connected to

individual wellbeing, and while water has a symbolic value increasingly there is growing awareness of its economic potential (Jackson, 2005; Stoeckl et al., 2006).

Jackson and Morrison (2007) argue that Indigenous rights and interests to water tend to be construed narrowly to subsistence rights. There is a growing importance placed on commercial opportunities from water according to the authors which exist alongside aspirations to manage or co-manage water resources in the north. This point of economic aspirations for water is also underscored by Lingiari Foundation (2002) and NAILSMA (2008). The pursuit of economic rights identifies the emergence of values and attitudes within Indigenous groups which are focused on meeting socio-political objectives of self sufficiency. Altman and Arthur (2009) emphasise that economic aspirations among Indigenous people are diverse, not all of these are commercial objectives, the authors also identify distinctions between commercial and customary water, offering that customary water is that which is required to meet native title rights and interests, while commercial water is for the express purpose of enterprise development. Most jurisdictions require separate recognition of water for consumptive (commercial) and non consumptive (customary) uses—but there is significant interdependency in the Indigenous context.[5] Indigenous interests have been pursuing the creation of a cultural flow which is an allocation of water to be managed by Indigenous peoples to meet their unique customary aspirations in their respective regions (Jackson, 2009; NAIEWFF, 2009).

Jackson (2009) argues that water management processes across Australia should aim to understand cultural values and the extent to which policy addressees the maintenance of these values, as well as determine whether environmental flows actually support these values. Jackson and Altman (2009) offer that Indigenous values related to water are becoming marginalised in policy discussions in northern Australia by "externally imposed non-Indigenous values that are locally irrelevant…while Aboriginal values that are locally dominant and highly relevant either go unrecognised or, at best, are poorly understood" (p. 36). The authors refer to the national water reform process which they argue places an economic value on water, treating it as a commodity to be bought and sold or as water left for the environment—this perspective is in stark contrast to the holistic Indigenous perspective to water (Jackson and Altman, 2009). Understanding Indigenous values can be complex and more so to integrate these into mainstream resource planning and management frameworks using public consultation mechanism, but Jackson and Altman (2009) offer that what is required is improved collaboration with Indigenous interests.

3.6 Values and Attitudes Towards Water Markets

In terms of values and attitudes to water markets in the Australian context literature has focused on irrigators in southern Australia (Syme et al., 1999; Tisdell and Ward, 2003; Tisdell et al., 2001). Tisdell et al. (2001) in their comparative study of irrigators in two jurisdictions found that there was general support for the water reform process

[5] Wutunee (2004) underscores that Indigenous approaches to economic development are characterised by the importance placed on balancing social, ecological, cultural and economic objectives.

with respondents believing that the movement towards water entitlements would improve their security and reliability of supply. As well there was agreement among respondents with the 'unbundling' (separation) of land and water title to encourage greater transferability; respondents felt it appropriate to meet environmental requirements before allocating water among irrigators; and they also viewed social justice issues as important. Building on a framework created by Syme et al. (1999), Tisdell et al. (2001) put forward four philosophical viewpoints to irrigators in lay terms to understand their social justice and equity objectives around water trading, these are: utilitarianism, or the greatest good for the greatest number resulting from trading; Rawlsian, to address inequities those groups who are disadvantaged are provided with benefits in water markets; Kaldor Hicks, where beneficiaries of trading redress the losses incurred by others; and Kant, where each unique setting is subject to its own trading rules to reflect difference. Tisdell et al. (2001) found that irrigators in their study agreed most with utilitarian principles, followed by a Rawlsian perspective.

In terms of the operation of markets, respondents in Tisdell et al. (2001) also supported temporary free trade between sectors but on the condition water remain within the district. The study highlighted concerns among irrigators that markets would result in environmental impacts and monopolisation of water resources. A report by Frontier Economics (2007) highlights community opposition to permanent trades out of district, confirming fears of community decline if restrictions against this were lifted. Using a mixed quantitative and qualitative survey of irrigators in a catchment in western Victoria, Tisdell and Ward (2003) found that in developing market based regimes for water allocation social and cultural attitudes of stakeholders must be carefully considered to successfully implement reform, as well as to achieve optimal water management. In short, the successful operation of markets is dependent on the attitudes and behaviour of water users and community acceptance in general. This supports the work of Syme and Hatfield-Dodds (2007) who argue that in establishing water markets and supporting institutional arrangements, the trading framework must be consistent with stakeholder values to be supported and be effective. Key findings from Tisdell and Ward (2003) include a view among respondents that markets should not be limited to just users (including support for sleeper entitlements); that markets should be regulated to ensure equity and ecological outcomes; that trade should only occur where a farmer has an excess supply of water and cannot explore other options to apply it on farm; and the authors note that there existed at the time a strong 'nexus' between land and water among respondents (this was pre NWI). There were fears highlighted in the study in moving towards markets that they could result in social decline in some irrigation communities, as well as encourage hoarding of water and speculation, and enable the monopolisation of water by a major corporation (Tisdell and Ward, 2003).

In northern Australia Stoeckl et al. (2006) identify concerns raised in stakeholder focus groups that water markets may precipitate water being held by those with the most money and may marginalise non market users. Straton et al (2009) highlight community perceptions in the Katherine region (NT) which reject water trading and speculation in water markets. There were fears raised in the work of the decline of family farms in irrigation communities if markets developed in the region. This equity issue is important to stakeholders and echoes findings in a southern Australian context. Straton et al. (2009) describe scepticism among irrigators that markets could

support and protect environmental flow requirements. Despite the concerns there is a sentiment among growers which seeks greater security of access to water, an open and simple licensing process and increased use of scientific assessment for water planning and water sharing. Norms were found to be an important influence in institutional arrangements for markets and water management, with social connections, reputation and reciprocity playing in trading experiments (Straton et al. 2009).

3.7 Summary

Water reform in Australia outlined in the NWI (2004) encourages the use of market mechanisms to allocate water within a planning framework. This framework should take into consideration third party impacts, the environment and Indigenous access to water (as well as native title interests). It is seen as important to understand stakeholder attitudes and values in making resource management decisions for two reasons. First is that reflecting community values in resource management frameworks improves the legitimacy of institutions and their decisions in the minds of the public (Syme, Hatfield-Dodds, 2007). Second, an awareness of values can aide the resolution of conflict where there is disagreement between parties by offering a range of alternatives that are aligned with peoples values (Hermans et al., 2006). Stakeholders are identified as those individuals and groups who are affected by policy decisions (Gregory and Keeney, 1994). Values are the preferred states of existence and preferred conduct of individuals and groups (Rokeach, 1973). Values are the standards and criteria by which we judge the behaviour of society and individuals (including self) (Schwartz, 1992). Attitudes have a variety of definitions but for this work we see them as the summary evaluation of issues, ranging on a scale from positive to negative (including ambivalence) (Petty et al., 1997). Attitudes are context dependent and are influenced by a range of factors such as emotion (Schwartz and Bohner, 2001).

Much has been written on Indigenous values to water across the north, but it generally encompasses water to meet domestic, customary, spiritual and economic aspirations. Water and land are viewed as one entity to Indigenous people across the north (Armstrong, 2008). Jackson (2005: 136) identifies that Indigenous values to water are "subjective, intangible and highly distinct" and the author argues that integrating these with formal environmental management regimes is complex. Water is increasingly being viewed as an important vehicle for facilitating commercial opportunities for Indigenous people (Cooper and Jackson, 2008; Jackson and Morrison, 2007; NAIEWFF, 2009; NAILSMA, 2008).

Literature on values and attitudes towards water markets has been focused on southern Australia, where an integrating community values into water reform and markets is seen as important (Syme, Hatfield-Dodds 2007; Tisdell and Ward, 2003). There is a general support for water reform (such as unbundling) and trading in literature, but with caveats such as regulated trade within district (Frontier Economics, 2007). Equity and sustainability are important values to stakeholders in relation to the development of water markets (Tisdell et al., 2001). There are general fears of a monopolisation of water resources and speculation which could lead to community decline and this too is reflected in the work of Straton et al. (2009) in Katherine (NT). As well, Straton et al. (2009) highlight that irrigators in Katherine view markets with

scepticism and that they are unlikely to support environmental outcomes. At the same time the authors describe that irrigators are seeking greater security in access to water and improved scientific assessment in planning. Social norms are viewed as important in providing checks and balances in institutional arrangements, with reputation, reciprocity and social sanctions important.

4. Project Methodology

The research questions for this study were addressed using a mixed qualitative and quantitative approach, and data was then compared, and tested against existing literature and documentation to enhance the validity of findings (Jick, 1979). A survey instrument was designed which combined closed and open ended measures (see Appendix 1 for an example of the Indigenous survey). The closed ended questions included categorical measures for census data, multiple choice, 5 point Likert scales (ranging from strongly agree to strongly disagree as well as neither agree or disagree to capture ambivalent or mixed responses), and ordinal measures (to rank an attitudinal object which was who will benefit or be impacted most from the development of water markets in the north). The closed ended measures sought to create comparability across stakeholder groups and across jurisdictions. While the use of structured open ended questions allowed respondents to provide greater detail on their unique local experiences and perspective, providing important context to data (Silverman, 2001). This mixed method approach has been used in southern Australia to assess attitudes to water markets. For example, Tisdell and Ward (2003) identify in their mixed qualitative and quantitative study attitudes among irrigators toward water markets and reforms (such as unbundling).

The survey instrument was developed in an iterative way. There was initially collaboration with research partners and various experts in the field to identify a range of key issues to be included in the instrument. Pre-testing then occurred with selected people and changes were made where appropriate to the survey instrument. Next a focus group discussed the survey which comprised the Project Advisory Group for this study, which are representatives from key federal, states and territory government agencies (June 17 2009). Feedback on another draft was provided by representatives of the Project Advisory Group during September 2009. This draft was then used in stakeholder focus groups which were conducted from September 7th to 11th 2009 to pre-test and ground-truth the survey. These efforts informed the production of a final version of the survey.

4.1 Sampling

Given that the implementation of water reform in particular the use of water markets is at an early stage across northern Australia a purposive sample was used to access those individuals with expertise or awareness of water reform and markets. It is understood that many stakeholders in the north have had little opportunity to view the benefits of trading, nor understand how it works. Research partners such as NAILSMA and TRaCK provided the contact details for some individuals with expertise and awareness across the north. The researcher then employed a snowball approach to access those individuals in communities with an interest in or awareness of water reform to get broader representation.

In the Indigenous context the use of introductions was important for access, and cultural protocols and language barriers meant that the use of NAILSMA's Indigenous Community Water Facilitators, being those individuals in certain regions

whose role it is to facilitate awareness of water reform, as well as the use of interpreters, was important.

4.2 Data Collection

Data collection was commenced Sep 12 2009 after the final stakeholder focus group and pre-test. Field work was completed after the final respondent identified using the snowball approach was interviewed on February 20 2010. The researcher travelled to Darwin, Katherine, Burketown, Cairns, Kununurra, Broome and Fitzroy Crossing to meet with respondents. A protocol was followed in administering the survey: contact was initially made through research partners (such as NAILSMA) or through respondents who provided introductions to other potential respondents. The researcher then contacted those who agreed to participate in the study. In total 120 surveys were completed, 85 surveys were administered by the researcher, most of these were face to face in a location identified by the respondent. Another 35 surveys were completed by respondents themselves and emailed to the researcher. While each survey was generally conducted with one individual, for cultural reasons some Indigenous people felt it necessary to answer in a group of representatives with the cultural authority to respond (this occurred twice during field work).

4.3 Data Analysis

There were two parts to data analysis: qualitative analysis of data from open ended responses; and statistical analysis of data from closed ended questions. Augmenting the qualitative and statistical analysis, data gained from surveys was compared against issues raised in the literature as well as with secondary sources, including government and NGO publications, media and other publications. Triangulating data sources seeks to improve validity according to Jick (1979). Preliminary findings were sent to respondents and the Project Advisory Group for their comment, feedback was assessed and where appropriate incorporated into the final report.

For qualitative data the analysis followed the procedure set out by Miles and Huberman (1994) where codes are assigned to segments of data and patters discerned. The codes are developed from the research questions and literature. There were three parts to qualitative data analysis, these were: data reduction into categories and themes; data display; and conclusion drawing and verification (Auberbach and Silverstein, 2003; Miles and Huberman, 1994). The statistical analyses used ordered probit models, *robust* standard errors and also controlled for a lack of independence within each group using *cluster.* Since all of the dependent variables are qualitative, we run ordered probit models with the method of estimation as Maximum Likelihood estimation. The method does not allow us to know how much of the variation in dependent variable is explained by the independent variables as in ordinary least square estimation (OLS). However, for all models, the tests for overall significance using Pseudo-R^2 imply that the models are overall significance.

As in all multivariate analyses, some level of multicolinearity (or correlation) between independent variables is unavoidable. And practically, the problem of multicolinearity becomes serious when this makes most of the variables become insignificant. In our models, we still see the significance of many variables and the signs of variables seem to be appropriate as expected. So the multicolinearity should not be a problem in our

analysis. Furthermore, our reported models are final models that we chose after removing some redundant variables, the process of removing redundant variables from the models, itself, reduces the multicolinearity problem.

As an illustration for the conclusions from our models, we find the correlation coefficients and tabulate some significant independent variables against dependent variables:

Example 1: The results in the model for the questions "Water should be a tradable commodity" indicates that respondents having involvement in water management will increase the probability of answering that water should be a tradable commodity by 0.219. As a support for this conclusion, the correlation between these two variables is 0.2404 which is positive, and the Pearson-chi2 test indicates that this correlation between two variables is significant.

```
. corr  watertradable_1 involvewm
(obs=117)
             | watert~1 involv~m
-------------+------------------
watertrada~1 |   1.0000
   involvewm |   0.2404   1.0000


watertrada |       involvewm
     ble_1 |         0          1 |     Total
-----------+----------------------+----------
         1 |        19         11 |        30
         3 |        23         39 |        62
-----------+----------------------+----------
     Total |        42         50 |        92
```

Pearson chi2(1) = 5.6091 Pr = 0.018

Example 2: The results in the model for the question "The benefits of water trading will be higher than costs" indicates that involvement in water management will increase the probability of answering that the benefits of water trading will be higher than costs by 0.174. As a support for this conclusion, the correlation between these two variables is 0.1812 which is positive, and the Pearson-chi2 test indicates that this correlation between two variables is significant.

```
. corr  benefit_higher_cost_1 involvewm
(obs=112)

             | benefi~1 involv~m
-------------+------------------
benefit_hi~1 |   1.0000
   involvewm |   0.1812   1.0000


tabulate  benefit_higher_cost_1 involvewm if
benefit_higher_cost_1!=2, chi2

benefit_hi |
gher_cost_ |       involvewm
```

```
         1 |         0          1 |     Total
-----------+----------------------+----------
         1 |        22         14 |        36
         3 |        17         26 |        43
-----------+----------------------+----------
     Total |        39         40 |        79
```

Pearson chi2(1) = 3.6494 Pr = 0.056

Example 3: The results in model for the questions “Water should be transferred from one area to another” indicates that answering on behalf of industry will increase the probability of answering that water should be transferred from one area to another by 0.371. As a support for this conclusion, the correlation between these two variables is 0.3458 which is positive, and the Pearson-chi2 test indicates that the correlation between the two variables is significant.

```
corr  water_transfer_1 industry
(obs=117)

             | water_~1 industry
-------------+------------------
water_tran~1 |   1.0000
    industry |   0.3459   1.0000
```

```
. tabulate  water_transfer_1 industry if  water_transfer_1!=2, chi2

water_tran |       industry
    sfer_1 |         0          1 |     Total
-----------+----------------------+----------
         1 |        53         11 |        64
         3 |        15         18 |        33
-----------+----------------------+----------
     Total |        68         29 |        97
```

Pearson chi2(1) = 14.4986 Pr = 0.000

5. Findings

This section provides the key statistical and qualitative findings from the survey.

5.1 Characteristics of sample

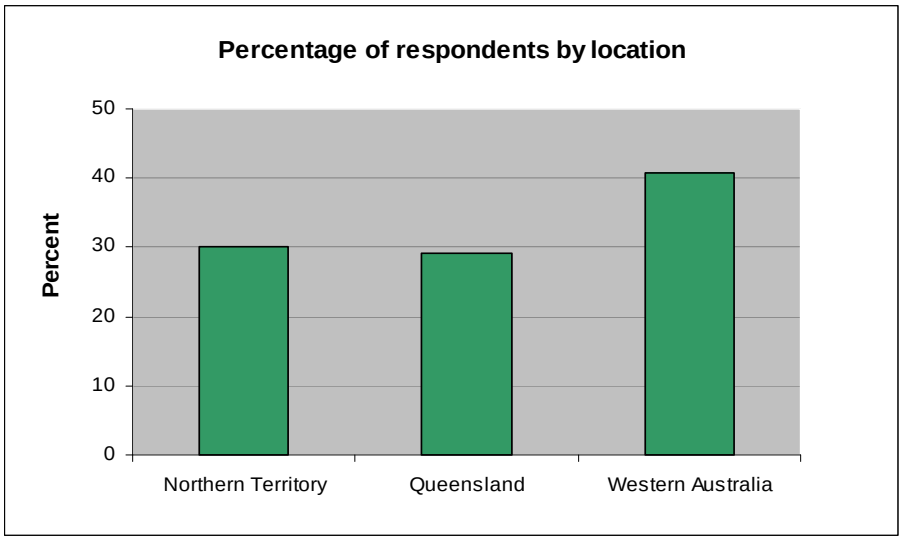
First we look at the characteristics of our population. Table 1 highlights the background of respondents and their position. Of the 120 respondents, over three quarters of were male, and 60% had a bachelors degree or higher. Forty percent of all respondents were stakeholders from state or territory governments.

Table 1: **The frequency of some qualitative characteristics**

	(%)
Male	77.5
Higher education (a bachelor degree or higher)	59.8
Had involvement in water management	50.4
Expecting water availability to decrease in future	50.9
Industry	29.2
Indigenous	30.8

Of those surveyed 40% resided in WA, with the rest split almost evenly between QLD and the NT (Figure 2).

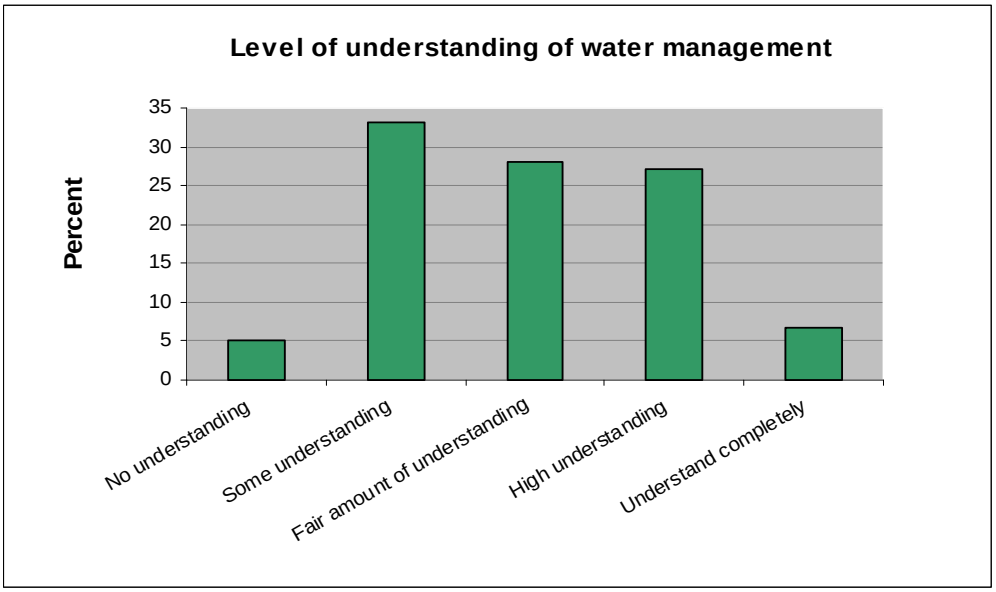
Figure 2: Percentage of respondents by location



5.2 Understanding of water management in their state or territory

Almost a third of respondents (or 39 respondents) answered that they had some understanding of water management in their state or territory (Figure 3). Another 33 respondents said they had a fair amount of understanding. Thirty two respondents offered that they had a high level of understanding; another 8 stated that they understood the water management regime in their jurisdiction completely. Only 5% of the total sample stated that they had no understanding of water management in their state or territory.

Figure 3: Respondents understanding of water management



5.3 Future increase or decrease in water availability

When asked whether they think there will be an increase or decrease in the level of water available in their region, 59 respondents argued there would be a decrease. While 57 respondents thought there would not be a decrease. Respondents were asked to explain their answer as to why they feel water will increase or decrease in availability in their region. One respondent provides their perspective which considers a range of factors in predicting water availability across their region:

> *"It's geographically determined. It might increase in the Ord, but aquifers will decrease with population growth at its limits in Halls Creek and in Wyndham. People look at the Kimberley as having abundant water, that doesn't mean the water is available to use though."*

Population growth, increasing industrial pressure and agricultural demand were viewed by 25 respondents as reducing the future available supply of water resources in local regions across the north. The effect of this reduced supply was viewed as having a variety of cultural and ecological impacts such as threatening biodiversity,

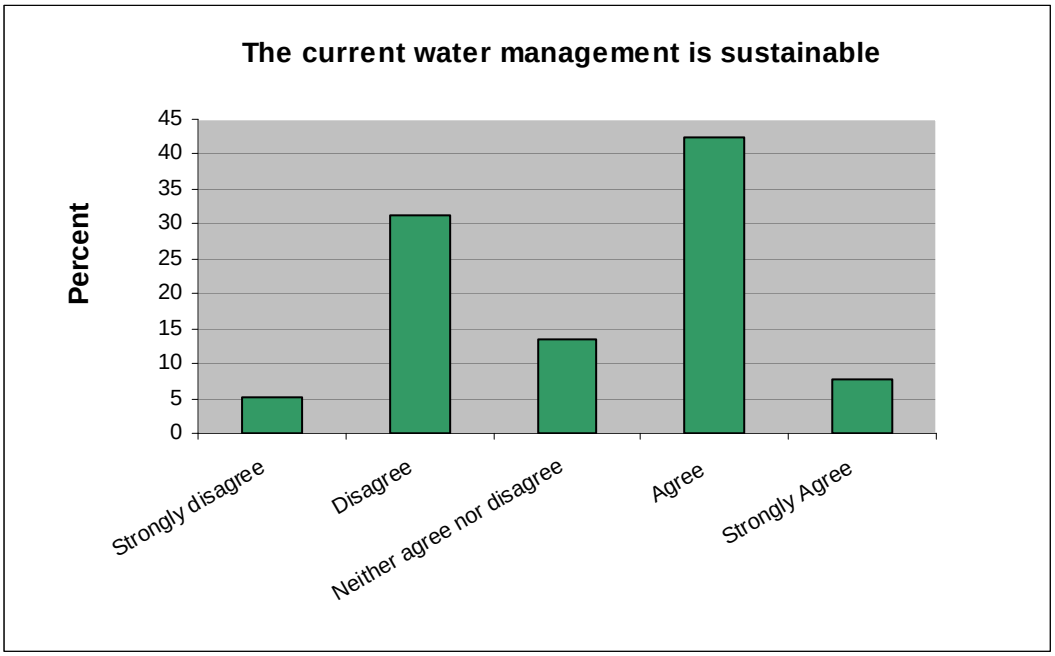
groundwater dependent ecosystems and waterholes of cultural significance. Recent work by CSIRO on the effects of climate change across the north was referred to by a number of respondents. For example a recreational user discusses that water availability across the north "*will decrease because of climate change. CSIRO says that there may be more rain, it will be more episodic though and more periods of no rain.*" Thirteen respondents argued that the amount of water availability in their region will be reduced by the effects of climate change. A further 7 respondents stated that a combination of climate change and increasing demand from domestic and commercial users will reduce the supply of water resources across the north, with several respondents suggesting that the combined pressures of increasing temperatures (which will lead to higher evaporation) combined with a migration of southern agriculture to the north would diminish water availability in various parts across the region (such as in Darwin, Katherine, Broome, Kununurra and northern Queensland). Some respondents suggested that government regulations will reduce the amount of water available for consumptive use in the north, 5 respondents argued that precautionary water planning and legislation like the Wild Rivers Act in Queensland would set more water aside for the environment.

Conversely, 12 respondents claimed that the amount of water available to users would increase, arguing that planning mechanisms would 'open up' currently unallocated water. For example, a government respondent suggests that the "*increase in infrastructure projects and a number of development proposals…will increase the amount of water available for allocation*." Another 14 respondents suggested that the water supply outlook for the north will remain stable, drawing on CSIRO work which suggests average precipitation levels for the north generally. For example, a government respondent states that in Western Australia "*climate change modelling is suggesting that the northern Australian climate… will not vary much from the long term average (North Australian Sustainable Yields, CSIRO).*" Another government respondent reiterates this point generally by arguing that "*if there is any decrease in total water availability it will be relatively minor and associated with increased evaporation rather than substantially decreased rainfall."* A further 3 respondents argued that the amount of water available will increase with climate change because of increased precipitation.

5.4 Current water management is sustainable

Respondents were asked whether they thought water management to be sustainable in their region (see Figure 4). The term sustainable was defined as the responsible management and allocation of water resources, guided by the aim of balancing all the competing needs for water. Half of all respondents felt that the current water management regime in their jurisdiction is sustainable (of these 8% strongly agreed). Thirty six percent of respondents disagreed that water management is sustainable in their region. Sixteen respondents neither agreed nor disagreed with the statement (14%).

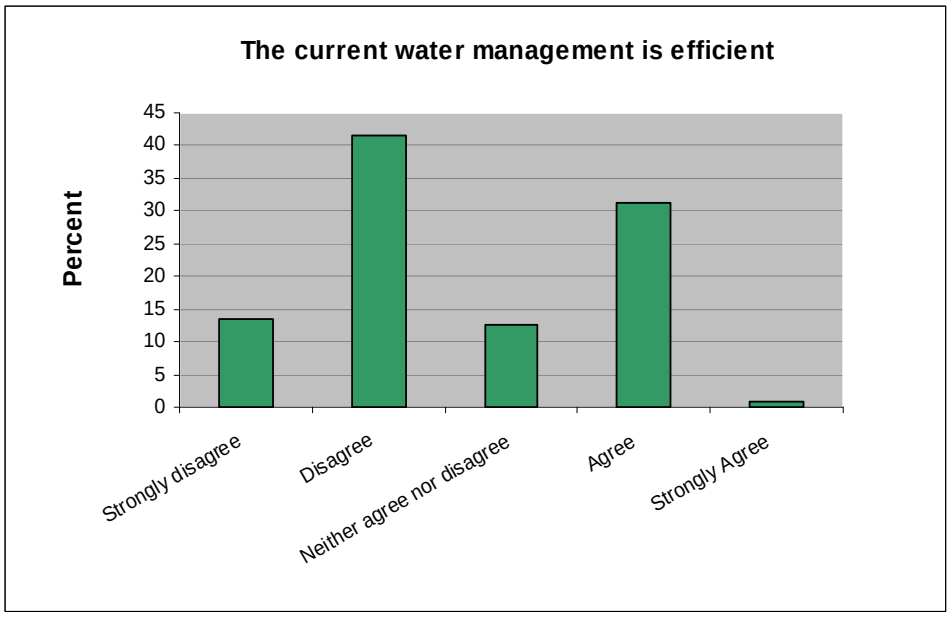
Figure 4: Current water management is sustainable



5.5 Current water management is efficient

This question asked respondents whether water management is efficient in their region. By efficient we mean that is it does not involve the wastage of water resources. Over half of respondents did not think that water is managed efficiently in their state or territory (see Figure 5). Just under a third believed water management to be efficient in their region.

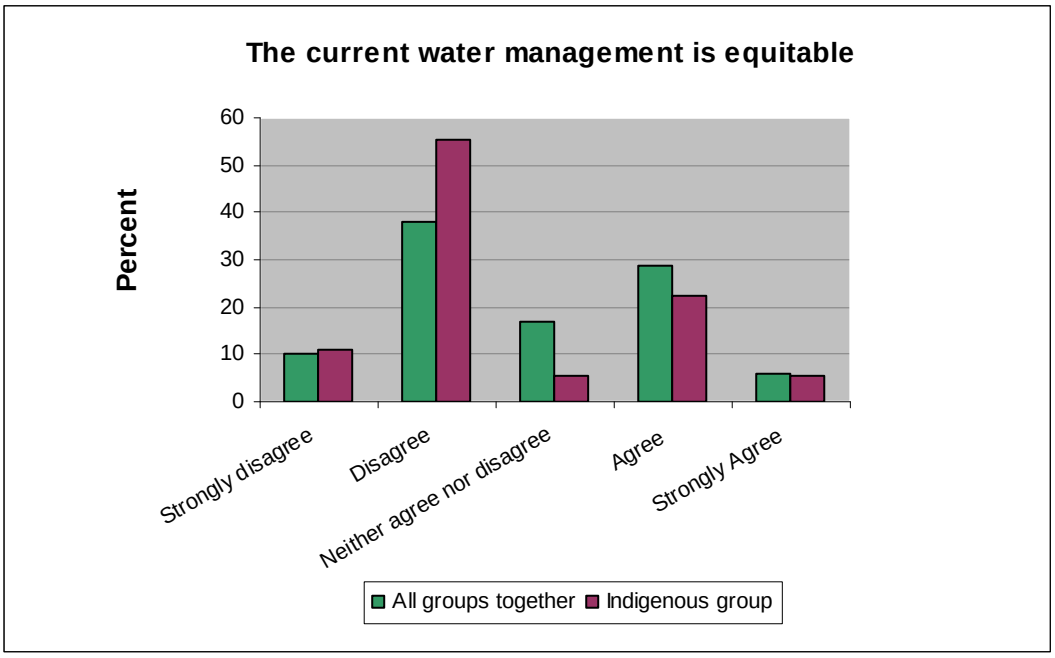
Figure 5: Water management is efficient



5.6 Current water management is equitable

This question asked respondents whether they thought water management was equitable in their region. Equitable is considered to mean that all parties are treated equally and fairly under the water management regime (see Figure 6). Nearly half (48%) of all respondents felt that it was not equitable (of these 10% strongly disagreed). Over two thirds of Indigenous respondents disagreed that water management was equitable in their region (11% strongly disagreed). Over a third of all respondents considered water management to be equitable compared to just over one quarter of Indigenous respondents.

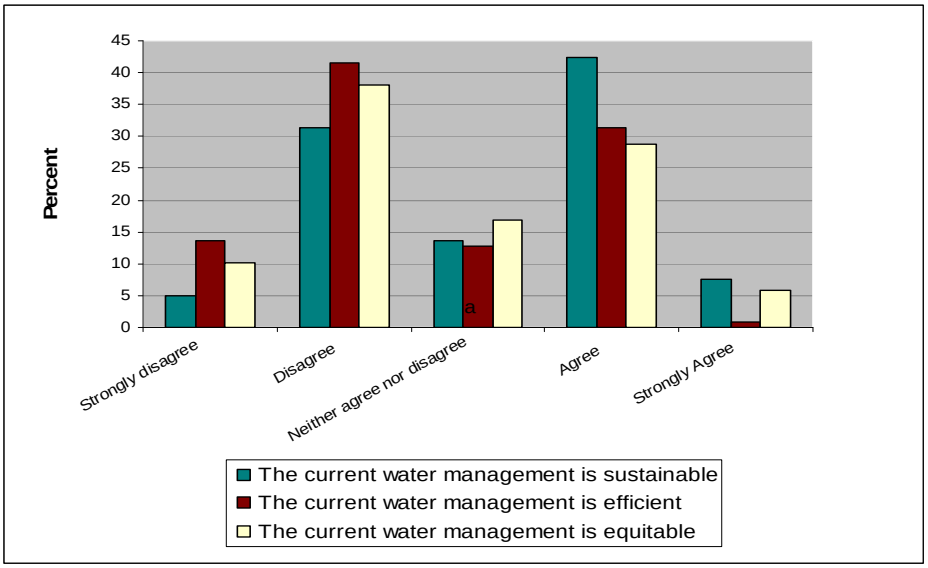
Figure 6: Current water management is equitable, comparing Indigenous respondents to all responses



5.7 Comparing responses on whether water management is sustainable, efficient and equitable

Figure 7 compares the responses to the three questions around whether water management is equitable, efficient and sustainable. Over forty percent of respondents agreed that water management was sustainable in their region, but equally respondents disagreed that water management is efficient in their region (over half of respondents). Following this, almost 50% of respondents did not think that water management was equitable in their jurisdiction. This highlights mixed perceptions of water management across the north, with respondents feeling that water management is responsible and balances competing needs (i.e. sustainable), but is at the same time inefficient and inequitable.

Figure 7: Comparing responses on whether water management is sustainable, efficient and equitable



5.8 Would a water market be useful?

Respondents where asked whether creating a water market would be useful to manage water in their region (see Figure 8). Half of respondents felt that it would be useful (of these 9% thought it extremely useful). Nineteen percent of respondents neither agreed nor disagreed with the statement, perhaps reflecting mixed feelings around water markets or ambivalence.

Figure 8: How useful to set up a water market

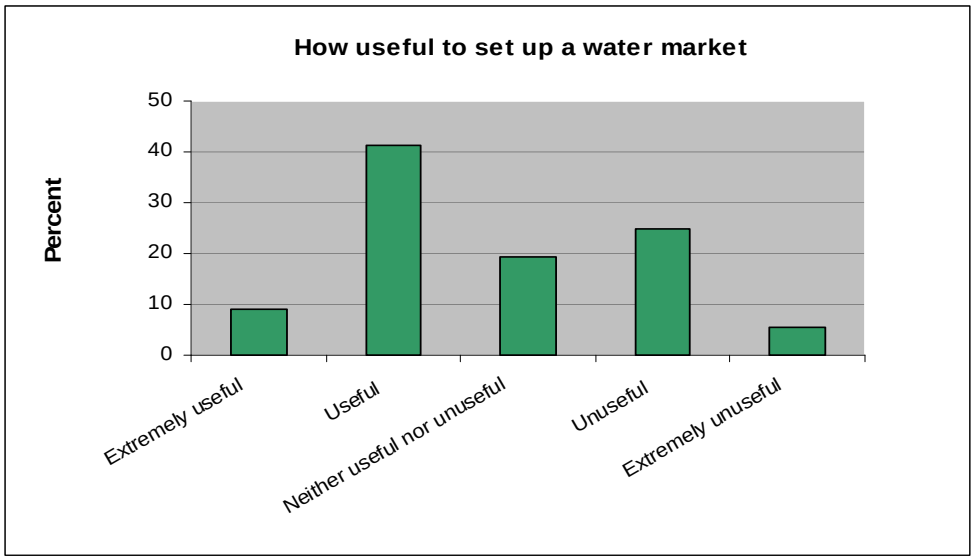


Table 2 presents the variables that are significant at conventional levels of significance. Living in the NT, age, a higher education, and a high level of understanding of water management increase the probability that respondents will see water markets as useful. If the respondent was Indigenous then there was a higher probability the respondents would see markets as useful. This finding highlights the support for water markets among Indigenous respondents.

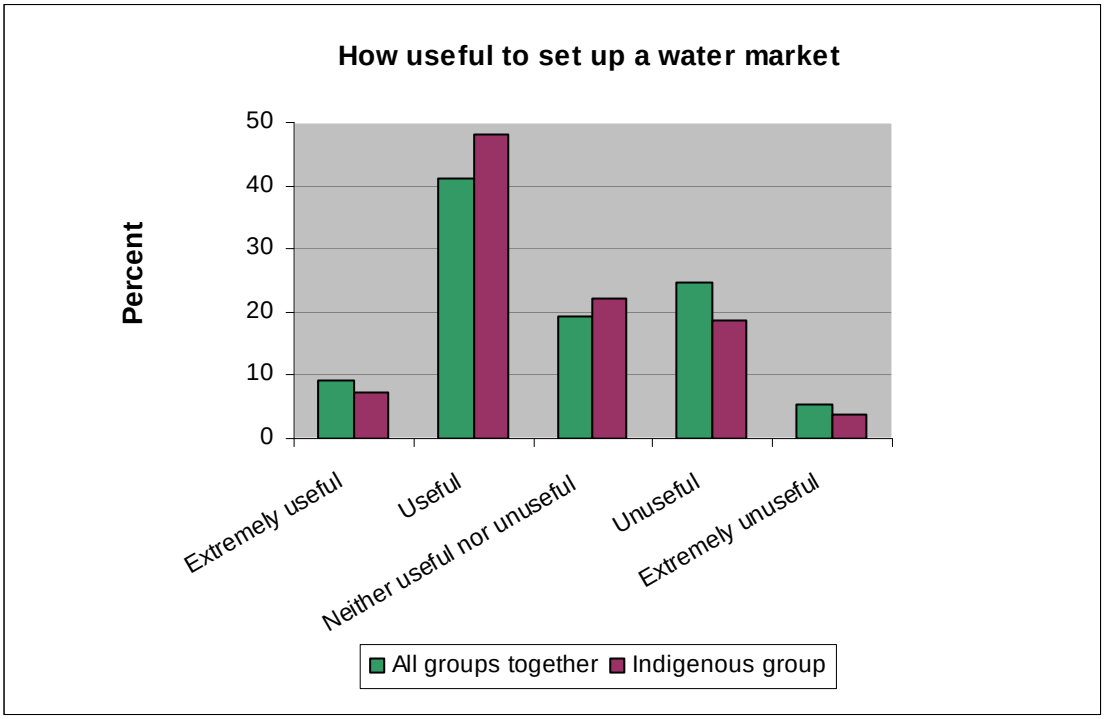
Table 2: Marginal effect on probability of answering that a market is useful

Marginal effect on the probability of answering that it is useful to set up a water market		
Variable	Marginal effect	P_value
Living in the Northern Territory	0.279	0.015**
Living in Queensland	0.149	0.123
Age of respondent	0.005	0.016**
Having a higher education (bachelor degree or higher)	0.095	0.078*
Higher level of understanding water management	0.053	0.003***
Strongly agree that current water management is sustainable	0.009	0.690
Expecting the water availability to decrease in future	0.046	0.749
Involving in water management	0.095	0.237
Answering on behalf of indigenous community	0.225	0.008***
N	102	

5.9 How useful to set up a water market: comparing Indigenous and all respondents

Forty eight percent of Indigenous respondents supported the creation of water markets (another 7% thinking markets extremely useful) compared with just over 40% for all groups (see Figure 9). Almost a quarter of Indigenous respondents thought markets to be neither useful nor unuseful, reflecting mixed feelings towards markets or ambivalence.

Figure 9: How useful to set up a water market: Indigenous compared to all respondents grouped together



5.10 Markets help sustainable water management

Participants were asked whether they agree or disagree with the idea that markets support sustainable water management (see Figure 10). Almost twice as many respondents agreed (53%) that water markets help sustainable water management as those who disagree and strongly disagree (27%). There were mixed feelings or ambivalence towards markets with 21% of respondents neither agreeing nor disagreeing.

Figure 10: Water markets help sustainable water management

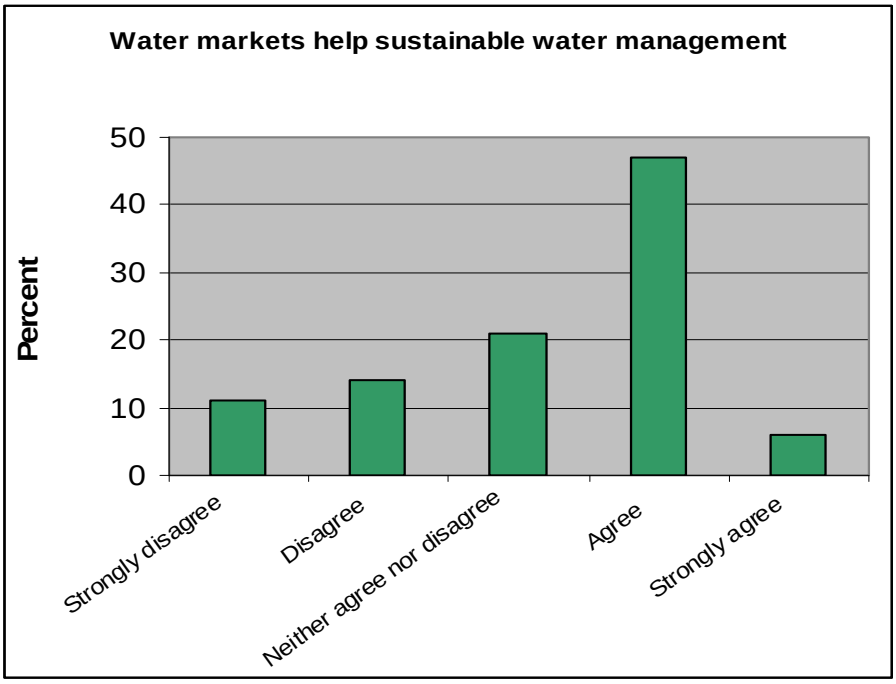


Table 3 presents those variables which increase the probability of agreeing or disagreeing that markets help sustainable water management. Being a male, having a higher education, expecting water availability to decrease, and respondents having had involvement in water management increased their likelihood in agreeing. Those who were more likely to disagree that markets would help sustainable water management were those living in the NT and QLD, and those who strongly agreed that current water management is already sustainable.

Table 3: Marginal effect on the probability of agreeing that water markets help sustainable water management

Marginal effect on the probability of answering that water market help sustainable water management		
Variable	Marginal effect	P_value
Being a man	0.288	0.000**
Living in Northern Territory	-0.137	0.068*
Living in Queensland	-0.387	0.091*
Age of respondent	0.006	0.489
Higher education (bachelor degree or higher)	0.296	0.000**
Higher level of understanding water management	0.061	0.408
Strongly agree that current water management is sustainable	-0.095	0.000**
Strongly agree that current water management is efficient	-0.050	0.133
Strongly agree that current water management is equitable	0.140	0.157
Expecting the water availability to decrease in future	0.180	0.000**
Involving in water management	0.150	0.021**
N	68	

* Significant at 10% level

** Significant at 5% level

5.11 Water should be a tradable commodity

This question asked whether water should be a tradable commodity. Over half agreed that it should be (see Figure 11). A quarter of respondents disagreed with the idea of water as a tradable commodity. Twenty five respondents (or just over 20%) neither agreed nor disagreed with the statement, reflecting mixed feelings or ambivalence to water being treated as a tradable commodity.

Figure 11: Water should be a tradable commodity

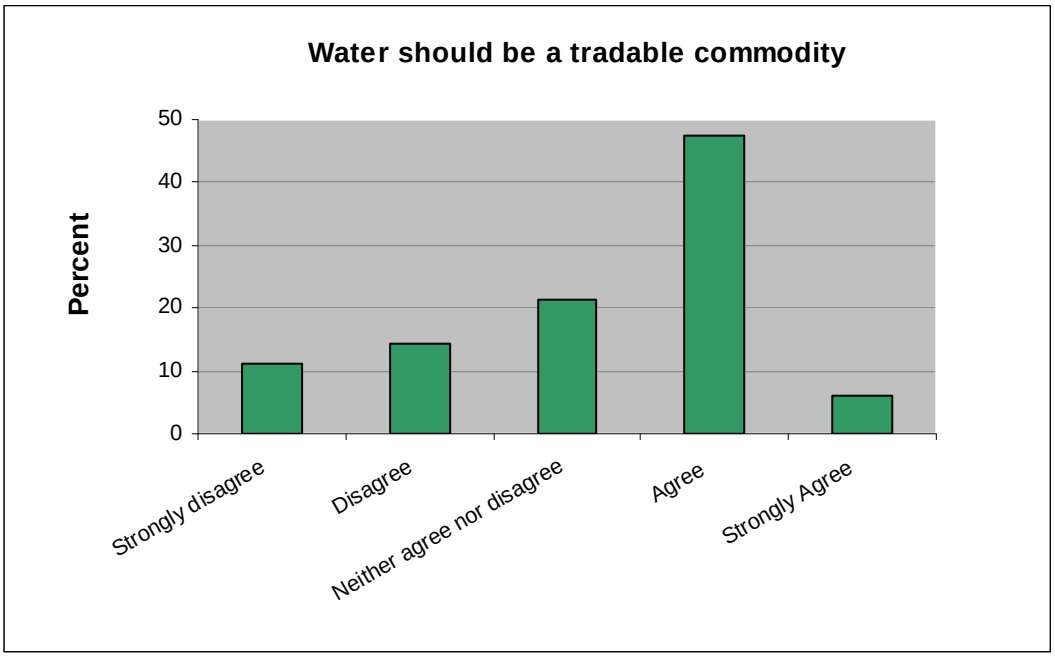


Table 4 presents variables and their effect on the probability of agreeing that water should be a tradable commodity. Those variables that increased the probability of respondents agreeing were: being a male (which was highly significant), as was having a higher education and having had involvement in water management.

Table 4: Marginal effect on the probability of agreeing that water should be a tradable commodity

Marginal effect on the probability of answering that water should be a tradable commodity		
Variable	Marginal effect	P_value
Being a man	0.226	0.004**
Living in Northern Territory	0.135	0.346
Living in Queensland	-0.088	0.386
Age of respondent	0.004	0.479
Having higher education (bachelor degree or higher)	0.242	0.003**
Higher level of understanding water management	-0.004	0.947
Involvement in water management	0.219	0.095*
Answering on behalf of indigenous community	-0.007	0.948*
N	111	

Indigenous responses to whether water should be a tradable commodity

Figure 12 compares the responses of Indigenous respondents to all respondents together. Thirty four percent of Indigenous respondents agreed that water should be a tradable commodity compared to 53 % of all respondents. One third of Indigenous respondents neither agreed nor disagreed compared to 21% of all respondents. Indigenous respondents were twice as likely to strongly disagree to the idea of water as tradable commodity (22% compared to 11%).

Figure 12: Water should be tradable commodity comparing Indigenous responses to all responses grouped together

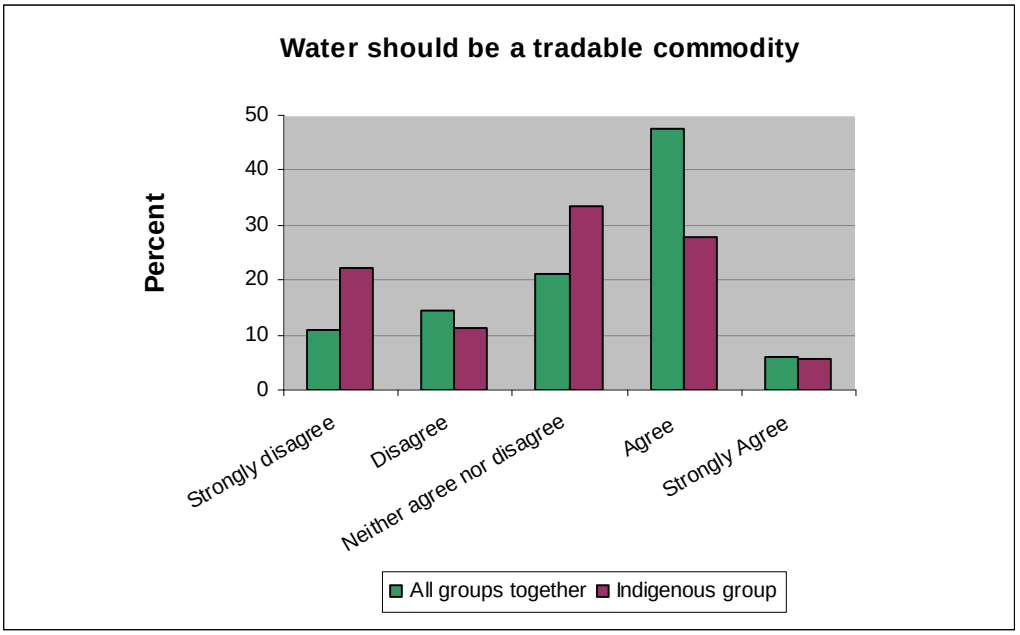
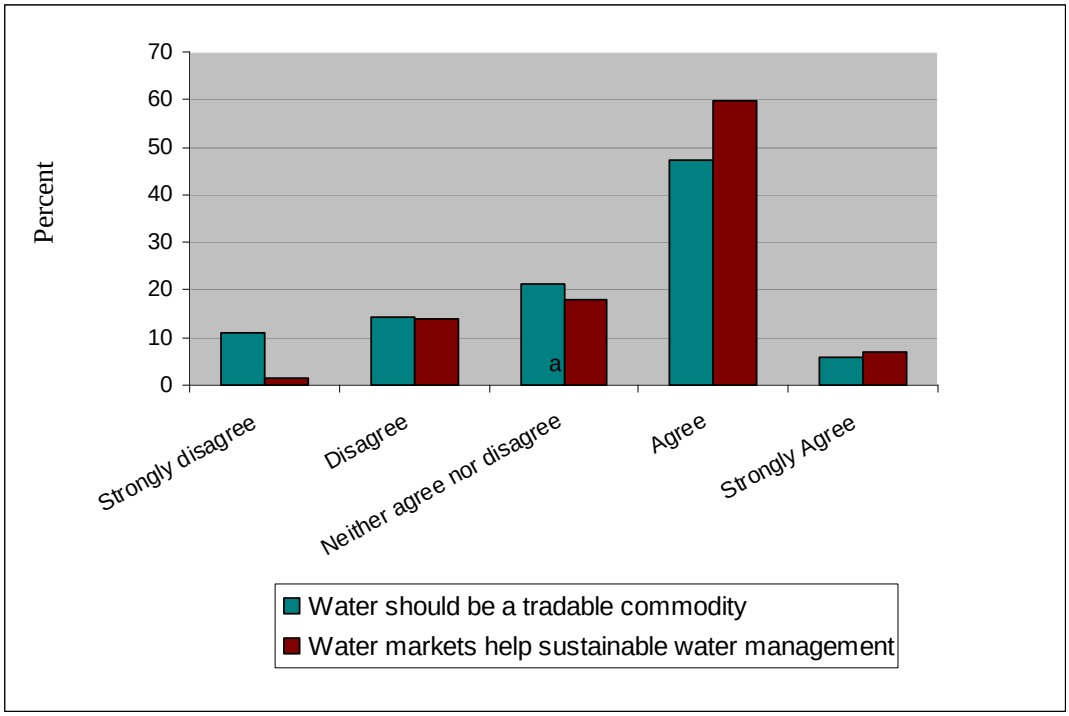


Figure 13 compares respondents answers to whether water should be a tradable commodity and if water markets help sustainable water management. It highlights that respondents were slightly more likely to agree that markets support sustainable water management than treating water as a tradable commodity.

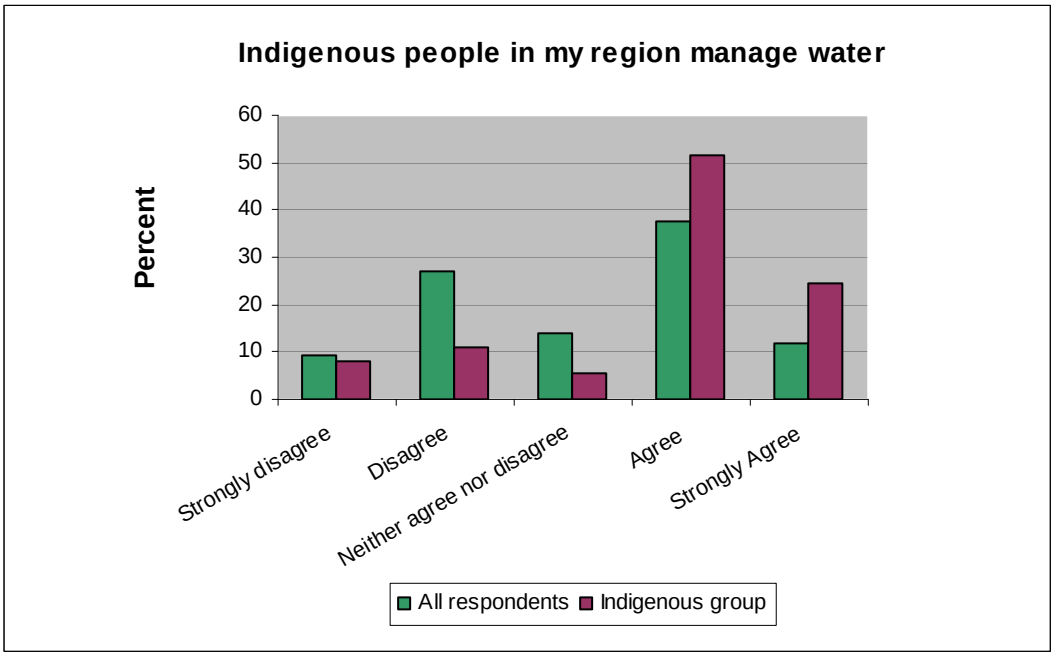
Figure 13: Comparing responses to whether water should be a tradable commodity to water markets help sustainable water management



5.12 Indigenous people manage water in my region

This question asks respondents from government, recreational user groups and Indigenous groups whether Indigenous people manage water in their region (see Figure 14). Eighty five respondents answered the question and 37 were Indigenous. Half of respondents agreed that Indigenous people managed water in their region. Indigenous respondents were more likely to recognise Indigenous water management practices than other respondents (75% of Indigenous respondents agreed that Indigenous people managed water).

Figure 14: Indigenous people manage water in respondents region comparing Indigenous to all respondents

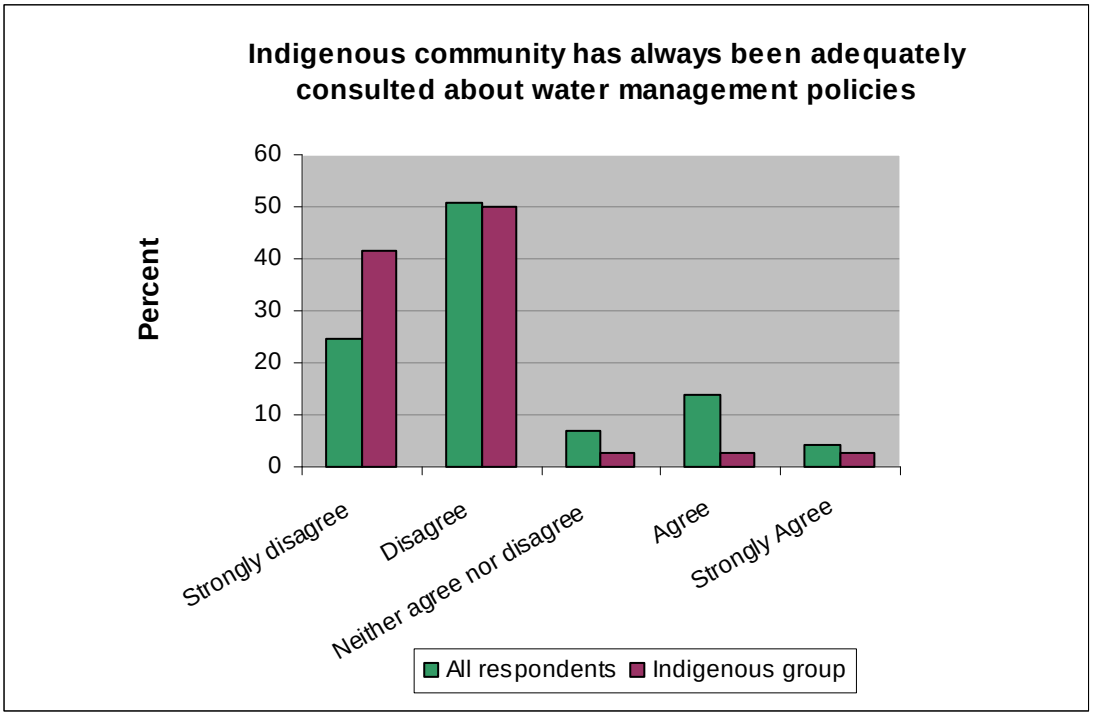


In examining open ended measures to describe Indigenous water management some 30 respondents stated that Indigenous people actively managed water culturally and traditionally in their regions. For example, respondents reflected that Indigenous people in their local regions are spiritual custodians for water, actively managing springs and waterholes, as well as using burning practices to manage vegetation around waterways and hence influence water quality. A further 7 respondents agreed that Indigenous people managed water culturally and through ranger programs, reflecting a formal recognition and in some cases a resurgence of traditional practices, an Indigenous respondent articulates that "*We are slowly bringing things back through Rangers, fencing off water holes.*" Three respondents stated that Indigenous people only manage water formally through ranger programs such as weeds and waterways programs. Some respondents argued that there is no opportunity for Indigenous people to be involved meaningfully in water management in their region. While one respondent suggested that Indigenous people like any other people did not have enough information to manage water effectively.

5.13 Indigenous community has always been adequately consulted by government when developing the water management policies

This question asks government, recreational users and Indigenous respondents whether Indigenous groups have been adequately consulted by government in developing water management policies in their region. In total 73 respondents answered this question (see Figure 15), with just over three quarters disagreeing that Indigenous people had been adequately consulted (with 25% of these respondents strongly disagreeing). Of the 36 Indigenous respondents who answered this question, 92% disagreed that Indigenous people had been adequately consulted (of which 42% strongly disagreed).

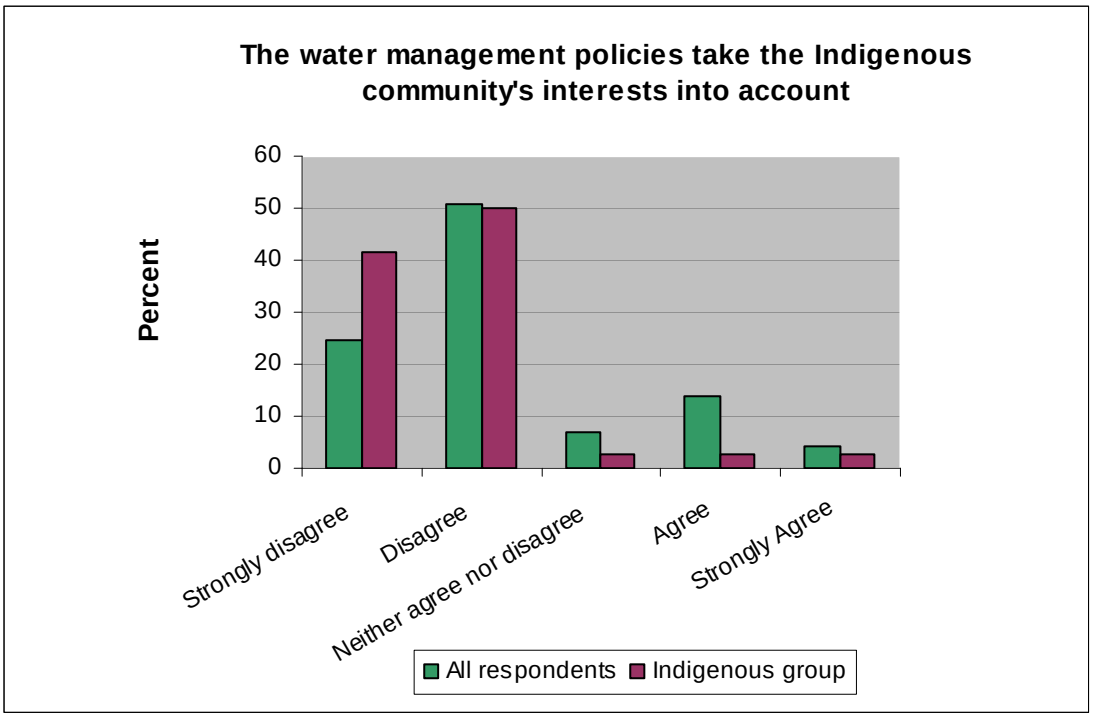
Figure 15: Indigenous community has always been adequately consulted about water management policies, comparing Indigenous to all responses



5.14 The water management policies take Indigenous community's interests into account

This question asks respondents whether they agree or disagree with the statement that water management policies take the interests of Indigenous communities into account (see Figure 16). A total of 74 respondents answered this question, with most disagreeing that Indigenous community's interests are reflected in water management policies. Indigenous respondents (36 whom answered) were nearly twice as likely to strongly disagree with this statement.

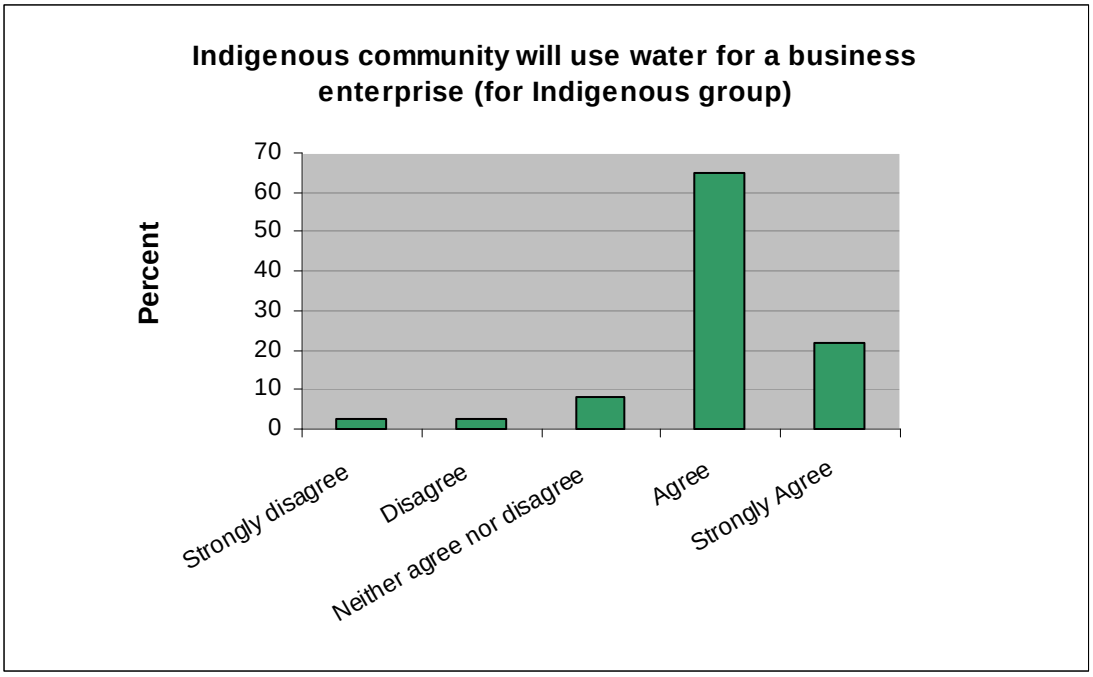
Figure 16: Water management policies take Indigenous community's interests into account



5.15 Indigenous community will use water for a business enterprise

The question puts to Indigenous respondents that their community will use water for water based enterprise (see Figure 17). In total 37 respondents answered this question, with a strong consensus 87% agreeing that their community will develop water based enterprise (of these 22% strongly agreed).

Figure 17: Indigenous community will use water for water based enterprise



Type of Water Based Enterprise

> *"We need to shift from poverty to wealth creation. Over the long term we would like to showcase our relationship with the [Fitzroy] river and showcase this as a cultural asset, showcase our cultural knowledge, our management [and] the biodiversity."*

This open ended question asked Indigenous respondents if they could provide more detail on the kinds of water based enterprises there communities would consider developing into the future. The frequency with which particular industries were cited by respondents is presented (note: some respondents mentioned more than one sector).

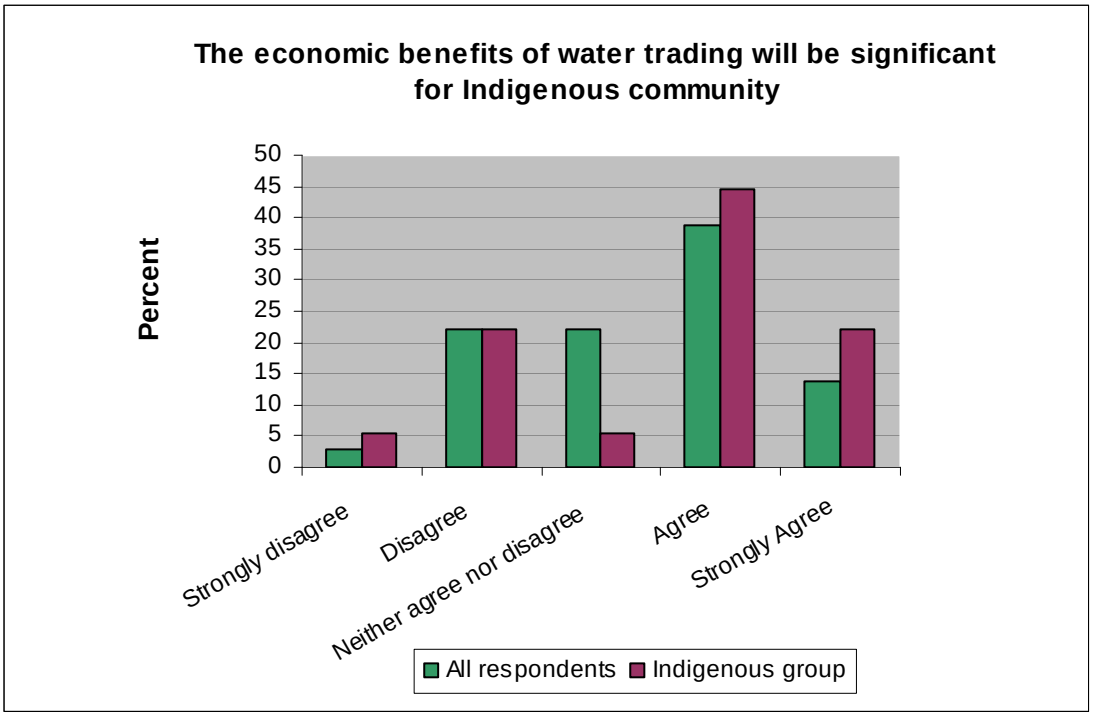
- Agriculture and Horticulture (including nurseries) were stated by 20 respondents as having commercial potential for their respective communities— four of these respondents identified small scale market gardens to supply their community; and one respondent discussed the potential for producing indigenous foods (such as Gubinge).
- Tourism linked to water was mentioned by 12 respondents as offering an opportunity to communities and of interest.

- The potential to get involved or expand pastoral operations was mentioned by 7 respondents.
- Bottled spring water was viewed by 6 respondents as offering commercial potential for their community.
- Aquaculture was discussed by 5 respondents with species such as Red Claw and Barramundi identified.
- Ecosystem services (such as ranger programs) and cultural services (e.g. indigenous knowledge) were each stated by 4 respondents.
- Forestry plantations were cited twice by respondents as being of interest to their community.
- The ability to trade water was identified by 2 respondents as offering potential economic outcomes to their community, however, a caveat was imposed by another respondent who suggested that it will take time, "*once we set up the system it will impact behaviour, people will see it as a source of income. It will not be extensive. It's such a new idea to exploit water, the notion to trade and make money from it is alien* [to us]*.*"

5.16 The economic benefits of water trading will be significant for the Indigenous community

Government and Indigenous respondents were asked whether they agree or disagree with the statement that the potential economic benefits for water trading will be significant for Indigenous communities. A total of 72 respondents answered the question (see Figure 18). Over half of respondents felt that the benefits of trading would be significant (53%). Some 22% of respondents disagreed that the benefits would be significant and another 22% neither agreed nor disagreed, reflecting mixed perceptions or ambivalence. Two thirds of Indigenous respondents felt that the benefits of water trading would be substantial, while 22% disagreed.

Figure 18: The economic benefits of water trading will be significant for Indigenous communities



5.17 Benefits of Water Markets

Respondents were asked to provide an assessment of three perceived benefits of water markets across northern Australia in order of importance.

First benefit of water markets

- Forty-eight respondents identified improvements in the management and regulation of water and the associated economic outcomes such as efficiency and highest and best use as key benefits of establishing water markets.
    - As well respondents highlighted greater flexibility to users and greater knowledge of the resource as potential benefits.

- Twenty three respondents argued that the key benefits would be the certainty water markets could provide to growers and the potential for this to facilitate economic development in regions.
    - A respondent elaborates that "*For farming you need a 10 to 15 year outlook, you need all the resources to be there, all your ducks in a row. Particularly with tree crops, you might not see a return for 7 years on some trees."*

- Sixteen respondents felt that water markets could provide economic opportunities to meet Indigenous economic aspirations.
    - A respondent from a recreational user group offers that *"…if water goes to Indigenous people to manage environmental and cultural values and has involvement in the commercial side, it could be beneficial."*

- The importance of securing a recognised amount of water for the environment was the primary benefit identified by 6 respondents.
    - A respondent argues that a market could create a fair mechanism to claim back water for the environment in times of shortage, the respondent reasons that "*Markets are a pragmatic way to claw-back for the environment from users. There are a few tools we have available to get water back for the environment."* The respondent goes further to suggest though that *"in healthy systems water markets serve no purpose other than to encourage industry,"* this reflects the findings of those respondents who view water markets as encouraging economic development in regions.

Second benefit of water markets

- Twenty four respondents identified gains in economic efficiency and decreased wastage.

- Fifteen respondents recognised improved water planning through establishing a market framework which would create a better picture of consumptive and non consumptive uses as well as providing a mechanism for adjustment, allowing planners to reduce take and users can re-allocate when supply is reduced.

- Another 13 respondents stated that the potential for water markets to establish tradable rights to facilitate regional economic development.
    - An industry respondent suggests that the *"flow on benefits to surrounding towns, such as more economic activity and increased population"* could be instrumental. Another respondent suggests that the "*trade within sector to create heterogeneity and create differences on marginal productivity,"* is an important outcome of water trading to regional development.

- Flexibility for the user was identified by 10 respondents.
    - As one respondent argues, markets offer the *"capacity to get out, from one crop to another, shift to the higher value crop or sell the water to someone else and stay on the farm."*

- Seven respondents stated the potential for Indigenous economic development outcomes was important

- The potential to provide a more equitable distribution of access to water was identified by 6 respondents.

- Four respondents felt that markets would protect the environment by setting a firm environmental flow regime that could be protected. As well a respondent argues it could enable *"environmental organisations [to] buy water to use as extra environmental flows."*

- Greater transparency in allocation decisions was viewed by three respondents as important.

Third benefit of water markets

- Twelve respondents identified the security of environmental flows

- Another 12 respondents argued that the economic development outcomes from greater certainty are significant.

- Sustainable water management, balancing social, economic and ecological aspirations, through improved water management was identified by 10 respondents as important.

- Nine respondents suggested the efficiency and the potential for water to be allocated to highest and best use.

- Eight respondents cited the potential economic outcomes to Indigenous people as important.

- While flexibility to the user was cited by 2 respondents, and equity was identified by one respondent

5.18 Costs of water markets

The costs of water markets identified by respondents are cited in order of importance.

First cost of water markets

- Twenty nine respondents identify the financial cost of regulation, administration and monitoring of the system as the most important cost.
    - One respondent suggested the creation of this framework would require an additional tax to support the bureaucracy which it will necessitate.

- Nineteen respondents argued that the creation of a market framework would impose additional costs on operators.
    - A government respondent suggests that *"At the present time, only a fraction of the water planning and management costs incurred by the Queensland Government are passed on to water users."* If this were to change some respondents from industry reflected that many farmers would be forced out of business and water would be diverted to urban users or to mining developments, a respondent articulates in relation to experience in other parts of Queensland that *"traditional irrigators it has been shown cannot afford to buy in, they are outcompeted by coal mines, so there is a transfer in water from low to high value uses which have higher economic returns, this has social implications."*

- Twenty six respondents cite environmental impacts as the largest costs.
    - One respondent suggested that water trading *"goes hand in hand with increased water extraction and ecological impacts such as pollution of river systems."* Another respondent referred to the situation in the Murray Darling and reflected that *"the idea that Government will get it right this time is rubbish. We need to ensure that we don't make the same mistakes again. Northern Rivers should be left alone."*

- Often linked with ecological costs were the perceived social costs of introducing water markets (cited by 14 respondents).
    - Eight of these respondents felt that Indigenous people could get alienated from water resources and further from the economy, as well as be prevented from meeting their cultural obligations as traditional owners.

- Nine respondents identified expenses in addressing knowledge gaps on water resources in the north as significant

- A further 3 respondents cited infrastructure development costs

Second cost of water markets

- Thirty two respondents identified an increase in financial costs of water, caused by a range of factors such as capital costs related to infrastructure development, regulation and administration fees

- Twenty four respondents identified increased development and the ecological impacts.
    - One respondent argues that with reform there will be environmental impacts *"Traditionally if water was not required it simply remained in the environment, in a market situation this water is more likely to be traded for consumption."*
    - A respondent identifies their concerns for the environment as *"issues of flow on irrigation such as increased salinity and water-logging, the Gulf has clay soils. All irrigation will have problems* [though] *with salinity, it's just about managing it."*

- Seventeen respondents argued that creating tradable rights could marginalise Indigenous people and recreational users from water resources.
    - One respondent highlighted that existing social and economic inequities could be a barrier for Indigenous people to get access to water markets.
    - As well some respondents suggested that small farmers may be forced out or that there would be an increase in homogeneity among growers, leading to community decline.

- Two respondents suggested that the government will be subject to political costs by imposing a real value on water to users who may not pay for it now (though some respondents suggested the capital costs of sinking bores in some regions is considerable and that charging for use would make agricultural development prohibitive in some areas).
    - One of these respondents was conciliatory, suggesting that "*people like to have water at no cost, although if people see they can make money by selling it in bad years it becomes more acceptable."*

Third cost of water markets

- Eighteen respondents identified administrative, monitoring and research costs as significant

- A further 18 respondents suggested that social impacts on Indigenous people and on small farmers would be an important cost.
    - One respondent felt that the "*overemphasis on economic outcomes [is] promoting the interest of those who already have disproportionate access,"* highlighting concerns that there may be a monopolisation of water licenses/entitlements.
    - Small scale farmers may be outcompeted for water accessing water; one respondent suggested that boundaries should be maintained for water trading, as *"the resources may leave these areas, so in the north*

you need a closed market so that water is not transferred out of catchments or groundwater recharge areas."

- Eight respondents emphasised the environmental impacts from the development of water markets, which they considered would intensify pressure on water sources across the north and lead to increases in nutrient runoff.
    - One respondent argued that there would be an increase in weeds and toads. Another respondent had concerns about water becoming a commodity as opposed to a *"medium that sustains all life."*

- Three respondents felt that water markets would impact recreational and cultural values directly, an Indigenous respondent reflected that *"Its not good how they looking for water, they've destroyed lots of dreaming sites."* Another respondent suggested that increased consumption of water would lead to species decline and impact cultural and recreational activities.

5.19 Will the benefits of water markets outweigh the costs?

Thirty eight percent of respondents felt that the benefits of water markets would outweigh the costs (see Figure 19). A third of respondents thought that the costs would exceed the benefits, and 30% (or 34 respondents) were undecided or ambivalent.

Figure 19: The benefits of water trading will be higher than the costs

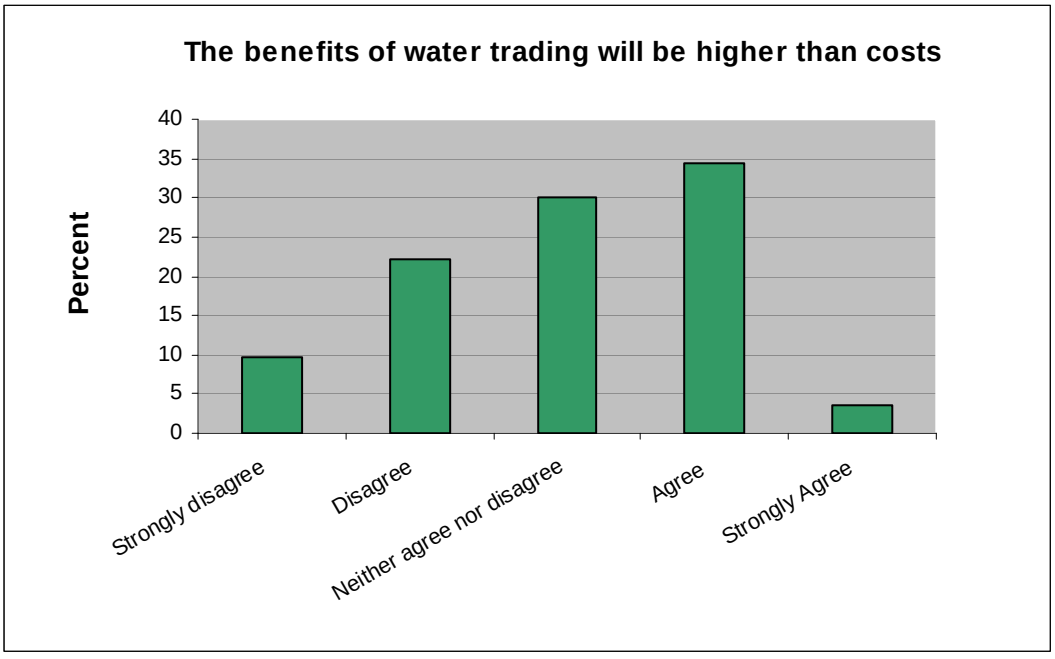


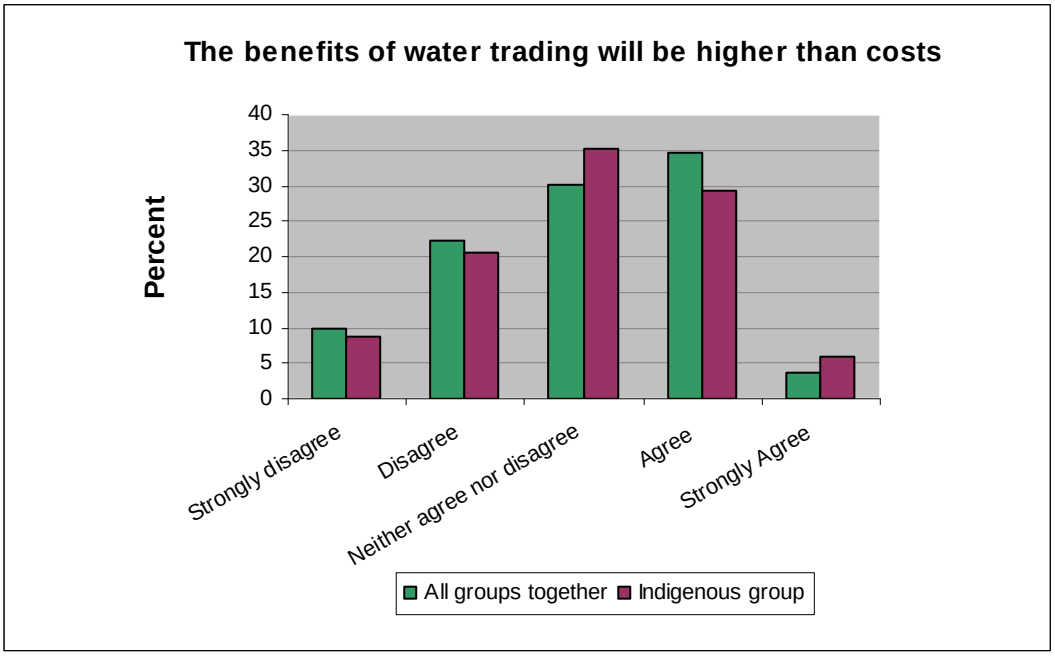
Table 5 presents those variables which increased the probability of answering that the benefits of markets would be higher than the costs. These were: the age of the respondent, having a higher education. Being a male was also significant, and those respondents who have had involvement in water management were more likely to agree that the benefits of water trading will outweigh the costs.

Table 5: Marginal effect on the probability of answering that the benefits of water trading will be higher than the costs

Marginal effect on the probability of answering that benefits of water trading will be higher than costs		
Variable	Marginal effect	P_value
Being a man	0.139	0.051**
Living in Northern Territory	0.075	0.615
Living in Queensland	-0.071	0.421
Age of respondent	0.008	0.000***
Having higher education (bachelor degree or higher)	0.229	0.000***
Expecting the water availability to decrease in future	0.012	0.871
Involvement in water management	0.174	0.095*
Answering on behalf of indigenous community	0.178	0.155
N	107	

Figure 20 highlights the responses of Indigenous respondents compared to all respondents. Over a third (35%) of Indigenous respondents neither agreed nor disagreed that the benefits of trading would outweigh the costs, while for other respondents it was 30%. The pattern was similar to agreeing or disagreeing, with a third (34%) of all respondents thinking the benefits would outweigh the costs, while 29% of Indigenous respondents agreed.

Figure 20: The benefits of water trading will be higher than the costs, comparing Indigenous to all respondents



5.19.1 Explanations as to why or why not the benefits of water trading will outweigh the costs

Respondents were provided with an open ended question to identify the reasons for why they thought the benefits of water markets would outweigh the costs (or not). As the results from the closed ended measure suggest there are mixed views on the outcomes of markets. There were concerns that establishing a market framework would necessitate a tax on producers and inevitably more red tape.

- Thirty four respondents argued that the costs of water trading would outweigh the benefits in their region. There was a focus on the financial (administrative) and ecological costs of establishing a trading system.
    - In terms of ecological impacts the diversion of water away from one area was viewed as allowing for saltwater intrusion up rivers, as well as “drying country” up. These effects were seen as irreversible and destructive to ecosystems by some respondents.
    - The costs of quantifying water use were seen as prohibitive in a region a number of respondents considered to have an abundance of water but high operating costs for business. However, it was recognised that in

some areas there may be pressure to move to trading in the future. As one respondent articulates:

"At this point in time the level of water use and competition for water is relatively low, thus the cost of market establishment appears greater than the perceived benefit. However, the potential for significant accelerated…water use in some areas is recognised, largely depending on significant developments. Careful monitoring of [the] *level of use should provide a useful signal on timing of market establishment."*

- Twenty seven respondents argued that the benefits of water markets would outweigh the costs. Respondents suggested that establishing a monetary value on water would improve efficiency and allocation to highest and best value use. One respondent articulates that:

  "The economic arguments for allocating resources through market like mechanisms are very strong. The key advantage include[s] an increase in net returns (surpluses) to society, better resources, and a transparent signalling (price) mechanism. The incentives that water markets create include better exit signals for less productive performers, as well as more flexible opportunities for new developments…Water trading enables users to make considered decisions about water use, and to…sees the value of their water as a secure asset."

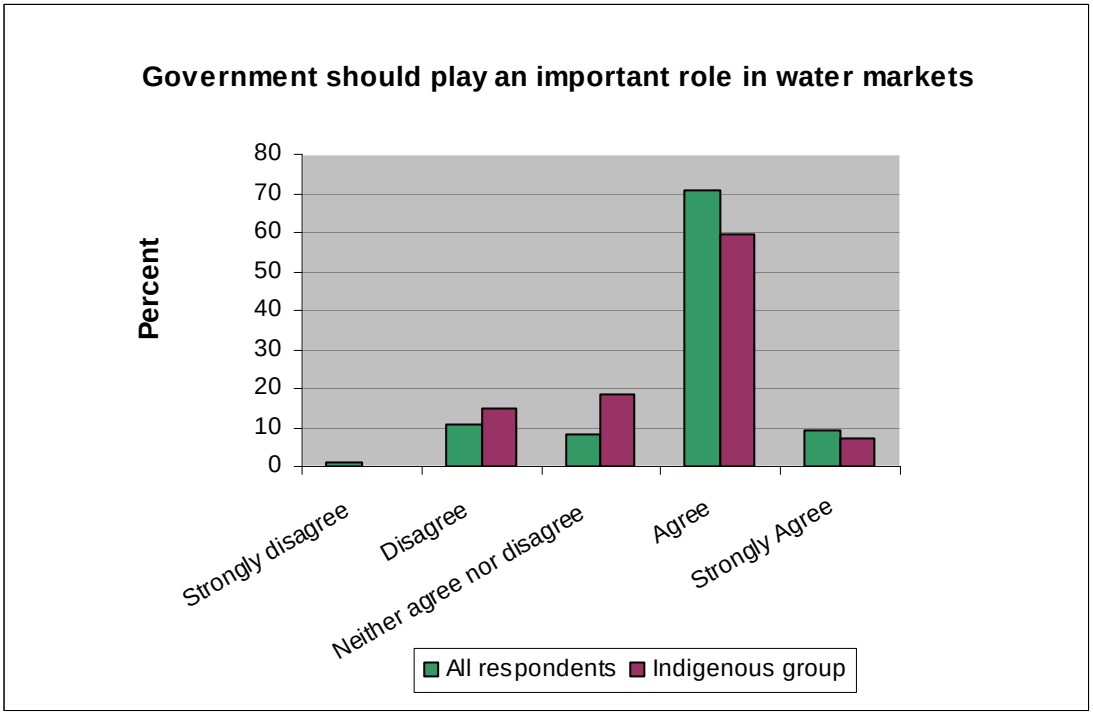
- Five respondents viewed water markets as having the potential to facilitate Indigenous economic development across the north which would be a significant benefit given the socio-economic disadvantage present among the Indigenous population.
  - However, this was conditional on recognition of Indigenous rights, which ranged from a share of the consumptive pool and meaningful involvement in the management and allocation of water resources. A respondent offers that *"If it is structured properly [water markets] and Indigenous people have rights, which recognise that if land and water is separated that compensation is payable."*

- One respondent suggested that a different approach to water reform, one that is more participatory, is required for the benefits of water markets to outweigh the costs, *"it will need people to be more involved in water management and research."*

5.20 Government should play an important role in water markets

Respondents were asked whether they thought government should play an important role in a water market regime (see Figure 21). There is strong support for government having a role in water markets with 80% of respondents agreeing (n=109). The same pattern was true for Indigenous respondents with 66% supporting a role for government. However, almost 20% of Indigenous respondents neither agreed nor disagreed, perhaps reflecting mixed views on a role for government or ambivalence.

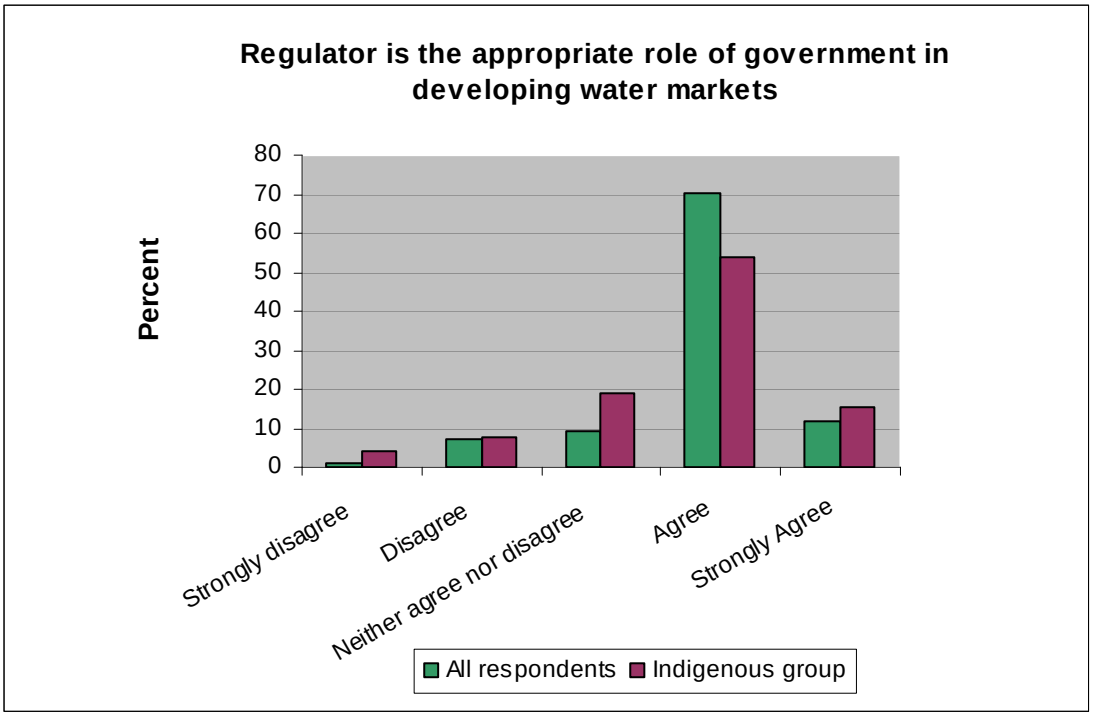
Figure 21: Government should play an important role in water markets, comparing Indigenous and non Indigenous responses



5.21 Regulator is the appropriate role of government in developing water markets

Respondents were asked whether they agreed with the statement that regulator is the appropriate role of government in developing water markets (see Figure 22). Respondents showed strong support for government as a regulator of water markets, with 82% agreeing (n=108). Indigenous respondents also supported government as a regulator (with 69% agreeing). Again 19% of Indigenous respondents neither agreed nor disagreed.

Figure 22: Regulator is the appropriate role of government in developing water markets



5.22 Water should be transferred from one area to another

Respondents were asked whether they agreed or disagreed with water being transferred from one area to another (see Figure 23). Most respondents (55%) disagreed with water transfers (n=117). A little over a quarter of respondents agreed with water transfers (26.5%).

Figure 23: Water should be transferred from one area to another

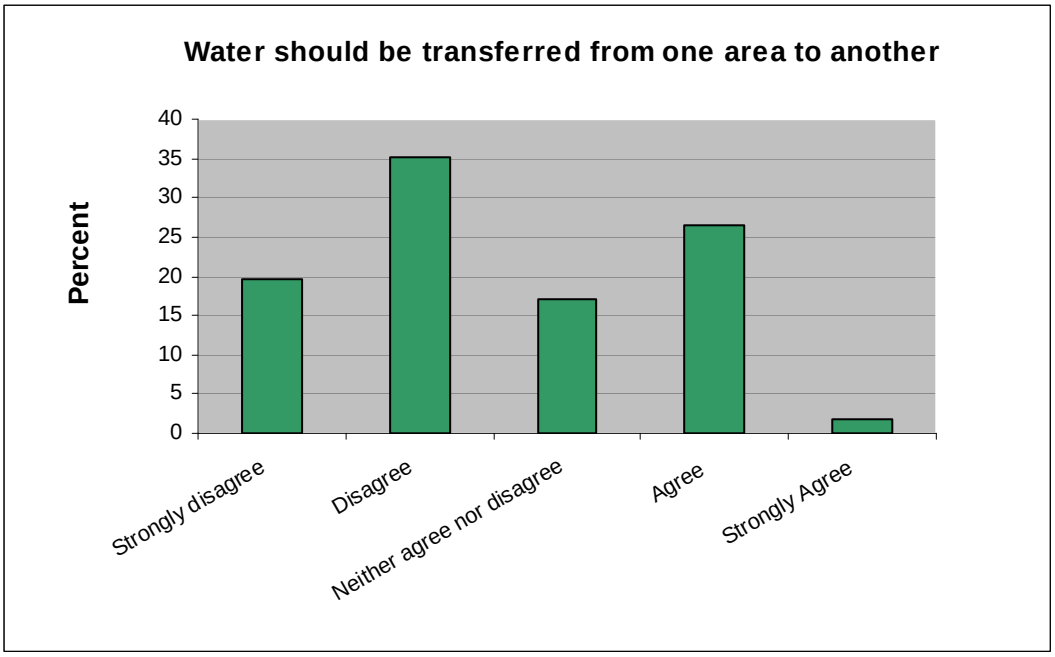


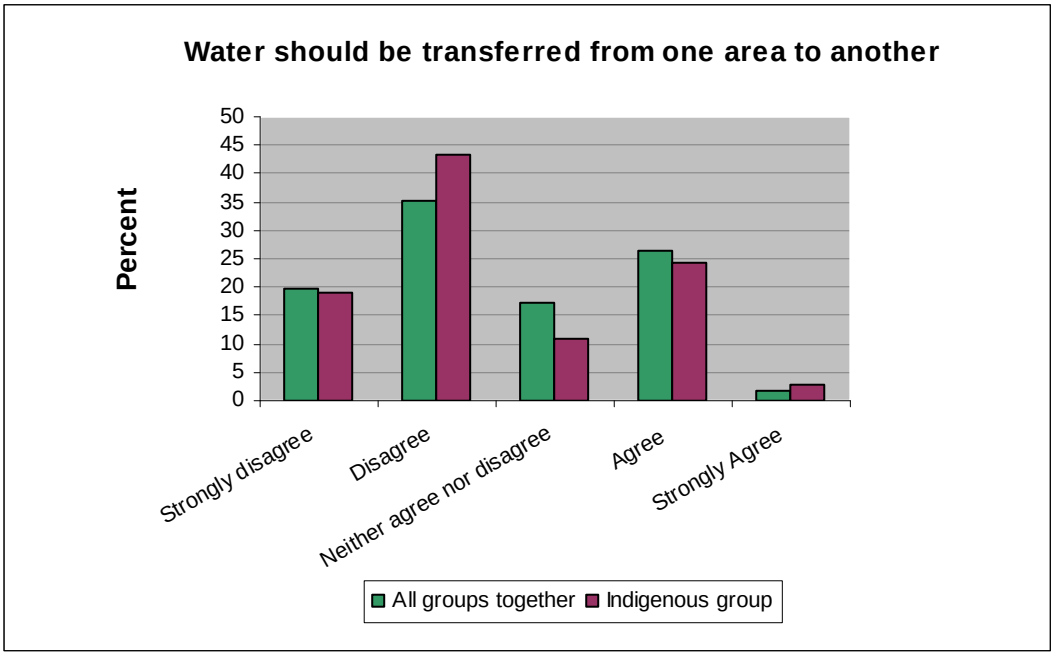
Table 6 shows the variables that are significant at conventional levels of significance. The variables which increased the probability to agree to transfers are: being involved in industry, having a higher level of understanding water management, being Indigenous, living in the NT and being a male.

Table 6: Marginal effect on the probability of answering that water should be transferred from one area to another

Marginal effect on the probability of answering that water should be transferred from one area to another		
Variable	Marginal effect	P_value
Being a man	0.091	0.059*
Living in Northern Territory	0.105	0.055*
Living in Queensland	-0.026	0.761
Higher level of understanding water management	0.081	0.000**
Strongly agree that current water management is sustainable	0.022	0.631
Expecting water availability to decrease in future	0.062	0.545
Involvement in water management	-0.033	0.539
Industry	0.371	0.000**
Answering on behalf of indigenous community	0.202	0.001**
N	112	

Figure 24 highlights that 62% of Indigenous respondents disagree with water transfers (compared to 55% of all respondents). While 28.5% of all respondents agreed to water transfers compared to 27% for Indigenous respondents.

Figure 24: Water should be transferred from one area to another, Indigenous responses compared to all responses



5.23 Title to land and water should be separated

This question asked respondents (n=118) whether they think land and water title should be separated (see Figure 25). There was almost an even split with 45% of respondents agreeing that it should, while 43% disagreed to unbundling. Twelve percent of respondents neither agreed nor disagreed with the idea of separating title to land and water.

Figure 25: Title to land and water should be separated

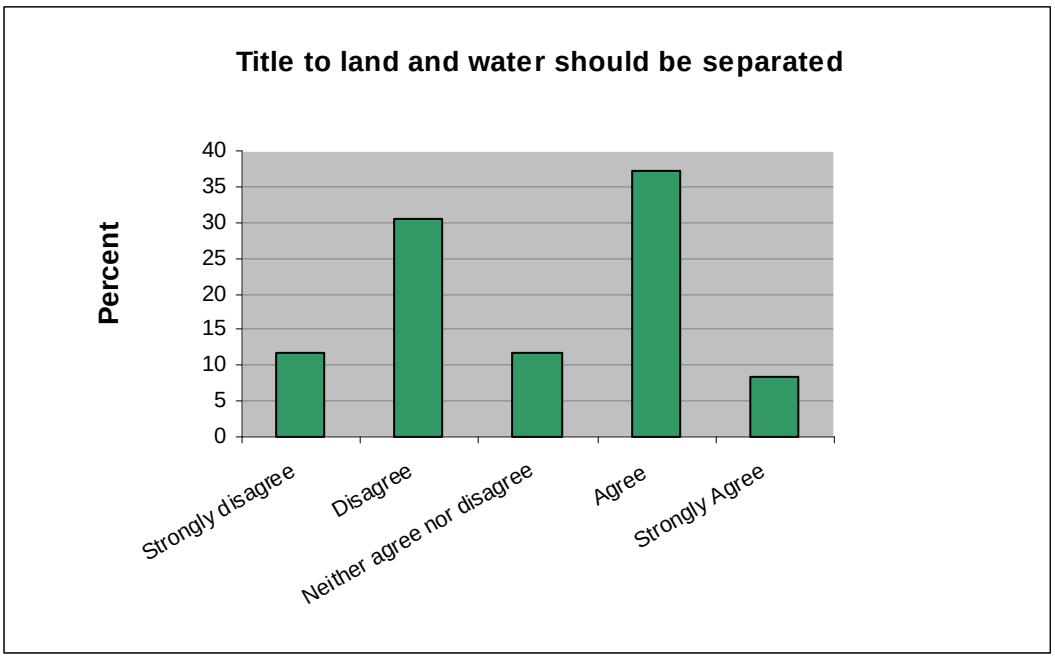


Table 7 presents that being a male and having a higher education significantly increase the probability of agreeing to a separation of land and water title. Indigenous respondents were more likely to disagree to the separation of land and water title.

Table 7: Marginal effect on the probability of agreeing that title to land and water should be separated

Marginal effect on the probability of answering that title to land and water should be separated		
Variable	Marginal effect	P_value
Being a man	0.202	0.001**
Living in Northern Territory	-0.036	0.805
Living in Queensland	0.072	0.617
Having higher education (a bachelor or higher degree)	0.243	0.035**
Higher level of understanding water management	0.048	0.428
Strongly agree that current water management is sustainable	-0.008	0.725
Expecting the water availability to decrease in future	-0.081	0.483
Involvement in water management	0.022	0.822
Answering on behalf of indigenous community	-0.317	0.000**
N	109	

5.24 Should environmental flow be tradable?

This question asks respondents (n=108) whether environmental flows should be tradable. Figure 26 shows that 73% of respondents disagreed with the trade of environmental flows (38% strongly disagreeing).

Figure 26: Should environmental flows be tradable

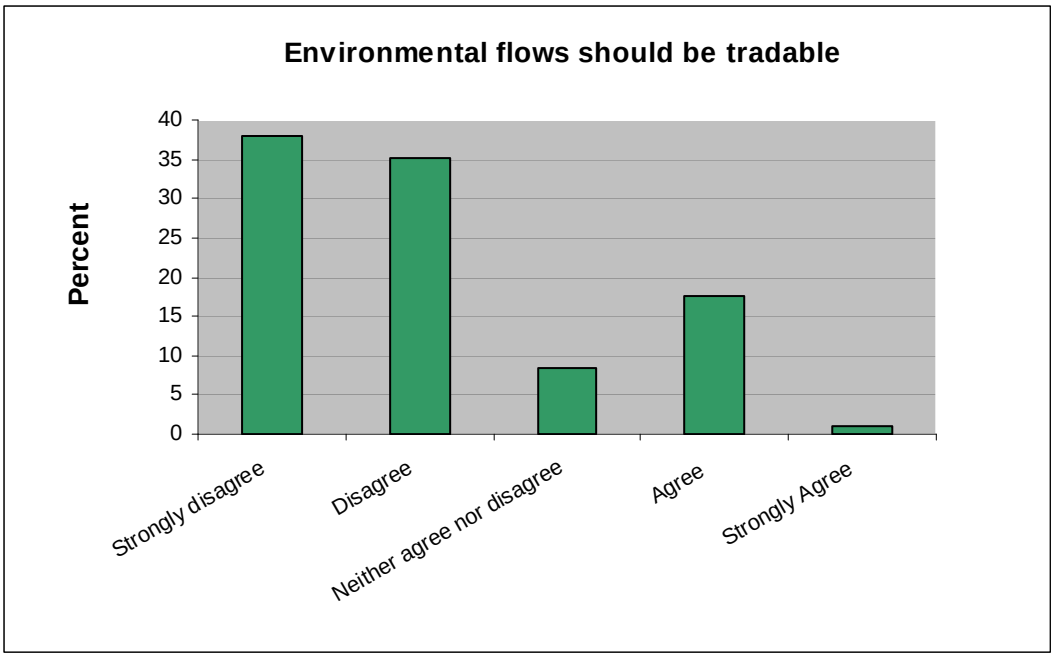


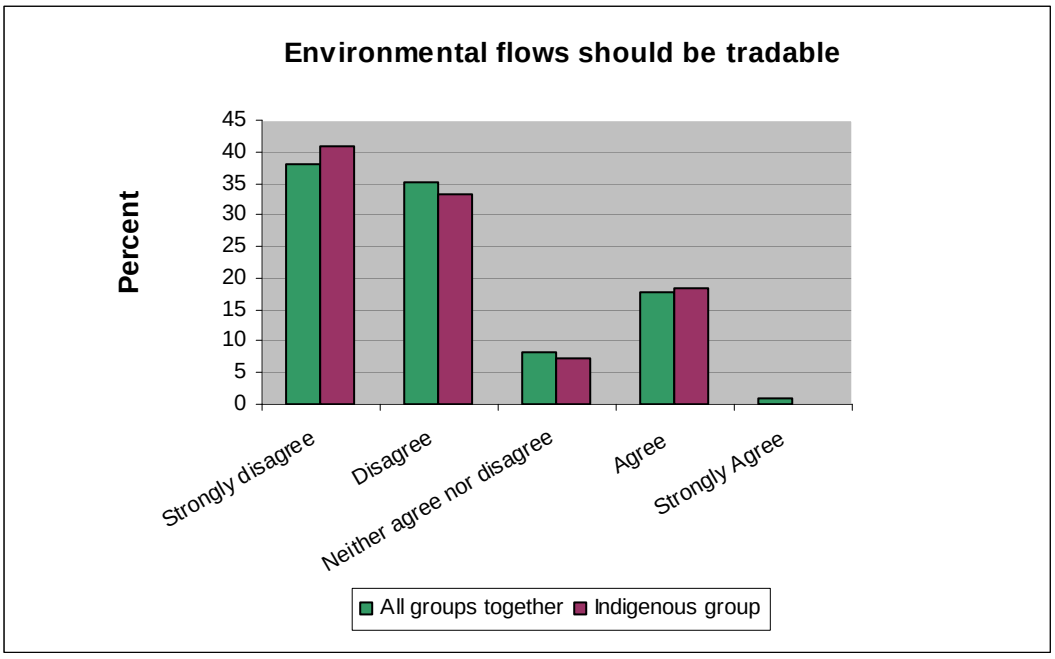
Table 8 shows that Indigenous respondents and those respondents with a high level of understanding of water management would be more likely to disagree to the trade of environmental flows.

Table 8: Marginal effect on the probability of answering that environmental flows should be tradable

Marginal effect on the probability of answering that environmental flows should be tradable		
Variable	Marginal effect	P_value
Being a man	0.120	0.003**
Living in Northern Territory	0.032	0.797
Living in Queensland	-0.079	0.461
Having a higher education (bachelor degree or higher)	-0.083	0.324
Higher level of understanding water management	-0.081	0.000**
Strongly agree that current water management is efficient	-0.036	0.566
Expecting the water availability to decrease in future	-0.026	0.680
Involvement in water management	0.063	0.017
Answering on behalf of indigenous community	-0.119	0.079*
N	100	

Figure 27 highlights consistent responses in the population with 74% of Indigenous people disagreeing to the trade of environmental flows compared to 73% of all respondents.

Figure 27: Environmental flows should be tradable, comparing Indigenous and all respondents



5.25 Should cultural flows be tradable?

Figure 28 shows that 63% of respondents (n=108) thought that cultural flows should not be tradable. Just under a quarter felt cultural flows should be tradable.

Figure 28: Cultural flows should be tradable

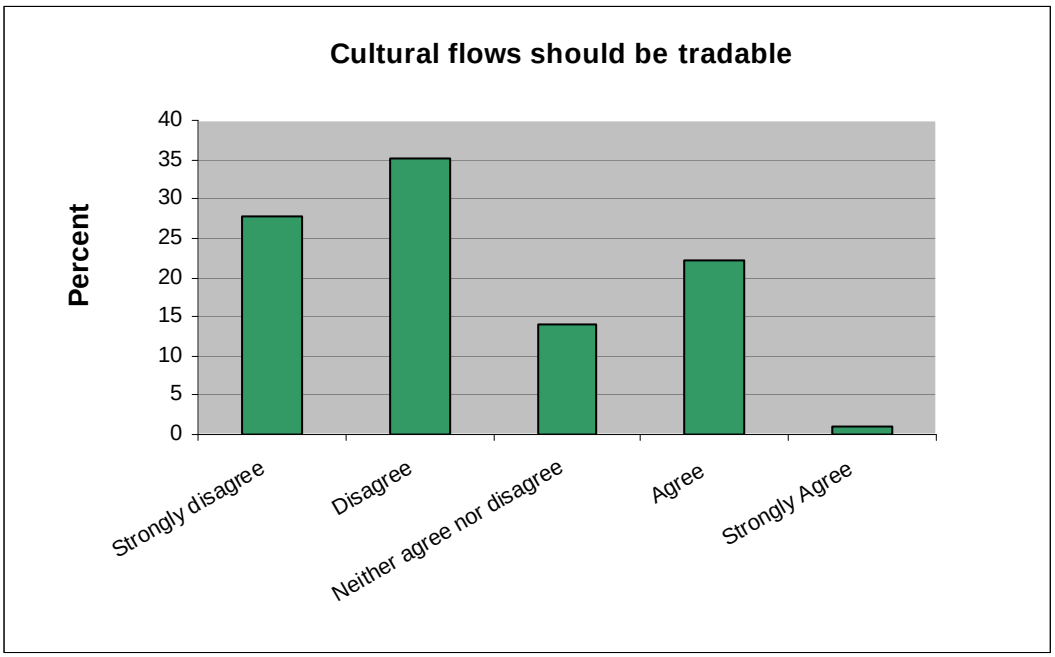


Table 9 highlights that respondents would more likely disagree with tradable cultural flows if they had a higher level of understanding of water management, a higher education or were Indigenous.

Table 9: Marginal effect on the probability of agreeing that cultural flows should be tradable

Marginal effect on the probability of answering that cultural flows should be tradable		
Variable	Marginal effect	P_value
Being a man	0.101	0.137
Living in Northern Territory	0.050	0.603
Living in Queensland	-0.044	0.614
Age of respondent	-0.001	0.696
Having a higher education (bachelor degree or higher)	-0.070	0.080
Higher level of understanding water management	-0.064	0.000
Strongly agree that current water management is efficient	-0.008	0.792
Involvement in water management	-0.010	0.812
Answering on behalf of indigenous community	-0.091	0.015
N	101	

Figure 29 illustrates that a large proportion of all respondents disagree with the trade of cultural flows. .

Figure 29: Cultural flows should be tradable, comparing Indigenous and all respondents

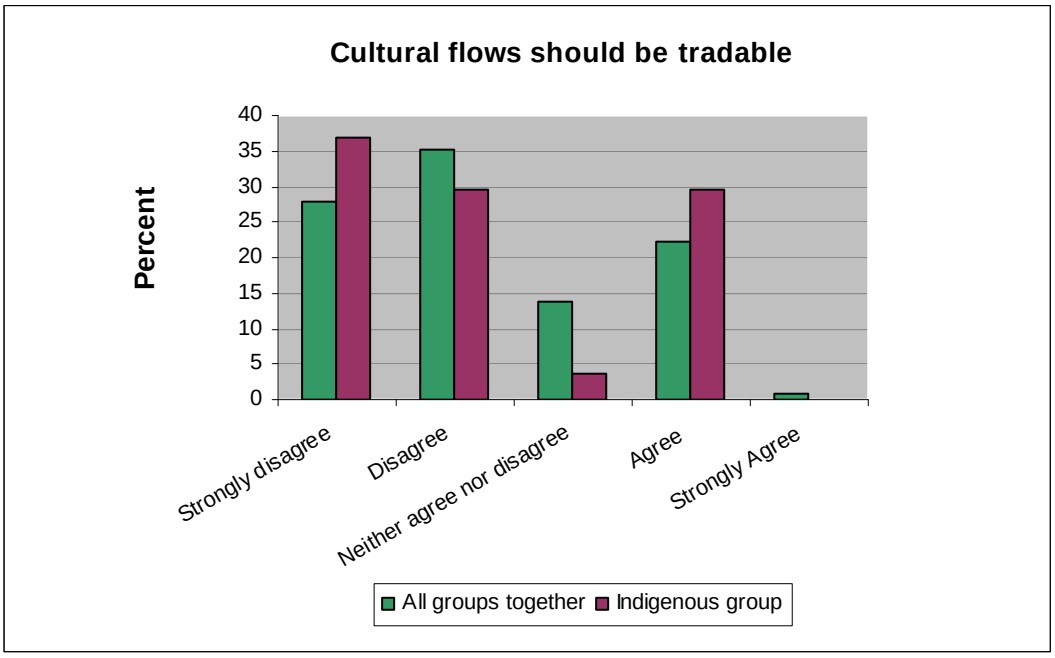
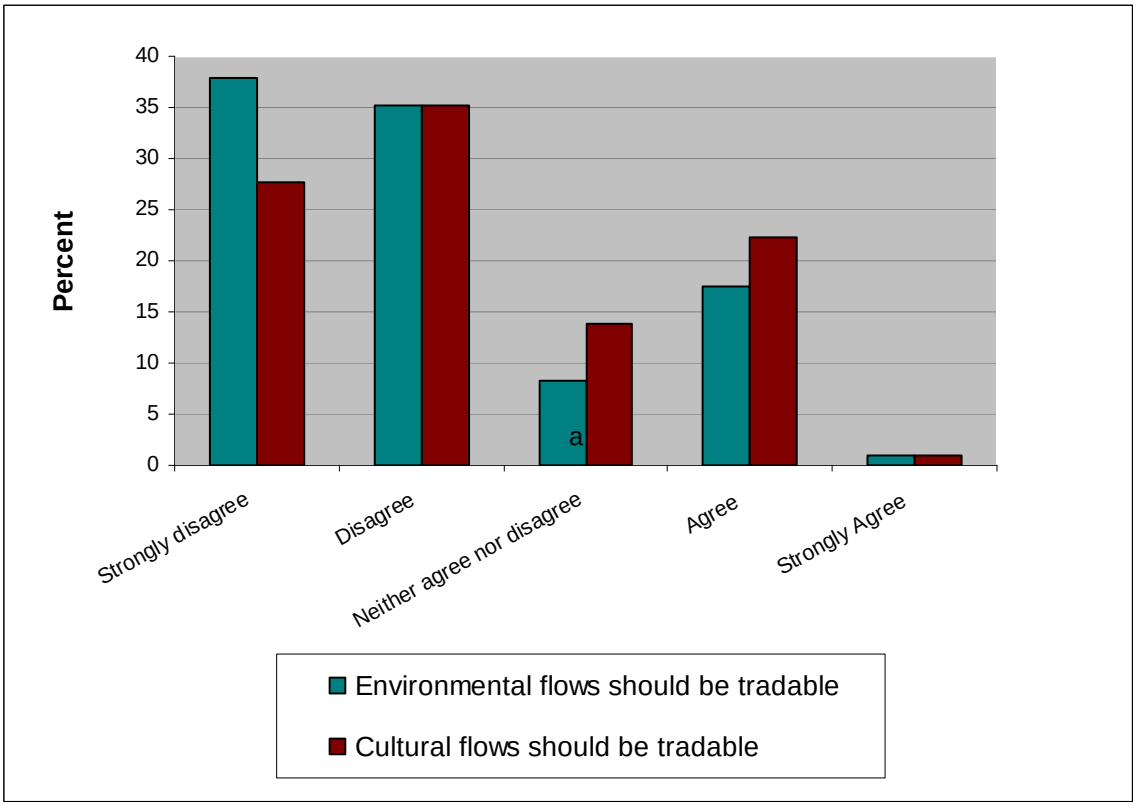


Figure 30 compares the responses to whether environmental flows and cultural flows should be tradable. Responses were relatively consistent, with 35% of respondents disagreeing to the trade of environmental and cultural flows. However, respondents were more likely to strongly disagree to the trade of environmental flows than cultural flows (38% to 28%).

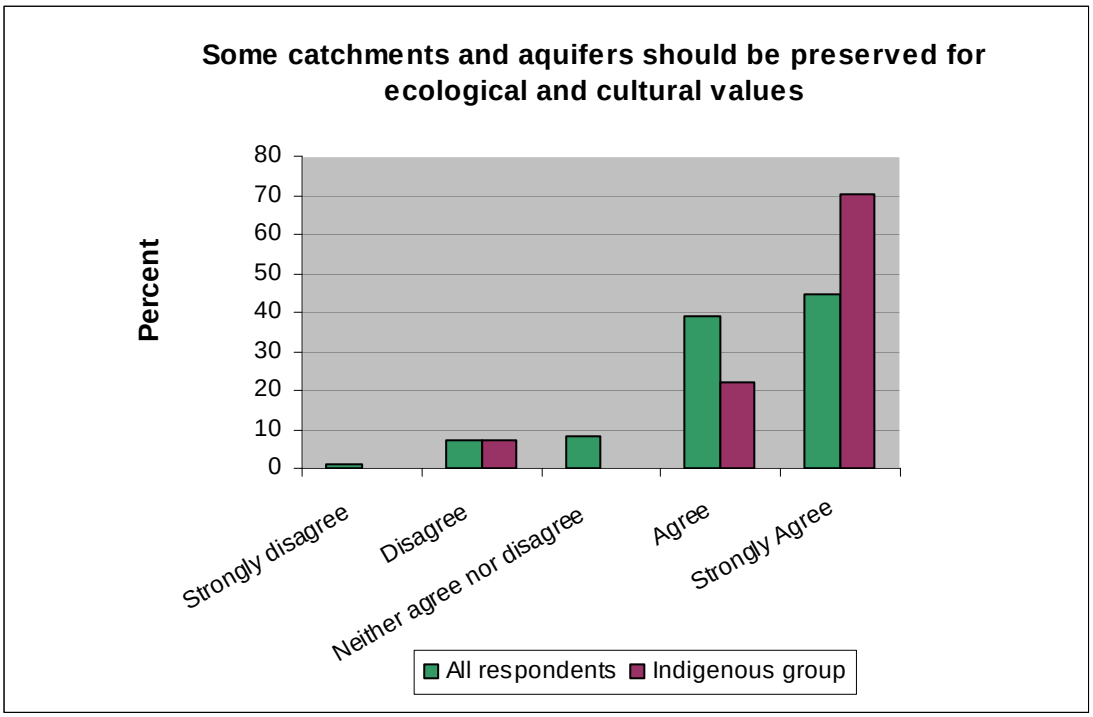
Figure 30: Comparing responses for tradable environmental and cultural flows



5.26 Some catchments and aquifers should be preserved for ecological and cultural values

This question asked respondents (n=108) if they think that some catchments and aquifers should be preserved to maintain ecological and cultural values (see Figure 31). There was significant support for the preservation of some catchments and aquifers with unique values, 81% of respondents agreeing (44% strongly). There was unanimous support for this among Indigenous respondents, almost 70% of Indigenous respondents strongly agreed to preserving certain catchments and aquifers and another 22% agreeing.

Figure 31: Some catchments and aquifers should be preserved for their ecological and cultural values



5.27 Obstacles to the development of water markets in the north

Respondents identified the obstacles, both existing and perceived, to the development of water markets across the north, in order of importance.

First obstacle to the development of water markets

- Forty seven respondents viewed community opposition as being the major obstacle. Respondents offered that communities would be opposed to a change in the status quo, or to the potential for water to be traded as a commodity and be capable of being monopolised.
    - A respondent elaborates that *"The general community is fundamentally opposed to water markets as they view the resource as a community resource to be shared and not one which should be commodified, bought and sold by those with access and the means to do so."* There was also a distrust of government in some respondents' views. Some respondents reflected that community opposition is linked to a lack of awareness and offered that government would need to address this with education and awareness programs.

- According to 22 respondents there is a perceived abundance of water and a distinct lack of competition among consumptive users for water which creates no need generally for water markets across the north.
    - For example one respondent suggested that "*current water availability means that there is no driver for the market, you can access water for free from the Department of Water,"* another suggests that there is "*no need for it* [a water market framework]…*Trading would be great if I had 1000 ML and you had 1000 ML and I needed more water and you didn't want to farm anymore. But that scenario doesn't exist."*

- Eight respondents identified environmental considerations as the major obstacle to the development of water markets across the north, citing factors such as unique hydrology, inappropriate soil types for agriculture, seasonality.
    - One respondent highlighted the diverse landscapes across the north and climate variability, suggesting that planning would have to be highly localised to assess the likely impact of irrigation on defined areas and the ecological values present.

- Limited data on ecological values and gaps in knowledge on the availability and quality of water resources across the north were viewed by a further 8 respondents.
    - One respondent suggests that in northern Queensland for example that there "*is little data available with which to definitively define the volume of water that can be sustainably taken for consumptive purposes."* The same point was raised in other northern jurisdictions.

- Six respondents identified the impediments of distance to market, infrastructure and costs as the biggest obstacles.

Second obstacle to the development of water markets

- Twenty three respondents saw community acceptance of water markets as the second most significant impediment. Some respondents suggested that reshaping people's behaviour in using water would require focus by government (community education and awareness programs were identified).
    - One respondent argues that *"There is a strong public resistance to metering, such that Governments are unlikely to introduce metering, for fear of losing the next election."*
    - Several respondents offered that people think water should be free and any attempt to impose a charge will be greeted with opposition.
    - Some indigenous respondents suggested that culturally they could not accept that water could be traded. While other respondents argued that a trading framework would marginalise the general public to support industry.

- A lack of infrastructure and the costs of doing business, as well as the costs of administering a water trading system in the north were viewed as prohibitive and a major obstacle by 16 respondents.
    - One government respondent suggests that in terms of establishing agricultural schemes across the north and allowing water trading that "*The costs of doing it will be insurmountable; I mean if you have open channels it will all evaporate."* However, one respondent notes that "[our] *approach has been to give priority to introducing water trading into areas where the demand for water is greatest. This ensures that the investment of resources into establishing the water market provides and overall benefit to the state's economy."*
    - A further 3 respondents offered that there is no need for water trading in the north because demand will never exceed supply.

- According to14 respondents, government was viewed as the second most significant obstacle to the development of a water trading framework in the north.
    - Some respondents suggested that government had failed to communicate water reform effectively enough which reduced awareness and created opposition to change.
    - Another respondent suggested that Wild Rivers was a major obstacle, linking water trading to economic development, arguing that the "*restrictions of Wild Rivers, [on] our traditional lands its meant to be freehold title but there is so much red tape to get approval, you have to go through the Minister, there are so many hurdles and loops."*
    - Bureaucracy and political will were also viewed as important barriers.

- Thirteen respondents identified environmental impacts as the biggest obstacles, citing distribution of weeds and chemical runoff, as well as saltwater intrusion of rivers as limiting the expansion of markets.
    - One respondent refers to southern experiences articulating that *"We don't want another Murray Darling in the Fitzroy. In Adelaide the river is dirty, it never gets clean."*

- Five respondents identified gaps in knowledge on water systems in the north, in particular the interaction of groundwater and surface water, and on the potential impacts of increased extraction and irrigation activity.

- Three respondents argued that setting up a trading system and agreeing on a price for water would be challenging in the north.
    - As one respondent suggests in relation to a price for water that: *"ultimately the market will determine this in the long run. But initially parties will need to come to an agreement on price."*

- Three respondents identified land tenure issues across the north, in particular Aboriginal land tenure, as well as pastoral leases, as creating complexity in development. This in turn is an obstacle to the development of water markets. One of these respondents suggested the zone arrangements for water trading acts as an impediment to trading.

Third obstacle to the development of water markets

- Financial costs and remoteness were identified by 14 respondents as the third most significant obstacle to developing water markets. Distances and the increased costs of doing business were seen to have the effect of restricting economic development and hence the building of water infrastructure.
    - Also one respondent argues that "*markets tend to work where natural features and/or infrastructure exist to allow easy transfer of water between the source of water and the user…few areas* [in the north] *currently lend themselves to ease of transfer between sources and users."*
    - The costs of administering and maintaining a water market in the north were viewed as prohibitive by some respondents.
    - Another four respondents argued that there was no need for water markets in the north as there was neither little value extracted from water use nor has crop water exceeded allocation limits in many areas.

- Seven respondents identified government as an obstacle, arguing that government had not committed enough resources to further markets, nor did they have the political agreement or will to do so.
    - One respondent offered that a simple and equitable legislative and regulative system would be needed but may not be forthcoming for establishing water markets.

- Environmental considerations were a significant obstacle in the minds of 6 respondents, who argued that increased development would have lasting impacts on ecosystems across the north.
    - The requirements of the north are unique, a government respondent suggests that the *"perception is that we have too much water but in fact this may be what's needed to sustain our unique ecosystems."*
    - Another respondent offers that the *"flow and environmental groundwater aquifer requirements may be so great that there is negligible volumes of natural water available for sale on the market."*

- One respondent argues that weeds and cane toads would be obstacles to getting markets off the ground which they felt "*would be another disaster on our food* [chain]."
- A further two respondents identified knowledge gaps around the impacts of water extraction on the environment as being the third biggest impediment to developing water markets.

- Community acceptance was identified by six respondents as an impediment.

- A further six respondents identified the resolution of Indigenous concerns as being a significant obstacle to the development of water markets.
  - For example, one respondent argues that an important issue is a *"lack of formal settlement with TO' s (traditional owners) and native title owners"* around water.
  - While another respondent reflects that it will take time for water reform to be assessed by Indigenous groups, "*Every group will have to take the time to come to an agreement with each other on what they want to do, you just cant make a decision without taking to other people."*
  - One respondent offered that there is still not agreement between Indigenous people and government on what is an appropriate cultural flow and an equitable Indigenous reserve, which the respondent asserts is *"not necessarily one and the same."*

5.28 Market Design

Respondents were asked to describe how they would like to see a water market designed, and to identify the kinds of institutional and regulatory features they think would be important. Respondents cited up to three preferences in terms of their importance.

First preference for market design

- Twenty one respondents stated that Indigenous people should have some role in water markets, ranging from involvement in management and governance to planning, as well as recognition of Indigenous cultural and commercial rights.
  - One respondent articulates that "*Indigenous people need to be integral* [and] *have equity in planning and decision making in the North."*

- A market should contain prescriptive rules according to 14 respondents. Respondents cited various elements they thought important in water trading frameworks, such as limited transfer between sectors, trade only within catchments or aquifers, an annual infrastructure charge to avoid sleeper entitlements, trade only among actual users, restrictions on permanent trade and rules against the monopolisation of rights.
  - A respondent states that there "*should be limits to speculation—no scenarios like futures trading."*

    - Four of these respondents argued that land and water should not be separated.

- Conversely, four respondents suggested a freely tradable entitlement which is not constrained by red tape, and one of these respondents offered that monitoring and reporting should be voluntary.
    - Another respondent argues to "*Give people their allocation and let them do what they want with them. They can develop their land and if they need to they can trade it."*
    - While another respondent suggests that a capacity sharing system would be effective in the north "*allowing growers to access water when they need it, as opposed to when the system requires them to have it."*

- Nine respondents articulated a market with a clear ecological and social mandate, which takes into account activity at a landscape level.
    - A respondent articulates that in northern Australia, a way for water markets to work would be "*where the fundamental baseline is ecology and human needs, any surplus water could be used."*

- A total of 6 respondents reiterated that they were opposed to the creation of water markets in northern Australia.
    - One respondent states in relation to water markets that "*We don't want it, it's our life, it's our everything, for young people and old people, to tourists and everyone. We can't buy it or sell it."*

- Four respondents thought that local communities should be involved in the management and regulation of water, one offering that there must be some social control over pricing.

- Two respondents suggested a clear management role for government to support broader community interests in water markets, as well as taking the role of regulator and controller in the market.
    - While one respondent argued that an agency independent from government should regulate the market.

- Another two respondents felt that markets should only be considered where systems are reaching their allocation limit.
    - One respondent asserts that there must be accounting systems to keep track of water to determine accurately when we are reaching the full allocation limit.

Second Preference for Market Design

- Water market should be based on rigorous plans that protect environmental and cultural flows according to 10 respondents.
    - One respondent suggests that these water plans should "*account for all water use including mining and stock and domestic"* to provide a more accurate picture to resource managers and planners.

- Eight respondents offered that markets should be designed so that there are mechanisms to promote equitable distribution and transparency in pricing and allocation.
    - One respondent suggests that "*publicly available information should be provided, to monitor things, allow academics and the public to monitor how things are."*
    - Six respondents offered that Indigenous people should be consulted and have input into the management of water markets to maintain equity.

- Seven respondents called for various initiatives to support agricultural communities around different classes of water use (defining consumptive and non consumptive), a shared pool, and water to support farming communities, trade restricted to specific regions, and a cooperative system.

- Five respondents suggested enhancing the conditions to trade by providing clear title.
    - Another two respondents offered that land and water should not be separated.
    - One respondent states that "*regulations will need to be streamlined to allow trade to occur. The onus should be on the landowner to manage environmental issues such as groundwater levels."*

- Four respondents felt that there should be no development and markets should not be progressed, this would ensure according to two respondents that the land and wildlife would be protected.

- Two people argued that community involvement would improve water management in a trading framework.

- A further two respondents identified a regional governance model to manage water; this could be akin to the cooperative model in the Ord according to one respondent.

Third Preferred Feature for Market Design

- Eleven respondents stated that there should be some form of an Indigenous allocation or involvement in water markets to address economic and cultural aspirations.
    - One respondent elaborates on the form this should take, offering that there should be established a "*Co-management model for water through Prescribed Body Corporate, or alternative Indigenous Leadership and Governance models as well as strong environmental protection must be the guiding principles."*

- Five respondents wanted rigorous planning to set the parameters of water markets. This should allow flexibility according to one respondent, while another suggests certainty for horticulture where growers need 10 year plans. What was important to these respondents was the adoption of precautionary principles, but also adaptive management to deal with change.

    - Other respondents wanted to see environmental and cultural flows traded with conditions, restrictions on water banking, a per hectare allocation of water and closed systems to prevent transfers to other sectors (such as mining).

- Two respondents highlighted community agreement on issues such as allocations to protocols on biodiversity as important.

- Two respondents want there to be different prices charged for water, one for households (another price for industry) and for grey water.

- One respondent states that there is required cross border policy on aquifers to ensure "*consistent patterns of usage.*"

5.29 Policy Recommendations

Respondents were asked to provide up to three policy recommendations for the development of water markets in northern Australia, cited in order of importance.

First Policy Recommendation

- Seventeen respondents called for a meaningful recognition and involvement of northern Australia's Indigenous peoples in the development of water markets.
    - Indigenous respondents emphasised their cultural connection to land and water, "*Water and land and culture all together, belong to the land. You get the land through your culture.*"
    - Supporting this cultural and spiritual connection is an important objective for Indigenous people across the north; as well a respondent states that Indigenous aspirations in water reform go beyond *"a cultural percentage to do what they want to do"* and includes *"a percentage tradable in the consumptive pool which can be sold."*
    - One respondent also suggests a pan-northern approach to planning and development.
    - Another respondent highlights the disparity in resources to provide input into water planning, where government has considerably more than Indigenous interests in making assessments which creates inequitable outcomes.

- Fifteen respondents urged for greater collaboration in reform between government and communities, recommending extensive consultation and community education programs to facilitate improved awareness of reform.
    - One respondent articulates that what is required is governments to *"take time to explain in explicit detail to all sectors of the community what's being proposed and the potential impact. People need to be aware of protecting country, plants and animals and significant sites. Likewise put equal effort into talking to commercial interests, how either domain will be enhanced, maybe not in the short term, but in the long term it will increase their commercial viability."*

- Eleven respondents argued that they did not want markets in the north, suggesting that the land and water should be left in its current natural state without reform.
    - A respondent elaborates that "*We don't sell water, it belong to the country, the birds, the animals. Aboriginal perspective we have a different view."*

- Five respondents articulated a vision of environmental protection in the north, linking its future to ecosystem services.
    - A respondent states that *"The future of the north is environmental protection, a conservation economy with no water trading or irrigation. There are opportunities in land management, tourism, not transplanting the failed orthodox development paradigm from the south to the north."*

- Conversely, four respondents argued that government should promote greater development and water trading could be one way to facilitate this, one respondent identifies that *"We need more infrastructure... Our population is increasing; we need infrastructure to support this."*
    - Another respondent called for greater protection of farmers if trading was to commence by preventing speculation.

- Three respondents cited an increased focus on environmental flows.
    - One respondent suggests there is too much provided to the environment. Another respondent articulates that *"Environmental water should be tradable and begin paying its way. Where there is drought people can trade their part of the entitlement and become more efficient and they can make the environment more efficient by building levees…and earn income… We also try to protect these museum environments by providing releases to the environment, it really is no use to anyone. We need to make it possible to make money elsewhere."*

- Two respondents felt that a market framework should be set up but only become activated once the systems reach full allocation.

- A further two respondents called for government to rethink how it implements reform, suggesting a more business like approach.

Second Policy Recommendation

- Twenty four respondents identified Indigenous considerations as a key policy issue in establishing water markets.
    - Indigenous respondents highlighted the importance of water to their culture and livelihoods. Many of these respondents called for increased indigenous involvement in managing water and were concerned about attempts to decouple land and water title.
    - One respondent suggests extensive consultation that builds understanding of water reform among Indigenous people.

- Another Indigenous respondent also underscored the emerging importance of water as one mechanism to address Indigenous socio-economic disadvantage, *"The possibility of setting up a water market for our country would provide a great economic foundation for us as traditional owners."*

- Fourteen respondents thought a robust institutional and policy framework is essential to the development of water markets and an important recommendation to policy makers.
  - Respondents cited strong rules, effective monitoring and review, common standards across jurisdictions, integration with land management, and an agreed environmental flow assessment system.
  - Two respondents suggested that this framework should be informed by and support local producers.
  - The notion that only local growers should be involved in trade was raised by a respondent, who argues that *"The people involved in the market should be local; they should have a genuine reason to have the water. Some water should be attached to farming land, land and water title should be separated but with a percentage to remain on land."*
  - Two respondents suggested that we should learn from the southern experience so as not to repeat it in the north. One respondent argues whether using markets is appropriate to allocate water, they go on and offer that *"We need a community resource approach. Government needs to control the process with community input. A trading board might be useful to deal with it."*

- Nine respondents recommended that water trading should develop in ways that encourage economic development and allowing market forces to operate without constraints.
  - Respondents suggested reducing red tape and promoting the development of storages.

- Another 6 respondents thought that government should increase the level of community understanding on reform before furthering water markets across the north.
  - One of these respondent states that what is required is a *"clearer view on the overall context in which water reform is occurring. There is little overview on the process, it occurs in little sections. We need a clearer picture."*
  - While an industry respondent offers that *"It's difficult to understand everything that's going on—it's complicated. You don't know what you don't know. It's a complex issue, a new issue. X tried to consult us about it but it missed the mark."*

- Five respondents restated their opposition to the development of water markets on the grounds of ecological impacts or disagreeing with the trading of water per se.

- One respondent in relation to water reform asserts that *"If it aint broke don't fix it."*

- While another respondent articulated that their region would be better served protected from development, stating that *"The Kimberley is of global environmental and cultural significance recognised by scientists around the world for its values."*

Third Policy Recommendation

- Eleven respondents recommended an improved understanding of environmental values in developing water markets; another suggested improved understanding of cultural values.
    - This information would support environmental flow outcomes and as some respondents highlighted prevent another Murray Darling.
    - One respondent from government thought that the *"efficiency of value for the environment must be considered in the same way as it is for farmers."*

- Six respondents regarded rules that were simple to support reform.
    - Respondents cited trade within catchments, keeping licenses linked to land and security to growers as important.

- Six respondents offered that there are required workshops and better consultation on water reform and the development of water markets. Also cited was better communication of reform to the broader public.

- Five respondents recommended not proceeding with markets in the north.
    - While one respondent suggested accelerating reform, arguing that *"If people are going to be moving north then you will need infrastructure, particularly transport and roads to get trucks in. Get on with it. It has been promised for 5 years. If we are going to implement this by 2014 and we are only starting in 2011 then we are behind."*

- Three respondents recommended that Indigenous people have meaningful involvement and recognition in water markets. One respondent recommends that trading only occur with caveats and that if *"markets support Indigenous livelihoods then they are a good thing."* Also one respondent recommends the integration of traditional knowledge into water management.

6. Discussion

This work is exploratory in nature examining the values and attitudes of a broad range of stakeholders towards water markets in a context where markets are at early stages of development, or do not operate at all. In terms of stakeholder values to water markets we find that sustainability, social justice and equity, environmental protection and economic development (particularly among Indigenous respondents) are important. This is consistent to some degree with the findings in southern Australia of Tisdell et al. (2001) who identify that social justice and equity are important values to irrigators in their study. Social justice and equity are very important to respondents in this study, with concerns expressed that current water management arrangements are not equitable. There was also strong support for the recognition and inclusion of Indigenous interests in the creation of markets. This study also identifies important aspirations of Indigenous economic development among north Australia's Indigenous peoples and water is seen as one mechanism to support economic outcomes. But as Jackson and Morrison (2007) suggest, these economic aspirations exist beside customary aspirations of Indigenous people, highlighted by the rejection of tradable cultural flows but support for water trading and water-based enterprise development. Environmental protection too is an important value that relates to the development of water markets, with unanimous support for the preservation of certain catchments and aquifers, this was consistent among all stakeholders (particularly among Indigenous respondents). Respondents also showed strong opposition to the trade of environmental, and disagreed to the trade of cultural flows, highlighting the importance of supporting a balance between cultural, economic and ecological outcomes through robust (non tradable) environmental (and where appropriate cultural) flow regimes.

A majority of respondents agreed that water management is sustainable in their region but at the same time over half of respondents felt that water management was not efficient. This may be related to the fact that respondents may see wastage (such as some respondents referring to flood irrigation or uncapped bores) but may not see their systems as over-allocated and hence unsustainable (like the example of the Murray Darling Basin in southern Australia which was commonly raised by respondents). A little under half of respondents thought water management not to be equitable, and over two thirds of Indigenous respondents did not think water management to be equitable—that is not all parties are treated equally and fairly. This highlights that the equity issue is felt most acutely by Indigenous Australians, reflecting the work of Nikolakis (2010), HREOC (2009) and Durette (2008) that describe the concerns of Indigenous Australians of being alienated from water reform and markets. As Nikolakis (2010) suggests while there is a movement towards recognising Indigenous interests in water sharing plans, greater work is required to adequately address this issue to create certainty and support equitable outcomes.

It is indicated that there is a lot of work to do around addressing Indigenous needs and interests in water policy and management— nearly three quarters of respondents (from government, Indigenous and recreational user groups) thought Indigenous people had not been engaged adequately in water policy consultation nor had their interests accounted for in water policy— it is clear that more work is required in this

area. This confirms the arguments of Jackson and Morrison (2007) that while Indigenous Australians have been recognised in the NWI they have not been meaningfully involved in the reform agenda— the Mary River Statement sets out a pan-north Australian position for improved Indigenous involvement in water reform and in the establishment of water markets (NAIEWFF, 2009).

The level of support among respondents for the use of water markets was mixed, but of note there was support among Indigenous respondents (55% compared to 50% of all respondents). Again though almost one quarter of Indigenous respondents neither agreed nor disagreed around whether water markets would be useful, perhaps reflecting mixed feelings and concerns on equity and environmental protection issues. The support for whether the benefits of markets would outweigh the costs was not strong, nearly a third were undecided or ambivalent highlighting the level of uncertainty on the effect of markets. Respondents had concerns that market frameworks would create more red tape and necessitate a tax (and increased costs of water) on producers and users. As well respondents thought markets would have ecological costs. Those likely to agree that the benefits would exceed the costs were males, with higher education and experience in water management. It is likely that these respondents were more familiar with markets. Respondents most often identified benefits derived from water markets to be efficiency and highest and best use through applying a price on water. Respondents thought that community opposition and acceptance were seen as the biggest obstacles to the development of water markets across northern Australia, followed by the costs of establishing markets.

A little over half of respondents felt that water markets would help sustainable water management, and there were a number of respondents who were uncertain, confirming to some extent the work of Straton et al. (2009) who identified doubts among irrigators in the NT that markets could effectively manage water for the environment. Just over half of respondents thought water should be treated as a tradable commodity; this was consistent with the responses for water markets help sustainable water management. There were concerns about treating water as a tradable commodity among Indigenous respondents, with only one third agreeing. There may be several reasons for this, but as Cooper and Jackson (2008) highlight water has an important spiritual value, but this is balanced against the growing need for economic development. Conceptualising water as a commodity has its challenges as well, Chong and Sunding (2006) offer that water is not a regular commodity and quantity is only one consideration among several—again in relation to this study there are considerations such as environmental protection, the customary economy, equity and sustainability. Support for markets as a mechanism to improve sustainable water management and water as a tradable commodity was stronger among males who have a higher education and have had involvement in water management, this again may be a result of greater exposure to markets among these respondents.

The findings from this study highlight that there is no unanimous support for separating land and water title, and Indigenous people are more likely to disagree to unbundling. Support for a separation of land and water title is stronger among males with a higher education. Our findings support the work of Altman with Branchut (2008) who identify in their study an aversion among Indigenous people in a remote northern community against separating land and water title. This work is also in line

with findings of Jackson (2005) who describes an Indigenous worldview which sees land and water as one. Attempts to unbundle land and water in reform run counter to this Indigenous worldview. In southern jurisdictions there is support for unbundling because of the flexibility it provides (such as in Tisdell et al., 2001), but stakeholders across northern Australia have yet to derive or experience the benefits of separate land and water title to date. There exists sentiment against water transfers, those likely to agree (about one quarter of respondents) were more likely to be from industry or consider themselves to have a high level of understanding of water management. Respondents showed strong support for government involvement in water markets and as a regulator in water markets. This reflects findings of Tisdell and Ward (2003) in southern Australia where irrigators sought robust regulations to support ecological and equity outcomes.

Among Indigenous respondents almost all wanted to see certain catchments and aquifers preserved for their unique values. This confirms the work of Cooper and Jackson (2008) and Touissant et al., (2005) in regions across the north where they highlight the interdependency of water with customary and spiritual aspirations of Indigenous Australians. But as Stoeckl et al. (2006) and Jackson (2005) highlight there is increasingly an awareness of the economic potential of water. This is reflected in our findings where 87% of Indigenous respondents agreed that they could foresee water being used to support enterprise development in their community (such as agriculture and horticulture and tourism based enterprises). There is also strong support for the notion that the economic benefits of water trading will be significant for relevant Indigenous interests. Two thirds of Indigenous respondents thought that the economic benefits of trading would be significant for Indigenous people (compared to just over half of all respondents). This work highlights the high level of importance Indigenous respondents attached to enterprise development, viewing water as potentially one mechanism to support economic outcomes across the north.

7. Implications for the design of water markets

Literature highlights the importance of understanding social and cultural values and reflecting these in resource management frameworks to create legitimacy (Syme and Hatfield-Dodds, 2007). As well Tisdell and Ward (2003) found that cultural and social attitudes must be considered to successfully implement water reform. We present implications in four key themes derived from our values and attitudes related to the development of water markets in the north.

1. **Indigenous involvement**

Our work highlights that a significant number of respondents supported Indigenous involvement in water markets. This involvement would range from management and planning to recognition of customary and commercial rights. Economic development aspirations were important to Indigenous respondents with many viewing water and water markets as offering a potential economic option to communities across the north. In the interests of broader efforts to address socio-economic disadvantage (like that argued by Craig, 2008 and Nikolakis, 2010) it may be necessary for policy makers to explore the possible arrangements available to include north Australia's Indigenous peoples in reform. It is clear that Indigenous people show support for the idea of water markets, but to some extent this is balanced by concerns of being alienated from markets and of the potential ecological impacts.

2. **Community awareness of and involvement in reform**

Social justice and equity as well as sustainability are important to respondents. McKay and Bjornlund (2001) acknowledge that water markets may pose a variety of sustainability and social justice challenges, and the authors offer that these challenges may be addressed through community education programs. Our work highlights that the general community seeks greater involvement in water management decisions as well as in planning. As well there was a call for improved awareness in the community of water reform among stakeholders (such as through education programs like that identified by McKay and Bjornlund, 2001). It was found in our work that respondents felt that consultation mechanisms were not adequate for Indigenous interests, nor were Indigenous interests reflected in water policy. More work will need to be done to assess how to effectively engage Indigenous people in reform in the north, and given the distances, cultural and language barriers, it will need to be adequately supported by government.

3. **Market subsidiary to plan**

It was found in this study that respondents valued environmental protection and sustainability, with respondents rejecting tradable environmental and cultural flows, as well as overwhelmingly supporting the preservation of certain catchments and aquifers for their unique values across the north. Alongside these values respondents sought simple but prescriptive rules in robust planning frameworks to support environmental values, as well as equity. Under this approach the water market would be subsidiary to the water plan where trading rules would seek to support economic

development but at the same time protect ecological values and sustain Indigenous customary aspirations. Gentle and Olszak (2007) offer that such an approach is in line with the ambitions of the NWI, and what is necessary to achieve this is a planning process which supports meaningful stakeholder input into plans, as well as extensive understanding of ecological and cultural values present in a system.

4. Minimise red tape and costs

Some respondents were concerned that establishing markets would create unnecessary bureaucracy that would require a tax on water to fund its costs. A number of respondents emphasised that water markets should consist of simple rules and red tape should be minimised. It was emphasised that agricultural development is often marginal across the north and any increases in costs would force producers out of business and act as a disincentive for entrants. What some respondents seek is a simple trading system that requires few administrative approvals and does not add to their operating costs.

8. Limitations and further research

This study utilised a purposive sample to access those stakeholders who have had some exposure to water reform (given the level of complexity), and this is reflected by the fact that most respondents had some to a high level of understanding of water management in their jurisdictions. Approximately half of respondents had involvement in water management at some point. As well just over three quarters of respondents were male and nearly 60% had a bachelor degree or higher. Given this we acknowledge that our study may not be reflective of the attitudes and values of all stakeholders across the north. While we see this as a potential limitation we attempted to get a broader representation of stakeholders by using a snowball approach combined with the purposive sample and actively sought to address this gender imbalance. Further research could examine women's attitudes and values towards water markets, as well as of those stakeholders who have had no experience with water management to improve understanding.

Further research could also explore how to address Indigenous interests in water reform and to involve Indigenous interests in market frameworks. Also important would be to explore how to improve Indigenous consultation, particularly given the language barriers and cultural differences that exist across the north.

References

Altman, J. (2004) Indigenous Interests and Water Property Rights, *Dialogue*, 23(3): 29—33.

Altman, J. with Branchut, V. (2008). Fresh Water in the Maningrida Region's Hybrid Economy: Intercultural Contestation over Values and Property Rights, CAEPR Working Paper No. 46/2008, Centre for Aboriginal Economic Policy Research, ANU: Canberra.

Altman, J., Jordan, K., Kerins, S., Buchanan, G., Biddle, N., Ens, E. and Mary, K. (2009). Chapter 7, Indigenous interests in land and water, Northern Australia Land and Water Science Review full report, available at: <http://www.nalwt.gov.au/files/Chapter_07-Indigenous_interests_in_land_and_water.pdf> (accessed on March 31st 2010).

Armstrong, R. (2008) An overview of Indigenous rights in water resource management. Revised: Onshore and offshore water rights discussion booklets, Lingiari Foundation & NAILSMA: Darwin

Auberbach, C. F, and Silverstein, L. B. (2003), *Qualitative data: An introduction to coding and analysis*. New York University Press: New York.

Baldwin, C. and Ross, H. (2006) Stakeholder Perceptions of Water Reform in Two Catchments in Queensland, paper presented to 9th International River Symposium, Brisbane, 4-7 Sept, 2006.

Beckley, T.M., Boxall, P.C., Just, L.K. and Wellstead, A.M. (1999) *Forest stakeholder attitudes and values: selected social-science contributions.* Nat.Resour.Can., Can. For.Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-362.

Brooks, R., and Harris, E. (2008) Efficiency gains from water markets: Empirical analysis of Watermove in Australia, *Agricultural Water Management*, 95, 391-399

Carson, D., Taylor, A. and Campbell, S. (2009). Demographic Trends and Likely Futures for Australia's Tropical Rivers, Unpublished Report. Charles Darwin University: Darwin.

Chong, H. and Sunding, D. (2006) Water Markets and Trading, *Annual Review of Environment and Resources*, 31: 239-264.

Connell, D., Dovers, S. and Grafton, R. (2005). A critical analysis of the National Water Initiative, *Australasian Journal of Natural Resources Law and Policy*, 10: 81–107.

Connell, D., Robins, L., and Dovers, S. (2007) Delivering the National Water Initiative: institutional roles, responsibilities and capacities, pp127-140 in Eds. K. Hussey and S. Dovers, *Managing Water for Australia,* CSIRO Publishing: Collingwood, Australia.

Cooper, D. and Jackson, S. (2008) *Preliminary Study on Indigenous Water Values and Interests in the Katherine Region of the Northern Territory,* A report prepared for NAILSMA's Indigenous Water Policy Group, CSIRO Sustainable Ecosystems: Darwin, Northern Territory.

Council of Australian Governments ('COAG'). (1994) Report of the working group on water, Council of Australian Governments: Canberra.

Craig, D. (2007) Indigenous Property Rights to Water: Environmental Flows, Cultural Values and Tradable Property Rights. In A. Smajgl and S. Larson (Eds.) *Sustainable Resource Use: Institutional Dynamics and Economics,* Earthscan: London; Sterling VA, pp. 124—143,

Crase, L., Pagan, P. and Dollery, B. (2004) Water markets as a vehicle for reforming water resource allocation in the Murray-Darling Basin of Australia, *Water Resour. Res*., 40, W08S05, doi:10.1029/2003WR002786.

Creswell, R., Harrington, G., Hodgen, M., Li, Lingtao., Petheram, C., Buettikofer, H., and Davies, P. (2009) Water Resources in northern Australia, Northern Land and Water Science Review full report, in available at: <http://www.nalwt.gov.au/files/Chapter_01-Water_Resources_in_northern_Australia_Final.pdf> (accessed on March 31st 2010).

deKoninck, V. (2007) Deconstructing the stakeholder: A case study from Garig Gunak Barlu National Park, *Australia International Journal of Biodiversity Science and Management* 3 (2): 77—87.

Donaldson, T. and Preston, L. (1995). The stakeholder theory of the modern corporation: Concepts, evidence and implications. *Academy of Management Review* 20 (1): 65—91.

Durette, M. (2008) Indigenous Legal Rights to Freshwater: Australia in the International Context, CAEPR Working Paper, No. 42—2008, Centre for Aboriginal Economic and Policy Research, Australian National University: Canberra.

Eagly, A. H. and Chaiken, S. (1993) The psychology of attitudes, Harcourt, Brace and Jovanovich: Fort Worth, TX.

Freeman, R.E. (1984) Strategic Management: A stakeholder approach, Pitman: Boston.

Frontier Economics (2007). The economic and social impacts of water trading: case studies in the Victorian Murray Valley, Rural Industries Research and Development Corporation, National Water Commission, Murray Darling Basin Commission: Canberra.

Gentle, G. and Olszak, C. (2007) Water planning: principles, practices and evaluation, in K. Hussey and S. Dovers (Eds.), *Managing Water for Australia,* CSIRO Publishing: Collingwood, Australia, pp 59—72.

Gleick, P. H. (2003) Water Use. *Annu. Rev. Environ. Resour*. 28: 275—314.

Gregory, R. (2000) Using stakeholder values to make smarter environmental decisions. *Environment*, 42 (5): 34— 44.

Gregory, R. and Keeney, R. L. (1994) Creating Policy Alternatives Using Stakeholder Values, *Management Science,* 40 (8): 1035—1048.

Hadjigeorgalis, E. (2009) A Place for Water Markets: Performance and Challenges, *Review of Agricultural Economics*, 31 (1): 50—67.

Hermans, L., Kadigi, R., Mahoo., and van Halsema, G., (2006) Conflict Analysis and Value-focused Thinking to Aid Resolution of Water Conflicts in the Mkoji Sub-catchment, Tanzania, in S. Perret, S. Farolfi and R Hassan (Eds) Water *Governance for Sustainable Development: Approaches and Lessons from Developing and Transitional Countries*, Earthscan: London, pp 149—166.

Hubbard, M. (1997) The new institutional economics in agricultural development: Insights and challenges, *Journal of Agricultural Economics,* 4 (2): 239—249

Human Rights and Equal Opportunity Commission (HREOC). (2009) Native Title Report 2008, Report of the Aboriginal and Torres Strait Islander Justice Commissioner and Australian Human Rights Commission: Sydney.

Jackson, S. (2005). Indigenous values and water resource management: a case study from the Northern Territory. *Australasian Journal of Environmental Management*, 12 (3): 136—146.

_____. (2007) 'Indigenous Interests and the NWI: Water Management, Reform and Implementation', Background Paper and Literature Review, CSIRO Sustainable Ecosystems and the North Australian Indigenous Land and Sea Management Alliance: Darwin.

_____. (2009) *National Indigenous Water Planning Forum: Background paper on Indigenous participation in water planning and access to water*, Report for the National Water Commission, CSIRO Sustainable Ecosystems, Darwin.

Jackson, S. and Altman, J. (2009) Indigenous rights and water policy: perspectives from tropical northern Australia, *Australian Indigenous Law Review,* 13 (1): 27—48.

Jackson, S. and Morrison, J. (2007) Indigenous perspectives in water management, reforms and implementation, in K. Hussey and S. Dovers (Eds.) *Managing Water for Australia,* CSIRO Publishing: Collingwood, Australia, pp 23—41.

Jick, T. (1979) Mixing Qualitative and Quantitative Methods: Triangulation in Action, *Administrative Science Quarterly,* 24 (4): 602—611.

Keeney, R. L. (1992) Value Focused Thinking: A Path to Creative Decision Making, Harvard University Press: Cambridge, MA.

Kempton, W., Boster, J.S. and Hartley, J.A. (1995) Environmental Values in American Culture. The MIT Press: Cambridge.

Koontz, T. (2005) We finished the plan, so now what? Impacts of collaborative stakeholder participation on land use policy, *The Policy Studies Journal* 33 (3): 459—481.

Leiserowitz, A., Kates, R. and Parris, T. (2006) Sustainability values, attitudes and behaviors: A review of multi-national and global trends. *Ann. Rev. Environ. Resour.* (31): 413—444.

Lingiari Foundation (2002) *Onshore water rights. A discussion booklet for the Aboriginal and Torres Strait Islander Commission,* Vol 1. Lingiari Foundation: Broome.

McDaniels, T., Gregory, R, and Fields, D. (1999) "Democratizing Risk Management: Successful Public Involvement in Local Water Management Decision," *Risk Analysis*, 19 (3): 497—510.

McKay, J. and Bjornlund, H. (2001) Recent Australian Market Mechanisms as a Component of an Environmental Policy That Can Make Choices Between Sustainability and Social Justice, *Social Justice Research*, 14 (4): 387—403.

Miles, M. and Huberman, M. (1994) Qualitative Data Analysis, Sage: Thousand Oaks, CA.

National Water Commission (NWC). (2008) Australian Water Markets Report, 2007-2008, NWC: Canberra.

_____. (2009a) Australian Water Markets Report, 2008-2009, NWC: Canberra.

_____. (2009b) Australian Water Reform 2009: Second biennial assessment of progress in implementation of the National Water Initiative, NWC: Canberra.

National Water Initiative. (2004) Intergovernmental Agreement on a National Water Initiative, Council of Australian Governments: Canberra. Available at: <http://www.nwc.gov.au/resources/documents/Intergovernmental-Agreement-on-a-national-water-initiative.pdf> (accessed 2 June, 2009).

Nikolakis, W. (2010) Providing for social equity in water markets, in R.Q. Grafton and K. Hussey (Eds.) *Water Resources Planning and Management*, Cambridge University Press: UK.

North Australian Indigenous Experts Water Futures Forum (NAIEWFF). (2009) Mary River Statement, August 2009. Available at: <http://www.nailsma.org.au/nailsma/forum/downloads/Mary-River-Statement.pdf> (accessed 2 June, 2010).

North Australian Indigenous Land and Sea Management Alliance. (2008) An overview of Indigenous Rights in Water Resource Management, NAILSMA: Darwin. Available at: <http://www.nailsma.org.au/nailsma/publications/downloads/NAILSMA_WaterResManag_web_Aug09.pdf> (accessed 5 March, 2010).

Ostrom, E., Gardner, R. and Walker, J. (1994) Rules, Games, & Common-Pool Resources, The University of Michigan Press: Michigan.

Petty, R. E., Wegener, D. T. and Fabriger, L. R. (1997) Attitudes and attitude change *Ann. Rev. Psychol.* (48): 609–647.

Pigram, J. (1993) Property Rights and Water Markets in Australia: an Evolutionary Process Toward Institutional Reform, *Water Resources Res.*, (29): 1313–1319.

_____. (2006) Australia's Water Resources: From Use to Management, CSIRO Publishing: Collingwood, Australia.

Rokeach, M. (1973) The Nature of Human Values, Free Press: NY.

_____. (1979) Understanding Human Values: Individual and Social, Free Press: NY.

Schwartz, S. H. (1992) Universals in the Content and Structure of Values: Theoretical Advances and Empirical Tests in 20 Countries, in M. P. Zanna (Ed.) *Advances in Experimental Social Psychology*, Vol 25, Academic Press: San Diego, pp. 1—65.

Schwarz, N. and Bohner, G. (2001) The construction of attitudes, in A. Tesser and N. Schwarz (Eds.) *Blackwell Handbook of Social Psychology: Intraindividual Process, ,* Blackwell Publishers: Malden, MA, pp 436—457.

Silverman, D. (2001) *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction* (Second ed.), London: Sage.

Stoeckl, N., Stanley, O., Jackson, S., Straton, A. and Brown, V. (2006) *An Assessment of the Social and Economic Values of Australia's Tropical Rivers: Scoping report prepared for Land and Water Australia's Tropical Rivers Program,* Land and Water Australia, CSIRO and James Cook University.

Straton, A. T., Heckbert, S., Ward, J.R. and Smajgl, A. (2009). Effectiveness of a Market-Based Instrument for the Allocation of Water in a Tropical River Environment, *Water Resources*, 36 (6): 743—751.

Syme, G.J. and Hatfield-Dodds, S. (2007) The role of communication and attitudes research in the evolution of effective resource management, in K. Hussey and S. Dovers (Eds.) *Managing Water for Australia,* Collingwood, Australia: CSIRO Publishing, pp.11—22.

Syme, G.J., Nancarrow, B.E. and McCreddin, J.A. (1999) Defining the components of fairness in the allocation of water to environmental and human uses, *Journal of Environmental Management,* 57 (1): 51—70.

Tesser, A. and Shaffer, D.R. (1990) Attitudes and Attitude Change, *Annual Review of Psychology*, 41, 479-523.

Tisdell, J.G. and Ward, J.R. (2003) Attitudes Towards Water Markets: An Australian Case Study, *Society & Natural Resources,* 16 (1): 61—75.

Tisdell, J.G. and Ward, J.R. and Grudzinski, T. (2001) 'Irrigator and Community Attitudes to water allocation and trading: A comparative study of the Goulburn Broken and Fitzroy Catchments', Technical Report 01/05 CRC Catchment Hydrology. Available at: <http://www.ens.gu.edu.au/Johnt/pdf/Tisdell_irrigator_com.pdf> (accessed on July 15 2010).

Toussaint, S., Sullivan, P. and Yu. S. (2005) Water Ways in Aboriginal Australia: An interconnected analysis, *Anthropological Forum,* 15: (1)61—74.

Venn, T.J. and Quiggin, J., 2007. Accommodating indigenous cultural heritage values in resource assessment: Cape York Peninsula and the Murray-Darling Basin, Australia, *Ecological Economics*, 61 (2-3): 334—344

Wutunee, W. (2004) Living Rhythms: Lessons in Aboriginal Economic Resilience and Vision, McGill-Queen's University Press: Montreal.

Yu, S. (2000). Ngapa kunangkul: living water: report on the aboriginal cultural values of groundwater in the La Grange sub-basin, Centre for Anthropological Research, University of Western Australia. Report for the Water and Rivers Commission Western Australia.

Zanna, M.P. and Rempel, J. K. (1988) Attitudes: a new look at an old concept, in D. Bar-Tal and A Kruglanski (Eds.) *The Social Psychology of Knowledge*, Cambridge University Press: NY, pp. 315—334.

Appendix: Survey

Exploring the feasibility of water markets in northern Australia

Who is conducting the survey?

This survey is undertaken by the Australian National University (ANU) in collaboration with the North Australian Indigenous Land and Sea Management Alliance (NAILSMA). For more information about the project please contact William Nikolakis on 0438 673 526 or at William.Nikolakis@anu.edu.au

What this survey is about?

The overall objective of this study is to look at the feasibility of setting up water markets across northern Australia. This survey aims to identify and examine stakeholder attitudes to water markets/trading in northern Australia, and how these attitudes and values may influence the design of water markets.

What we ask you to do?

Please answer the questions **on behalf of your community**. It should take about 15-20 minutes to answer. All respondents will remain anonymous unless expressly agreed to by the respondent in writing. Personal information is collected for statistical purposes only.

How will the research results be used?

The results of the research will be used to support the development of institutional-organisational structure/s to initiate water trading in northern Australia.

Contact details:

In case you have questions or concerns about the study please contact:

- William Nikolakis on 0438 673 526 or email William.Nikolakis@anu.edu.au
- Prof Quentin Grafton on 02 6125 6558 or email Quentin.Grafton@anu.edu.au
- Human Ethics Office, The Australian National University ***on (02)*** 6125-7945 or e-***mail:*** Human.Ethics.Officer@anu.edu.au

DEFINITIONS

- A water market allows water trading to occur
- Water trading involves the buying and selling of water access entitlements, also often called 'water rights'.
- A tradable commodity is something which is sold simply as a good and price is determined by supply and demand.
- Sustainable is taken to be the responsible management and allocation of water resources, guided by the aim of balancing all the competing needs for water.

Section A: First, we would like to ask you some questions about yourself. Please note that all information provided will be treated strictly confidential.

1. Name: ……

Name of your Town/Community: …….

Location: 1. Northern Territory

2. Queensland

3. Western Australia

2. Are you…?

1. Female
2. Male

3. Which of the following age groups do you fall into?

1. 18 to 24 years
2. 25 to 34 years
3. 35 to 44 years
4. 45 to 54 years
5. 55 to 64 years
6. 65 years or more

4. What is your highest completed education level?

1. Never went to school
2. Primary only
3. Junior /year 10
4. Secondary /year 12
5. Diploma or certificate
6. University-undergraduate
7. University-postgraduate
8. Other (Please Specify).....

5. What is your profession? _____

Section B: We would like to know about your community's water use.

6. What source(s) of water do you use?

1. Groundwater only ➔ **Go to question no 8**
2. Surface water only➔ **Go to question no 8**

3. Both groundwater and surface water➔ **Go to question no 7**

7. What approximate percentage of water use comes from:

Groundwater _____% and Surface water _____%

8. Please rate the following water purposes according to the importance your community attach to them. (1=most important, 6=least important)

___ Household use (water for drinking, cooking, washing)

___ Agricultural use (water to grow crops)

___ Environmental use (water to maintain biodiversity)

___ Recreational use (water for swimming, camping and fishing)

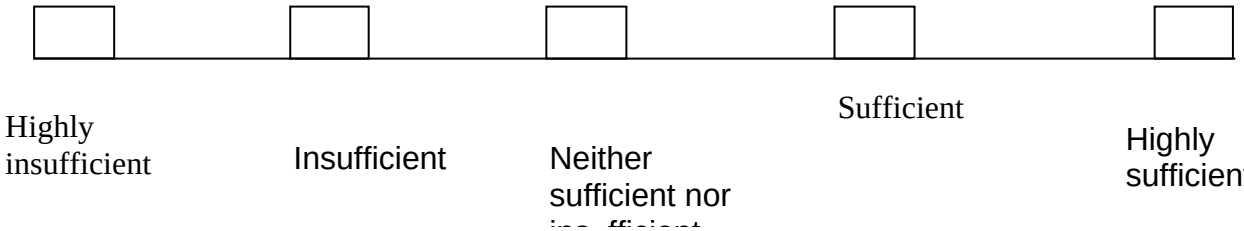
___ Cultural use (beauty, ceremony, customary responsibility)

___ Subsistence use (hunting, fishing, gathering food)

___ Commercial use (water for non-agricultural business activities)

___ Pastoral

9. How would you rate the current amount of water availability in your community for important activities listed in question 8?



10. What do you expect to happen to the level of water availability in this region over the next 10 years?

1. I expect the water availability to increase. ➔ **Go to question no 11**
2. I expect the water availability to decrease. ➔ **Go to question no 11**
3. I expect the water availability to remain the same. ➔ **Go to question no 12**

11. Why do you expect water availability to increase or decrease in future? (Please Specify)

_____

_____

12. What is the land tenure your community is on?

___ Land Trust/DOGIT ___ Reserve ___Lease ___ Fee Simple ___ I don't know

13. Does your community have native title?

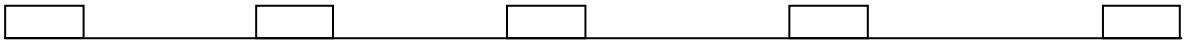
1. Yes
2. No
3. I don't know

14. How strongly do you agree or disagree with each of the following statements? (please refer to p2 for definitions).

14.a. Water should be a tradable commodity.

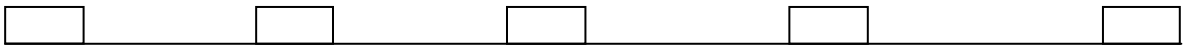
Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

14.b. Water should be owned by those who own the land the water is underneath or on.



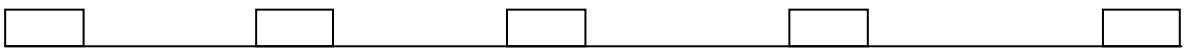
Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

14.c. No-one owns water.



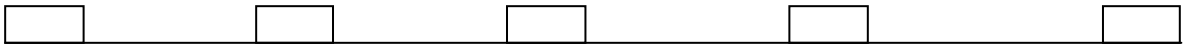
Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

14.d Title to land and water should be separated.



Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

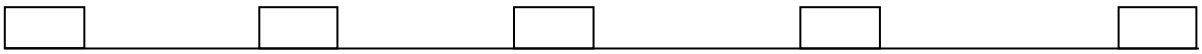
15. Water should be transferred from one area to another (e.g. piping water from a remote area to an urban area)



Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

Section C: We would like to know your experiences of water management and water markets (please refer to p2 for definitions).

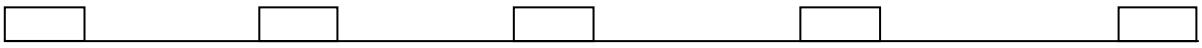
16. How would you rate your level of understanding of Government led water management in your State/Territory?



I have no understanding | I have some understanding | I have fair amount of understanding | I have high level of understanding | I understand it completely

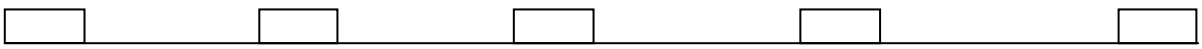
17. How strongly do you agree or disagree with each of the following statements?

17.a. The current water management practice in my region is sustainable.



Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

17.b. Indigenous people in my region manage water

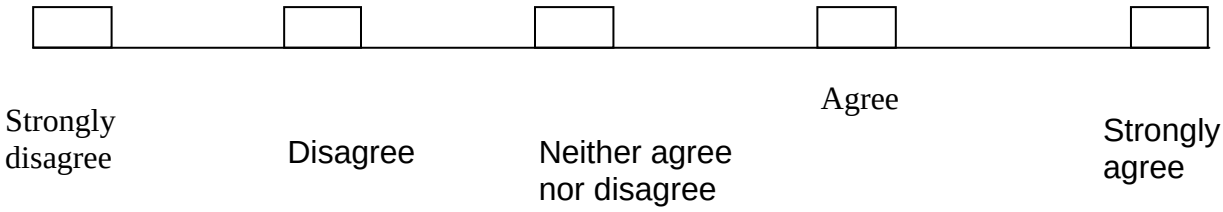


Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

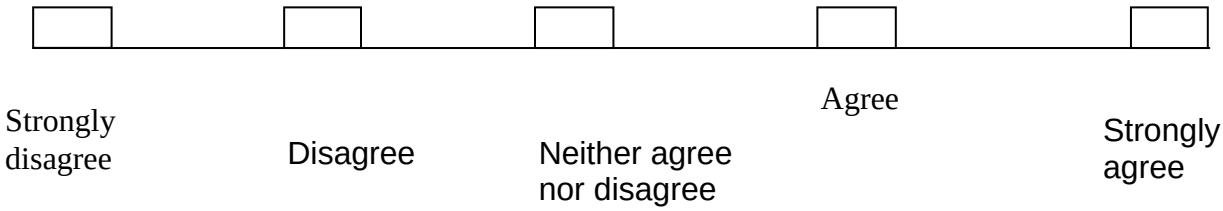
If so how? (e.g. culturally, joint management etc.)

_____

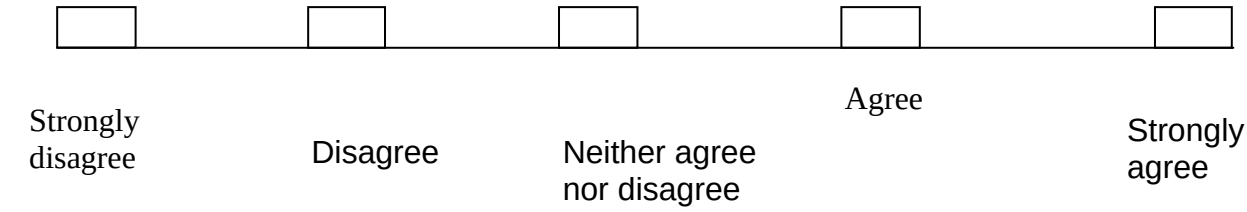
17.c. The current system of water management in my region is efficient (does not involve wastage of resources).



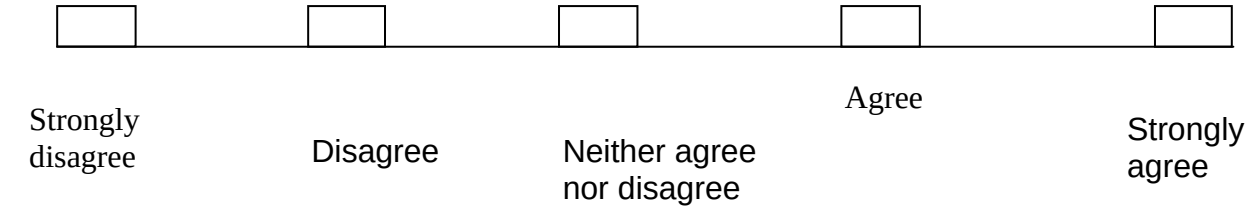
17.d. The current system of water management in my region is equitable (all relevant parties are treated equally and fairly).



17.e. Our community has always been adequately consulted by government when developing the water management policies in my region.



17.f. The water management policies in my region take the Indigenous community's interests into account.



18. Have you had involvement or provided input into water planning processes in your State/Territory?

1. No
2. Yes

19. Have you heard of water trading in Australia?

1. No ➔ Go to question no 23.a.
2. Yes ➔ Go to question no 19.a..

19.a. What do you know about water trading?

1. I have heard of this system. But I do not know how it operates.
2. I have some idea of water trading but I don't know a lot of details.
3. I know everything about water trading.

19.b. What do you know about the National Water Initiative (NWI)

1. I have not heard of this.
2. I have heard of this. But I do not know how it operates.
3. I have some idea of the NWI but I don't know a lot of details.
4. I know everything about the NWI.

<u>Section D:</u> We would like to know your views of water market in northern Australia. First, we want to give you a brief explanation of what a water market is and how it functions.

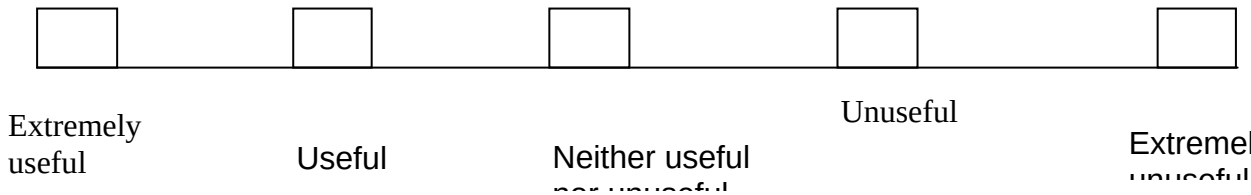
A water market facilitates water trading.

Water trading is the process of buying and selling of water access entitlements, also often called 'water rights'.

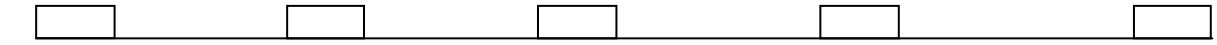
This enables users to buy water to expand their operations and holders of water entitlements to sell water they do not need.

Under this system, water access entitlements are separated from land title.

20. How useful do you think it would be to set-up a water market in your region?

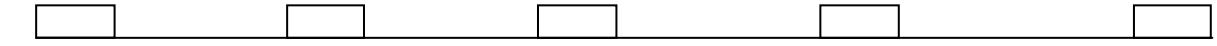


21.a. Government should play an important role in water markets.



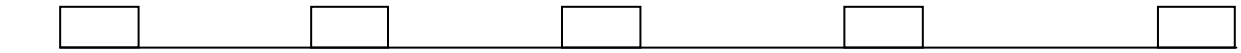
Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

21.b. Regulator is the appropriate most role of government in developing water markets.



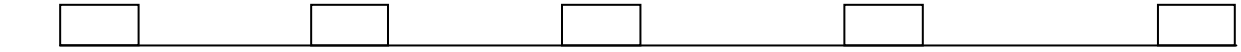
Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

22.a. Some catchments and aquifers should be preserved for their ecological and cultural values.



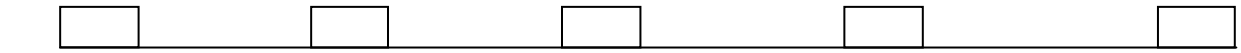
Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

22.b. The environmental flows should be tradable.



Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

22.c. The cultural flows (non consumptive uses) should be tradable.

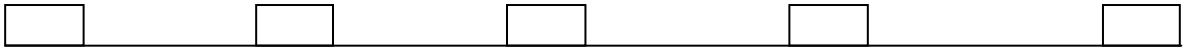


Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

23. What role do you think your community would play in a potential water market?

1. My community will buy water
2. My community will sell water
3. My community will buy and sell water
4. My community will have no role to play.
5. I don't know the role of my community.

23.a My community will use water for a business enterprise (i.e. for agricultural, or other type of water based business, or generate income through selling water).



Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

23.b If you agree or strongly agree to question 23 a. could you please list the kinds of water based business enterprise being considered.

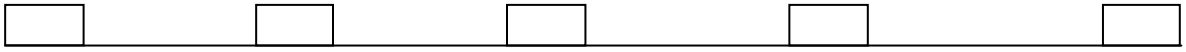
_____

_____

_____

_____

23.c. The economic benefits of water trading will be significant for relevant Indigenous interests.



Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

24.a Who do you think will benefit most from the set-up of a water market? (Please rank from 1 to 6)

____Everyone will benefit

____ My organisation

____The environment

____The Indigenous communities

____Government

____Other (Please Specify)…….

24. b Who do you think will be negatively impacted most from the set-up of a water market? (Please rank from 1 to 6)

____Nobody will suffer

____My organisation

____The environment

____The Indigenous communities

____Government

____Other (Please Specify)…….

25. When do you think a water market will be required in the north of your State/Territory? (please circle)

a. Water markets already operate

b. A water market will never be necessary in this region

c. Within the next _____ years

d. Other: …….

26. Could you mention three major benefits of introducing a water market in your State/Territory? Please briefly explain your view.

1._____

_____

_____

2._____

_____

_____

3._____

_____

_____

27. Could you mention three major costs of introducing a water market in your State/Territory? Please briefly explain your view.

1._____

_____

_____

2._____

_____

_____

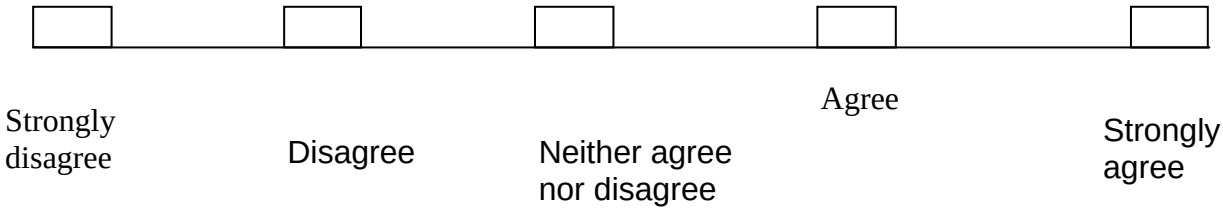
3._____

_____

_____

28. How strongly do you agree with the following statement:

28.a. The benefits of water trading in this region will outweigh the costs.



28.b. Please briefly explain the reasons behind your view.

_____

_____

_____

29. Could you mention three major obstacles of introducing a water market in your State/Territory? Please briefly explain your view.

1._____

_____

_____

2._____

_____

_____

3._____

_____

_____

30. How would you prefer the water market to be designed? Please mention your three most preferred institutional features of the water market (e.g.'s include strong protection for the environment, a flexible entitlement system or an Indigenous Reserve).

1._____

_____

_____

2._____

_____

_____

3._____

_____

_____

31. What would be your recommendations to the policy makers regarding the set up of a water market in your State/Territory?

1._____

_____

_____

2._____

_____

_____

3._____
_____
_____

This is the end of the interview. Many thanks for your participation.