Institutional Analysis in Outback Australia

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Abstract

The Australian outback is a unique ecological and social landscape. The people who live here cope with harsh and variable environmental conditions, particularly in terms of rainfall and the availability of surface water. The human population density is very low and the dominant land use is grazing, while other land uses include agriculture, mining, tourism, defence, and nature conservation. These harsh environmental factors frame all human activities in these regions and, in turn, these activities can have adverse environmental impacts, shaping what is possible in the future. To manage these impacts, all tiers of government impose institutional constraints, such as legislation and regulations that seek to influence the activities and aspirations of individuals and communities. The research project *Outback Institutions* used the Institutional Analysis and Development framework to assess institutional arrangements in this context through four case studies in outback regions of Queensland and the Northern Territory. The IAD framework was found to provide an effective means for structuring an institutional analysis. However, the room left for interpretation made comparison between case studies challenging, especially when comparing different stakeholder driven processes and analysing cross-scales feedbacks and institutional dynamics. The case study analyses found that the lack of *real* influence and power of community members in the decision making process and the lack of rules to stipulate and govern the monitoring of water use were two of several aspects of the institutional arrangements that did not enable the alignment of formal government legislation and regulations with individual and community actions and aspirations.

Keywords: *Institutional analysis, IAD framework, Outback Australia, Water management*

1 INTRODUCTION

The Australian outback is a unique ecological and social landscape. The people who live here cope with harsh and variable environmental conditions, particularly in terms of rainfall and the availability of surface water. The human population density is very low – less than 0.001 people per square kilometre – which is considerably less than the national average of 2.6. This population is widely dispersed around small urban centres that are remote from major Australian cities. The dominant land use is grazing, while other land uses include agriculture, mining, tourism, defence, and nature conservation. There is a growing interest in a broader diversity of economic activities, particularly ecotourism, to supplement grazing activities.

Environmental drivers of the outback are dominated by the availability of water, with 'droughts and flooding rains'[1] likely to remain a central feature of life in these parts of Australia. Water supply for human or ecosystem use across this region is determined by the highly variable rainfall and very high evaporation rates relative to rainfall. Water issues are very different between coastal and interior outback regions including in the regions in this study. Along the coastal and semi-arid region surface water flows are more reliable. However in the interior they are highly episodic and hence unreliable; instead water bores are vitally important sources of reliable water necessary to support human populations and their production systems.

These harsh environmental factors frame all human activities in these regions and, in turn, some human activities lead to adverse environmental impacts such as erosion. Consequently, public interests and stewardship roles of various tiers of governance impose institutional constraints, such as rules, that seek to align individual activities and decision making with the interests of the wider community.

Water supplies, and the institutions that surround water supplies, have come into the spotlight in recent times. The institutional history of water in Australia is closely linked to the colonisation and settlement policy of the country and generally has been left within the jurisdiction of the states. Each state considers its water resources and its own approach to water management, allocation and use in isolation from the other states (McKay, 2005). Growth in water demand has been met over time by increased capture and storage of surface water and the development of ground water resources (Larson, 2006).

In this context, this research aimed to assess the rules and institutional arrangements across four case studies in outback regions of Queensland and the Northern Territory. The specific research goal was to test how well the Institutional Analysis and Development (IAD) framework (developed by Elinor Ostrom and her colleagues) applied to the circumstances of Australia's outback regions. This framework has been applied to understanding institutions for managing common pool resources in more than twenty countries around the world, but has not previously been applied systematically in Australia.

2 CASE STUDY REGIONS

2.1 *Case study selection process*

Case study site selection was based on institutional and ecological gradients. A scoping study defined the study area within the outback of Australia through two states and arid to sub-tropical environments. A list of these potential areas formed the basis for obtaining expert and local knowledge to identify the feasibility of conducting a study. Workshop discussions with experts helped focus and converge conditions for site selection. The importance of community willingness to participate in the research emerged as paramount in the site selection process.

[1] A phrase from the popular Australian poem *My Country* by Dorothy Mackellar

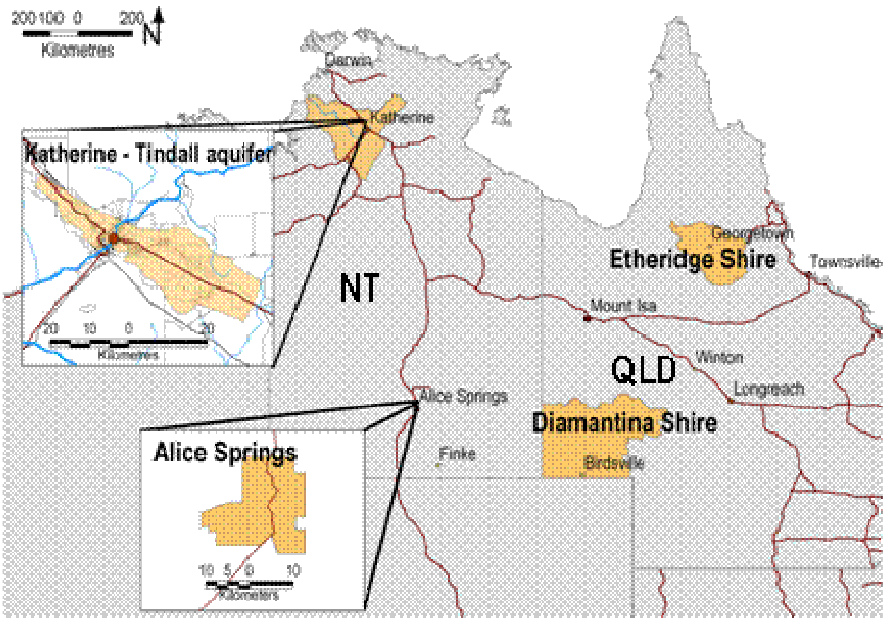

Figure 1. Pilot study site (Etheridge Shire) and the other study site locations; Katherine-Daly with the detail showing the Tindall aquifer, Alice Springs and the Diamantina shire.

Based on these conditions the study team undertook a pilot study in Etheridge Shire with its administrative centre of Georgetown. This pilot was to trial the methodology and process of engaging stakeholders. Upon completion, three further locations (the Daly River, Alice Springs, and the Diamantina Shire) were selected and subjected to an institutional analysis of common pool resources. The study area locations (Figure 1) are aligned with the institutional and ecological gradients identified in the scoping phase.

Etheridge Shire: The first case study presented was used as a pilot study. It was based in the Etheridge Shire (population 1012, area 39,000 km^2) which is located within the tropical savannah of the Northern Gulf region and has an economy predominantly based on pastoralism. Detailed attention in this case study was given to land use decisions and engagement in community development activities because they are activities for which policies can be devised to improve economic and sustainable development outcomes. Changing the formal and informal rules that guide and govern these two different kinds of decisions that people can make in the Etheridge Shire – the decision to improve one's own situation and the decision to improve the situation for others in the community – may expand the available options for people in the Shire to achieve their goals and aspirations.

One of the defining characteristics of the Etheridge Shire region is the relatively low levels of interaction not only among residents but between the Shire's inhabitants and other stakeholders. Significant changes and introduction of new government policies and regulations within the last decade represented a significant change for the region and added to a sense of frustration and uncertainty which, in turn, has had a considerable impact on land use decisions. Key challenges facing the region include: the community's limited ability to adapt to social, political and legislative changes affecting pastoralism; community attributes which reduce the amount of

active community engagement; and lack of access to service industries particularly banks, professionals and labour.

Methodologies employed in this case study included an agent based model which analysed the potential impacts of the adoption of a new social norm.

Diamantina Shire: The second case study focussed on the development of the Water Resource (Georgina and Diamantina) Plan which was prepared as a statutory requirement under the Water Act 2000 of the Queensland Government and came into force on 6 August 2004. The Diamantina Shire covers an area of 94,832 km^2 (5.5 percent of the Queensland land area) and is fully contained within the Georgina and Diamantina catchment. The estimated resident population of the Shire was 306 people in 2004. The regional economy of the Plan area is based on agriculture, mining, tourism and public sector employment. The Georgina and Diamantina catchment is unique as it is a major tributary of the Lake Eyre Basin, the world's largest internally draining system covering an area of 1.2 million km^2, or about 18 percent of the land area of Australia. A feature of this type of arid and semi-arid environments is variable drought and flood cycles which are important to the viability of the lower Diamantina and Georgina region.

The development of the Water Resource (Georgina and Diamantina) Plan 2004 planning process involved a consultation phase which was the key formal mode of interaction between the participants in the action arena. Two key areas of concern arose through this consultation process: enhanced protection of in-stream habitats and waterholes and connectivity between these; and the need for further and more explicit recognition of interstate interests and for integrated monitoring programs across the Lake Eyre Basin. Issues that emerged during the consultation phase were in the area of economic benefits, environment, equity issues and monitoring (discussed in detail in Larson, 2006). In addition, procedural and capacity issues emerged as residents felt that the process was not designed and executed with consideration of their needs (Larson, 2006).

Daly Shire: The third case study in the Daly River focused on the testing of a new institutional arrangement for the allocation of water in a tropical savannah setting for the Katherine-Daly River system in the Northern Territory under the broader policy context of the National Water Initiative, a national program of water reform.

The Daly River, with an average annual outflow of 6,730 gigalitres, has the fourth largest discharge of any river across northern Australia between Cairns and Broome. Its vast underground aquifers ensure relatively reliable flows of good quality water during the dry season which, combined with its high potential soils, are leading to the consideration of further agricultural development in the region. This hydrological regime also contributes to the unique ecological nature of the Daly River system, its cultural significance for both Aboriginal people and non Aboriginal people living in the region, and to the existence of habitats that support significant biodiversity values. The core agricultural enterprises undertaken in the region are cattle production, hay and seed production, agroforestry, and horticulture (including mangoes, melons, vegetables and citrus). All forms of agricultural production are considered likely to increase significantly.

In this case study, the Northern Territory Government's Departments of Natural Resources, Environment and the Arts (NRETA) and Primary Industry, Fisheries and Mines (PIFM), the NT Horticultural Association and the NT Agricultural Association formed a collaborative relationship to explore the potential impacts of a new water trading institutional arrangement on the ground through the analysis of a set of different institutional policy scenarios. This study was concerned specifically with understanding the potential response of irrigating growers in the region, firstly at the operational level to a market where there previously was none, and secondly, to different market scenarios. (Straton et al., 2006)

Alice Springs: The fourth case study is an institutional analysis of a recent draft strategy developed for the management of water resources in Alice Springs. Alice Springs is the largest inland population centre in the Northern Territory, with a population of 28,000 (with a five percent annual turnover in population) and 300,000 visitors each year. Due to variable rainfall (median rainfall is 286 mm/year but the range is highly variable at 60 – 903mm/year) and high evaporation rates (3,000 mm/year, there are no permanent surface waters but one intermittent river, one creek, and several waterholes. As a desert town, water is one of the critical resources that determine the sustainability of Alice Springs. The primary sources of water for Alice Springs are the surrounding deep and shallow aquifers. Recharge of these aquifers is limited and the water is currently used mainly for town domestic water supply, business, stock and horticulture. The uncertainty of water supplies requires a re-evaluation of the water strategy every five years, and an overhaul every ten years.

The action arena has two components: the action situation and the participants. For this study, the action arena of interest is the actors and interactions that contributed to drafting the Alice Springs Water Resource Strategy (ASWRS). The focal action situation is the Steering Committee through which representative agencies bargain over the allocation of water and develop a draft ASWRS to include a range of perspectives. The draft ASWRS would be submitted to the Northern Territory Government's Departments of Natural Resources, Environment and the Arts (NRETA) for final editing, and then to the Controller of Water, the Minister and, upon his discretion, the Cabinet. The final ASWRS is then implemented with the advice of a separately constituted local review panel, the Alice Springs Water Advisory Committee. The Steering Committee is experiencing tension between collective long-term outcomes and short-term organisational (individual) interests. As a result, both NRETA staff and members of the committee continually reflect on the importance of rules to address this conflict.

3 IAD FRAMEWORK

The IAD framework is based on work by Elinor Ostrom and her colleagues at the Workshop in Political Theory and Policy Analysis at the University of Indiana (Dietz, Ostrom, and Stern 2003, 302; Kiser and Ostrom 2000;Ostrom 1992; Ostrom 2005; Ostrom, Gardner, and Walker 1994). It has been developed to enable the analysis of 'institutional settings' – which are any situations that involve people interacting together in a certain context and following certain rules. (Ostrom 1992, p.19) defines an institution as "the set of rules actually used (the *working rules* or *rules-in-use*) by a set of individuals to organise repetitive activities that produce outcomes affecting those individuals and potentially affecting others."

Institutions thus define and limit the set of choices individuals have; they are the framework within which human interactions take place (North 1990). Bromley (2006) points out that while institutions may constrain some individuals they may also enable other individuals. For instance, constraining water use by a group of irrigators might protect biodiversity values, which provides benefits for those (current and future) individuals who enjoy water-linked ecosystem services.

This framework has been trialled and applied in a range of situations to systematically analyse the structure of situations faced by individuals and to determine how rules, the nature of events, and the attributes of the surrounding environment and local community affect these situations over time.

Theories explaining individual behaviour in an institutional setting have concentrated on five main components: (1) the decision maker; (2) the community affected by decision making; (3) events or goods and services that interacting individuals seek to produce or consume; (4) institutional arrangements guiding individual decisions; and (5) the decision situation in which individuals make choices (Kiser and Ostrom 1982). The IAD framework has since evolved from this (Figure 2), although these key components remain in slightly modified forms.

Each application of the framework focuses on a specific activity (the *action situation*), the people who take part in this activity (the *participants*), and the *patterns of interactions* between them. The combination of activity and participants is called the *action arena*.

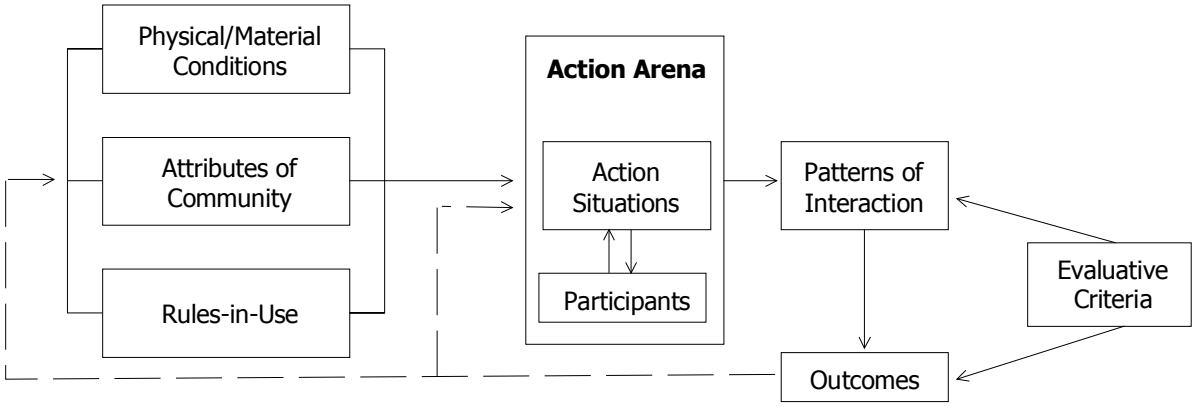

Figure 2. The Institutional Analysis and Development framework (Ostrom 2005)

Every action arena is influenced by a number of exogenous variables, broadly categorised to be *physical/material conditions*, *attributes of the community* and *rules*. The patterns of interaction between participants in an action arena result in *outcomes* that may feedback into the original exogenous variables and action arena and thereby restructure the situation. Both the outcomes and patterns of interaction are evaluated. It is most likely that different stakeholder groups will use different *evaluative criteria*.

The IAD framework can be used to analyse sets of rules existing at different 'levels'. Rules are often nested within, or form the greater context for, sets of rules at a different level of operation. Three vertical levels of rules analysis, proposed by Ostrom *et al.* (1994) and Kiser and Ostrom (1982; 2000), are seen as affecting cumulatively the actions taken and outcomes obtained in any setting (Figure 3). They have been summarised by Larson (2006) as:

1. *Operational rules*. This is the set of rules that affects day-to-day decisions in action settings. Actions are taken or decisions about future actions are made by individuals operating at this level and are based on the set of institutional arrangements within which they operate.

2. *Collective-choice rules*. The next tier of rules typically determines what the basic operational rules are and in particular sets the rules about who is eligible to participate at the operational level. Collective-choice level decisions are made by officials in order to determine, enforce, continue or alter actions authorised within institutional arrangements. This level of rules is typically reviewed or recreated in a 5-10 year time frame.

3. *Constitutional-choice rules*. This is the top tier, determining frameworks for lower-level rule creation. At this level, rules are set to guide future collective-level decisions that will authorise future operational-level actions. Therefore, constitutional choices are decisions about decision rules.

In addition, Larson (2006) summarises constitutional level decisions and rules as having a very long, and often undetermined, period of existence. Constitutional decisions establish institutional arrangements and their enforcement for collective choices; in other words, they create constitutions. Collective-choice level decisions, in turn, establish institutional arrangements and their enforcement for individual actions (Kiser and Ostrom 2000); they create laws. Operation level decisions determine, through the actual on-ground behaviour of participants, the outcomes in any institutional setting. Each level has its own action situation characterised by the internal structure described above.

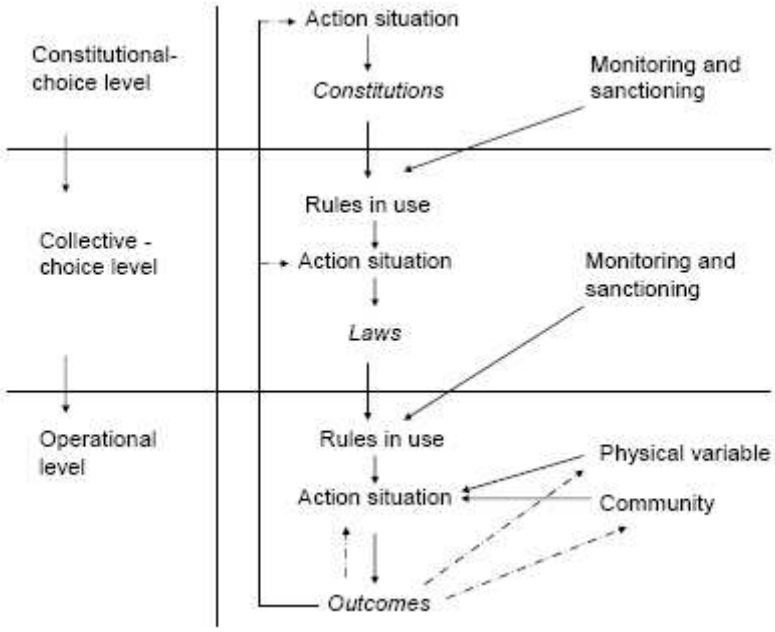

Figure 3. Levels of rules and the linkages between them (adapted from Ostrom et al. 1994, p.47)

Figure 3 presents linkages between the three levels of rule creation. The constitution resulting from the constitutional-choice action situation creates the rules in use governing the collective-choice action situation. The outcome of the collective-choice level action situation is the resultant laws that then become the rules in use governing the operational level action situation. The constitutional-choice level monitors and sanctions the use of rules at the collective-choice level, and the collective-choice level monitors and sanctions the use of rules at the operational level. This is the influence of higher levels on lower levels. Outcomes at the operational level may also feedback to influence changes in collective-choice level rules, and changes in collective-choice level rules may feedback to influence on constitutional-choice level rules. Thus the influence flows both downward and upward, although less so in the upward direction.

4 CONCEPTUALISING THE CONTEXT OF OUTBACK AUSTRALIA

4.1 *Attributes of the biophysical world*

The biophysical context for the analyses carried out as part of this project was the physical space of the Northern Territory and Queensland. The rainfall of the region is highly variable both in space and through time, and by the very high evaporation rates relative to rainfall. Runoff is redistributed across the landscapes of the study region through the river systems which drain to the north, the east and south into the Lake Eyre Basin (LEB). In general, runoff rates are low. For the 25 monitored catchments in the study region for which Peel et al. (2000) provide data, the mean annual runoff percentage was 24 percent of mean annual rainfall. An additional hydrological feature of the region is the Great Artesian Basin (GAB). Although infrequent, floods in the rivers draining south into the LEB are an important source of water for these outback landscapes.

Rainfall in the arid interior of Australia is highly variable in timing, duration and intensity, even when compared with other arid regions of the world (Stafford Smith and Morton 1990, 18). Consequently, Australian rivers have greater variation in flow and flooding patterns than elsewhere on the globe (Puckridge, Walker, and Costelloe 2000, 16;Williams 1981). Evaporation is up to 18 times greater than rainfall in the interior of the region but the ratio of evaporation to rainfall declines to less than one along the coast.

4.2 *Attributes of the community*

A major constraint to adequately characterising the study region from social and economic perspectives is the high uncertainty in the data available for use at this scale. The Australian Bureau of Statistics (ABS) is almost the sole source of this data. However the very low populations in many regions of the outback mean that for the 2001 census the non-resident population was very high, often greater than 50 percent. This means that the characteristics of the enumerated population may be very different to the characteristics of the resident population and this needs to be taken into account when interpreting the data.

For most of the study area the human population density is exceedingly low, less than 0.001 people per square kilometre, which is considerably less than the national average of 2.6. A few regions of higher population density and urban centres are scatted through the study region. in the 2001 census, in the Northern Territory 56 percent of the population was considered to be remote and 44 percent very remote (Trewin 2006). For Queensland the population was very much more urban and regionally based (Trewin 2006).

The demographic trends of Queensland and the NT inidicate relatively rapid growth in the cities: inner regional Queensland's population increased in 2004-05 by 75,900 people, the largest increase of any Australian state. The source of this growth was from net interstate migration (42%, the largest of any state or territory), net overseas migration (23%), and the increase due to natural increase and inter-regional migrations 36% (ABS, 2006). Queensland's annual growth rate of 2.0% was the fastest of any state or territory. Queensland's average annual population growth rate over the five years to June 2005 was also the highest in Australia at 2.2%. Most (70%) of this growth occurred however in the urban areas of SE Queensland and particularly in Brisbane.

The Northern Territory's population experienced similarly high growth rates (albeit from a much smaller base) with a 1.5% increase (3,000 people) in 2004–05, giving it the third fastest growth of all the states and territories. For the first time in a decade, net interstate migration was positive. The pastoral belt of Queensland was the only remote area to decline in population over the four years to June 2005, with an average annual rate of 0.1 percent (Trewin 2006). At the time of the 2001 census, indigenous people comprised 3.5 percent of the enumerated population of Queensland in 2001 and 28.8 percent of the population of the Northern Territory, both larger than the national figure of 2.4% (Trewin 2006).

In 2004 the unemployment rate for Queensland was 6.0 percent and for the Northern Territory it was 5.7 percent (Trewin 2006). Whilst the broad patterns of employment are similar in both regions, there remain some notable differences: the manufacturing sector is a relatively larger employer in Queensland than in the Northern Territory; the government, administration and defence sector is very large in the Northern Territory compared with Queensland. Although a dominant land use, the agricultural sector is a relatively small employer with most of the employment in the region provided within the service and government sectors.

The majority of the land area of Queensland and the Northern Territory is used for grazing with managed resource protection areas (e.g. nature conservation) being a second important, but lesser land use. Although there are a number of other land uses carried out in the region they do not occur over large, contiguous land areas. Although mining uses a relatively small area of the land of either the Northern Territory or Queensland, it is an important employer and economic contributor in both areas

In summary, the landscape that is the subject of this study is characterised by very low sparse populations. In many areas the population is actually in decline. The landscape is mostly used for grazing and hence we would expect the rules governing water use will critically affect, and be affected, by this sector. Although very localised in their physical occupancy, mines and the mining sector exert a tremendous influence on the economies of the region and hence the institutions controlling use of water. Although numerically relatively small, the indigenous populations of both the Northern Territory (where they make up a much larger proportion of the total population) and Queensland are culturally important and so add an important dimension to the analysis of institutions governing water in these regions.

4.3 *Rules in use*

The constitutional level of rules-in-use is defined by the Commonwealth and State governments. This chapter gives a brief overview on constitutional arrangements regarding land use and water use relevant to case studies in Northern Territory and Queensland.

4.3.1 Land related regulation

Land ownership in Australia is mainly divided into freehold title and Crown land. The Land Title Act 1994 defines freehold title for Queensland while the Law of Property Act 2002 defines freehold for the Northern Territory. Freehold title entails the greatest bundle of land related rights. The most significant forms of Crown land holdings are different types of leases, defined for Queensland under the Land Act 1994 and for the Northern Territories in the Pastoral Land Act 1998 and the Crowns Land Act 1999.

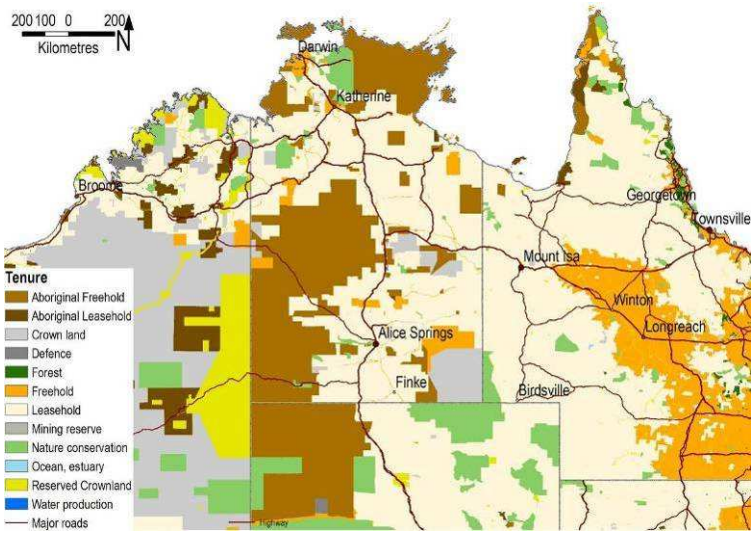

Figure 4. Land tenure for the study region. (Stewart et al. 2001)

In Queensland the *Land Act 1994* confers land allocation powers and powers to determine most appropriate tenure type. Figure 4 shows that in the rangelands of Northern Territories and Queensland, the most common tenure regime is pastoral leasehold property; in Queensland followed by freehold land and in the Northern Territory followed by Aboriginal freehold under the Aboriginal Land Rights Act 1976, the Land Acquisition Act 2004 and the Native Title Act 2003.

Land under a pastoral lease remains Crown land i.e. land owned collectively by the people of Australia. A pastoral lease gives the lease-holder the right to use the land for pastoral purposes, including raising livestock and developing the infrastructure necessary for pastoralism such as fences, yards, bores accommodation, etc. Pastoral leases are governed by the relevant State Government statutes. Lease terms and conditions vary greatly from one State to another with the rights of the pastoralist set out in various Land Acts. Specific conditions and prohibitions are also often spelt out in individual leases.

A pastoral lease is a limited form of property right; it does not give pastoralists full ownership rights. The pastoralist does not own the land, but pays rent to the Crown. At the expiry of the lease, the lease reverts to the Crown. Leasehold tenure also requires that the lease property must remain undivided, which means that members of the one family may divide the property for the purpose of their multiple businesses, but control over the whole resource (the whole property) must remain with one single entity. However, if there is a change in land use, this may afford the option to excise parts of the land into a different type of tenure, which requires extended negotiations with the state to gain approval. Diversification to allow properties to take advantage of alternative resources remains limited on leasehold lands. Leaseholders have the option to submit applications for special leases, such as low-impact tourism, but it is a lengthy process without a guarantee that will be allocated. Leaseholders also have the possibility of changing their leases to a perpetual lease, which grants landholders rights closest to freehold on their property. However, applicants must meet a series of strict conditions/criteria, including resolution of native title issues. The regulations and mechanisms for doing so are set out in the *Native Title Act* 1993.

The *Native Title Act 1993* was introduced by the Commonwealth to provide recognition and protection of Native Title. It defines processes that must be followed for Native Title to be claimed, protected and recognized through the courts. The State of Queensland enacted its own Native Title (Queensland) Act (1993), which is consistent with the Commonwealth Native Title. The Act gave legislative recognition of an existing common law of customary Aboriginal law, that of native title. This recognition was important because it does not suggest the granting of a right by government but rather accepts that the right has existed and is now recognized. Native title is not the same as land rights and the concept of claiming land rights is independent of native title. Land rights are new legal rights that are created and granted under Australian law to Indigenous Australians. In addition, Native Title can co-exist with non-indigenous proprietary rights and in some cases different indigenous groups can exercise their native title over the same land. The Act provides for indigenous land use agreements (ILUA). The definition of ILUAs includes area agreements and alternative procedure agreements, processes for defining and negotiating them, and impact on land use. The basis of an ILUA is the memorandum of understanding (MOU) which is an agreement between the Traditional Owner(s) and the leaseholder.

In the Northern Territory the federal Native title Act did not change incentives for Indigenous groups to claim land right as this right already exists since the *Aboriginal Land Rights Act (Northern Territory) 1976*. Titles granted are equivalent to communally freehold land. However, urban areas had been excluded and the Commonwealth Act changed introduced potential claims within town boundaries. This led in 2004 to the Lhere Artepe Aboriginal Cooperation, the body corporate for a successful claim of three Arrernte people over 113 land parcels; Australia's first native title in an urban area. (Davies and Aboriginal Legal Rights Movement Inc. 2005)

A key piece of legislation guiding use and management of land is the *Vegetation Management Act 1999*. At the level of the state, the Queensland Government's State Policy for Vegetation Management lays out the principles that underlie the policies, its desired outcomes, and how these will be achieved (NRW 2006). The Act allows for clearing fence lines (10 meters on either side) and development sites (e.g. 5 hectares for a dam site, 5 meter road) without a permit.

4.3.2 Water related regulation

The institutional history of water in Australia is closely linked to the colonisation and settlement policy of the country as well as Australia's economic needs (Larson, 2006). With the establishment of the Australian Constitution and the federal system of government in 1901, the constitutional division of power left water resources largely within the jurisdiction of the states. Each state began to develop its own approach to water management, allocation and use, by considering its water resources in isolation from the other states (McKay 2005). First this section summarises the situation in Queensland and then the situation in the Northern Territory.

The summary of the water-related institutional arrangements in Queensland is presented here as a quotation from Larson (2006, pp22-23):

“McKay (2005) compares the underlying paradigm governing water resources development in Australia from the start of the colonisation period in the late 18th century to the 1990s with the story of “magic pudding”, written by Norman Lindsay in 1918 (as cited in McKay, 2005, p38): “…peculiar thing about the magic puddin’ was that, though they had all had a great many slices off him, there was no sign of the place whence the slices had been cut off. The custodians of the puddin’. . . were always on guard in case it should run away or be stolen by puddin’ thieves”. In other words, growth in water demand was met over time by growth in water supply, through increased capture and development of water resources. The resource appeared endless.

However, by the mid 1970s, concerns were voiced about rising scientific and anecdotal evidence of deterioration in the qualities and quantities of waters in Australia. The concerns grew, and led to several key institutional developments in the early 1990s. The National Strategy for Ecologically Sustainable Development (1992) and the Council of Australian Governments Water Reform Framework (1994), among other institutional changes, have created a new era of water management. The new frameworks promote markets for water entitlements to improve efficiency but also promote allocation of water for environmental and social needs. Furthermore, since the Water Reform Agreement was signed in 1994, water institutions have evolved to include national and interstate concerns. The key initiatives of the agreement are improvement of the water quality, refinement of the water rights system and water allocation procedures, independent review of water prices and promotion of community participation (Department of Land and Water Conservation 1998).

In response to Commonwealth changes Queensland enacted the Water Act 2000 in order to “advance sustainable management and efficient use of water and other resources by establishing a system for planning, allocation and use of water”. The Queensland Water Act 2000 requires that all catchments in Queensland develop Water Resource Plans, the subordinate legislations of the Act. The Resource Operations Plans are then developed to implement Water Resource Plans. …

Several other key pieces of legislation are relevant to water in the study area: the Integrated Planning Act 1997; the Environmental Protection Act 1994; the Native Title Act 1993; and the Mineral Resources Act 1989. The Water Act 2000 is also linked to the National Strategy for the Ecologically Sustainable Development (section 11(b)), Environmental Protection Act and Environmental Protection (Water) Policy 1997 (Part 7). The DNRM&W (government department responsible for the management of water in Queensland) is therefore required to develop plans for water allocation that protect environment al values of water while allowing for sustainable development.”

The following paragraph is based on the report by Straton et al (2006). Similarly to Queensland, the Northern Territory defined the Water Act 1999 with the Department of Natural Resources, Environment and the Arts (NRETA) as the relevant governmental entity in the Northern Territories. The staff from NRETA are charged with implementing the Intergovernmental Agreement on a National Water Initiative, which contains the substance of a constitutional-level change in the rules governing

water planning, allocation, use and management in Australia. These rules are based around the following principles:

- a commitment to identifying over-allocated water systems, and restoring those systems to sustainable levels
- the expansion of the trade in water resulting in more profitable use of water and more cost-effective and flexible recovery of water to achieve environmental outcomes
- more confidence for those investing in the water industry due to more secure water access entitlements, better registry arrangements, monitoring, reporting and accounting of water use, and improved public access to information
- more sophisticated, transparent and comprehensive water planning, and
- better and more efficient management of water in urban environments, for example through the increased use of recycled water and stormwater. (National Water Commission 2005)

As a signatory to the Intergovernmental Agreement, the NT Government has agreed to establish water market and trading arrangements that will:

- facilitate the operation of efficient water markets and the opportunities for trading, within and between States and Territories, where water systems are physically shared or hydrologic connections and water supply considerations will permit water trading;
- minimise transaction costs on water trades, including through good information flows in the market and compatible entitlement, registry, regulatory and other arrangements across jurisdictions;
- enable the appropriate mix of water products to develop based on access entitlements which can be traded either in whole or in part, and either temporarily or permanently, or through lease arrangements or other trading options that may evolve over time;
- recognise and protect the needs of the environment
- provide appropriate protection of third-party interests (Council of Australian Governments 2004)

These Commonwealth and State level regulations define the legislative framework for land use and water use in the four case study regions.

5 DISCUSSION AND LESSONS LEARNT

This section takes a cross-comparative perspective and synthesises findings across the four case studies. In a second step we discuss the methodological perspective and analyse the utility of the IAD framework for analysing institutional arrangements in Australia.

5.1 *Cross-study synthesis*

The discussion on case study specific findings shows that four major themes are shared by at least three of the four case studies:

1. Role of centralised power
2. Role of discretionary powers
3. Decoupled rights and responsibilities
4. Opaque information flows and lack of transparency in decision making

In all four case studies it was noted that decision making power was centralised and was located outside of the local community. In all cases the distance from administrative centres was a significant descriptor for the action arena while the communities' capacity to participate in decision making processes varied across case studies. Field work in all cases pointed out that with increasing distances transaction costs rise. Considering low population densities (in three out of four case studies) it seems a likely response in an evolving governance structure to centralise decision making. The historical context provides an additional explanation as the colonial past defined a governance scheme in a top-down approach.

The second theme common to three of the four case studies shows that the consideration of local knowledge and end-user perspectives in decision making process is considered in process related rules. Such an involvement of the local community is mostly mandatory but is often not carried through to the final point of decision making. This defines a significant degree of uncertainty regarding potential involvement in processes on the collective choice and operational level for local communities, such as Alice Springs.

While the 'default' situation of decision making is centralised and involvement of local communities in decision making is discretionary, most of the case studies are charged with providing knowledge to external decision makers. All case studies show how such a high demand for information by external, usually government agencies, is perceived as a significant burden for the community. Facing these responsibilities in contributing to decision making processes communities are not given corresponding rights in making decisions.

The fourth shared finding in all cases is that local communities cite the lack of transparency in the decision making processes. While local knowledge is demanded, the information flow is perceived as a one way process and reasons for decision making outcomes are not clearly communicated. Stakeholders across case studies stated that it was unclear:

- how information provided by the local community was used
- what criteria would be, or had been, used by decision makers.

These shared findings led in all four cases to high levels of frustration in the local community. The perception of being disempowered seems to define in some cases a reinforcing cycle: The default situation of decision making power is centralised and local communities are responsible for contributing significant amounts of local understanding while the right to genuinely participate in decision making processes depends on the good will of higher tiers of governance. In cases like Alice Springs community representatives were frustrated because of uncertainty on final decisions making process, and, in cases like Etheridge Shire elevated levels of frustration led to disengagement due to resignation. In both cases the capacity of the local community to make decisions is reduced. Such a lack of decision making capacity reinforces the legitimisation of the centralisation of decision making rights as the default position. The case studies give the picture of an institutionally inferior situation. With such a potential for improvement, the strategy to invest in community capacity in order to break the reinforcing cycle is a promising option.

Three of Ostrom's design principles (Ostrom 2005) seem highly relevant in the context of Australia's Outback:

- Collective-choice arrangements
- Minimal recognition of rights to organise
- Nested enterprises

The collective-choice principle specifies that the majority of individuals should be able to participate in installing new rules and modifying existing ones. As described above, all the case studies violate this principle. The second principle listed refers to the right to self-organisation by the community of resource users. Case study results showed that the communities do not perceive such rights. The design principle referring to nested enterprises attempt to link knowledge with rights and responsibilities.

Considering research findings across the four case studies, these three principles seem most relevant and applying these principles seems likely to lead to improvements in outcomes for institutional arrangements in outback communities. But these principles require local capacity to participate in institutional processes. While Alice Springs seems to have this capacity (coupled with a transience problem), all other case studies were characterised by varying degrees of limitations. In all four cases, levels of frustration are very high and a lack of positive learning experience by community members reduces capacity to participate in institutional processes. Thus, the key element appears to be investing in local capacity by pressing more genuine rights to this level.

5.2 *The utility of the IAD framework*

The IAD framework has been applied to case studies in at least 21 countries (Ostrom 1999;Ostrom, Gardner, and Walker 1994). Such a level of application is a strong indicator of the impact of the IAD framework on applied institutional research. Applications of the framework cover the constitutional, the collective choice, and the operational level (Chmielewski 1995, 3; Lam, Lee, and Ostrom 1997;Ostrom 1986, 48; Schlager 1990; Schweik, Adhikari, and Pandit 1997, 17). The framework is applicable not just across tiers of governance and various countries, but also to various natural resource-use scenarios. Additionally, applications of the IAD framework offer material for a meta-analysis that aims at the identification of patterns, which leads to (1) an improved theory of common-pool resources and (2) case study independent principles (Ostrom 1990; Schlager 1990; Schlager 1994; Tang 1992).

The discussion of the utility of the IAD framework is structured in four steps:

1. The exact boundaries of the assessment are defined, which is necessary as the IAD framework is comprised of varying components in published applications.
2. Assessment criteria are specified.
3. Limitations of the underlying case study-based research are outlined.
4. The utility of the IAD framework is discussed based on the Australian experience documented in this study.

5.2.1 IAD framework and its components

Discussing the efficacy of a tool requires specifying the exact extents of the tool, especially if the tool is used including or excluding various peripheral elements. 'The framework' as it is applied in literature involves different elements. The conceptual model shown in Figure 2 is a central component, while the following are not always subsumed as part of the IAD framework:

- the definition of institutions
- the typology of rules (Ostrom, Gardner, and Walker 1994)
- the multi-level framework (Kiser and Ostrom 1982)
- the grammar of institutions (Crawford and Ostrom 1995, 89)
- the design principles (Anderies, Janssen, and Ostrom 2003; Gibson, Ostrom, and McKean 2000; Ostrom 2005;Ostrom 1990; Ostrom 1992; Sarker and Itoh 2001, 48; Wittayapak and Dearden 1999, 12; Yandle 2002, 27)

For the purpose of this analysis we take the framework to comprise the conceptual model (Figure 2), the definition of institutions, the typology of rules, and the multi-level approach. Elements like the design principles and the grammar of institutions are discussed separately.

5.2.2 Assessment criteria

Instead of attempting a general assessment of the IAD framework – Ostrom (1999) points out a set of nine assessment criteria – this study is focused on four criteria, which in parts constitute requirements for cross-comparative analysis:

1. Is the framework sufficiently general to be used across diverse contexts, levels and issues?
2. Is the framework sufficiently precise to provide clear guidance in order to allow cross comparability?
3. Does the framework add analytical value?
4. Is the framework compatible with other methodologies?

The first criterion demands a generic character in order to provide a tool that is useful for various situations. Such a characteristic is the foundation for cross -case study analysis, which would allow empirical research to feed back into theoretical understanding of institutional arrangements. A good example for such meta -case study learning are the design principles (Gibson, Ostrom, and McKean 2000; Ostrom 2005).

The second criterion reflects on the difficulty of applying frameworks in an empirical context and, more importantly, on the potential for inadequate precision. While a framework can be useful for a specific context with a specific research team, results would have to be repeatable by other research teams in the same context. The contextualisation of the reality of a situation provided by a framework would need to be precise enough to guide researchers with various backgrounds in order to achieve a comparable application.

The specification of the third criterion depends on the research focus. Generally, four types of contributions can be linked to an institutional analysis:

1. A structured description of status quo
   (What do we face?)

2. A cross comparative analysis
   (What can we learn by comparing two or more case studies?)
3. Development of potential solutions for the relevant context
   (What could we do?)
4. Analysis of potential consequences of options for institutional changes
   (What if we did what we could do?)

Following Ostrom (1990; 2005) the core application area is the initial understanding of a situation from an institutional perspective. This excludes questions 3 and 4 from the core application domain of the IAD framework. Therefore, the assessment is mainly performed against the background of question 1 and 2. Within this domain of research questions, the value of a framework depends on the value it adds to the analytical understanding. It can be assumed that a framework has a higher value if it helps to reveal aspects that are not obvious.

While the focus of the IAD framework analysis is research questions of type 1 and 2, a framework can add value by being compatible with other methodologies that endeavour to answer research questions in domains 3 or 4. This compatibility is thus defined as a fourth criterion for discussing the utility of the IAD framework.

5.2.3 Research limitations

The following discussion of the utility of the IAD framework has to be put into perspective as the research faced a range of limitations.

Firstly, the research teams were not extensively prepared in regards to how exactly to apply the IAD framework. Instead, every team developed between their researchers a coherent understanding of the framework within that specific team. Over a period of one year, two meetings were used to discuss the understanding of the IAD framework and Ostrom et al. (1993) and this was used as a common platform for defining terminology of the framework.

Secondly, all four teams applied the IAD framework for the first time and did not bring previous experience of the framework into the case study. This led in some cases to a ‘retrofitting’ approach; while the framework was discussed, field work was undertaken loosely. Therefore, in some sections case study descriptions read as if the results were retrospectively fitted to the needs of the framework.

Thirdly, the cross-comparative intention was based on a case study approach, selecting two case studies in Queensland and two case studies in the Northern Territory, of which one in each state is located in a savanna region and one in a desert region. This approach opened the possibility for comparing institutional arrangements and their outcomes (1) based on similar bio-physical conditions but different rules in use and (2) based on similar rules in use but different bio-physical conditions of outback communities. In other words, outcomes could be explained by biophysical variables framing the action arena or by institutional attributes.

Community attributes defined according to the IAD framework provide a third set of discriminatory variables. Inherently, the cross-comparative case study approach assumed certain homogeneity of outback communities or assumed a lower

explanatory power of community attributes. The case study results show that all four case studies fall into the category of remote outback communities, but that community attributes make their diversity significant and relevant to policy recommendations.

This additional dimension underlines the limitations of this project based on four case studies. Instead of a comparative analysis based on the findings of the IAD framework the diversity of contexts provided a heterogeneous set of findings.

Fourthly, during various phases of field work, stakeholders influenced the action arena. For instance, in the Etheridge Shire case study the initial choice of the case study region was triggered by a representative of a tourism association whose interest is the development of tourism activities around Georgetown. The scoping study revealed that most local community members do not perceive limitations on tourism related issues. Instead, the action arena was defined around social cohesion, road infrastructure, education, succession and involvement of the local community in governmental planning and decision making processes. Therefore, power relationships of different stakeholders and the resulting dynamics created potential for serious impediments for undertaking applications of the IAD framework.

These four aspects define critical limitations of the research approach and have to be taken into account when discussing the utility of the IAD framework in the Australian case studies.

5.2.4 Utility of the IAD framework in Outback case studies

For the outback context, experiences with the IAD framework are mixed. Regarding IAD terminology, the documented four case studies applied the ‘conceptual model’ based on the definitions of institutions and the typology of rules. In the Etheridge Shire case study the IAD framework was applied to the operational level with strong links to the collective-choice level. In the Daly River case study, the IAD framework was applied to the collective choice level and the operational level with some focus on the link between these two levels. The Diamantina Shire case study as well as the Alice Springs case study applied the framework to the collective choice level and framed the analysis in the relevant constitutional context. Additionally, these two case studies applied the IAD framework and the institutional design principles.

The research process involved stakeholders in all four cases, as each case study aimed to improve the understanding of the institutional arrangement. Team members shared their experiences in workshops that were held during and after applying the IAD framework.

Table 1. Overview on applications of IAD framework

Case study	Context	Level of IAD framework application			Design principles
		Operational	Collective choice	Constitutional	
Etheridge Shire	Land use	Focus	Considered		
Diamantina Shire	Water use		Focus		Explicit
Daly River	Water use	Considered	Focus		
Alice Springs	Water use		Focus		Explicit

5.2.4.1 Applicability of IAD framework across diverse issues and levels

The experience of the case studies indicates that the IAD framework is sufficiently general to be applied across diverse issues and levels. The case study reports involved four research teams working in very different contexts. Table 1 gives an overview of the context and level of applications of the IAD framework. Responses from the four research teams were very positive regarding the clarity and suitability of the framework. The terminology used by the framework is perceived to be coherent and easy to understand across the four case studies. Based on these characteristics, teams were able to effectively communicate about their research goals and research plans.

The results from the land focused application of the IAD framework are limited, but it would not be justifiable to conclude that the IAD framework is not suitable for such a focus. Instead, the results emphasise a well-specified action arena as a crucial prerequisite of an application of the IAD framework. The dynamics of this specific case study created sub-optimal circumstances: The stakeholder-driven process defined the first focus on institutional barriers for land-use change or multiple land use options particularly tourism opportunities in a currently grazing dominated context. However, the local community classified this first narrow definition of the action situation as inappropriate and driven by a minority of stakeholders.

Clearly identifying ‘the problem’ in the given context is a necessary prerequisite for applying the IAD framework. Contextualising, for instance, exogenous variables depends on a precise definition of the action arena. If the definition of the action arena changes during or after data gathering, field work interview material that has been collected is likely to miss the focus of the framework application. Clearly, this concern describes a methodological prerequisite and not a weakness of the methodology itself.

5.2.4.2 Precision of the IAD framework

While researchers emphasised the clarity and accessibility of the framework, the actual documentation of case study applications shows significant diversity of interpretations. The conceptual building blocks of the IAD framework are interpreted quite differently. Researchers involved in the four documented case studies argued that the stakeholder driven process required a context specific interpretation of

framework terminology. For instance, while one team placed aspirations of stakeholders under ‘patterns of interaction’, similar material is listed in another case study under ‘outcomes’ or ‘participants’. Similarly, agreements between negotiating partners are in one case study identified as an ‘outcome’ while in others as a ‘pattern of interaction’.

Such a range in applying the IAD framework shows that the potential for comparing case studies based on the same framework is not straightforward. While the IAD framework proved to be very effective from a case study perspective the cross case study comparison faces the problem that it is not easy to draw correlations between two or more system components based on the framework. It is very likely that better preparation of the four research teams in regards to aligning the exact understanding of the framework components would have improved the cross comparative potential.

If, for instance, an observed ‘attribute’ leads across case studies to specific ‘patterns of interaction’, lessons could be drawn for the Australian context. Also, if certain ‘patterns of interactions’ can be observed across case studies then the variation amongst ‘outcomes’ would inform practitioners and researchers.

Researchers across case studies recognised the limitations for comparative analysis due to the freedom of interpretation. In response, the IAD framework was discussed as being too theoretical and that a user manual would add benefits to making applications comparable. It remains open as to whether such a step would keep the framework flexible and generic enough to be applied to various contexts.

According to this discussion, interpretational degrees of freedom in applying the IAD framework limited the analysis across case studies. Nevertheless, as Section 5.1 summarises, lessons across case studies were identified. Thus, the application of the IAD framework allows the identification of contextual research findings that can be used in a comparative approach although conceptual components are used differently. This capacity and the given limitations lead to the question about how the framework adds analytical value beyond pointing out obvious characteristics of the analysed situation.

5.2.4.3 Analytical added-value of the IAD framework

Tools and methods can be evaluated with regard to the value they add to a research process. If research findings were not obvious at the beginning of a research project and a framework helped reveal these results, then the approach adds significant analytical value.

In order to capture the value adding of the IAD framework, discussions with the research teams were held prior to field work and after field work was finalised. The discussion was facilitated by two cross-case study workshops, phone calls and emails. In particular, the understanding of research teams that decision making power is centralised and discretionary was identified prior to applying the IAD framework. This might suggest that the IAD framework adds a low level of analytical value to the research process and that its strength lies in structuring the descriptive stages of the research.

Discussions revealed that such a conclusion cannot be made, as in all cases research teams formed an early opinion on *causality* in a given context. For instance, the centralisation of power as a driver for outcomes that are not highly valued by local stakeholders was identified as 'an institutional problem' across case studies. However, the IAD framework 'forced' researchers to run through all relevant system variables instead of jumping to conclusions. This allowed, for instance in the Etheridge Shire case study, the discovery that exogenous variables like community attributes did not provide the requirements for decentralising decision making rights.

Similarly, scoping work for the Etheridge Shire case study led to early expectations by the research team regarding institutional causality. Triggered by a few stakeholder contacts, the link between existing property rights regimes and limited degrees of multiple use shaped the action arena. Applying the IAD framework to the institutional context of Etheridge Shire revealed that such an assumption has to be put into perspective. Therefore, the framework added analytical value to the research undertaken by forcing researchers cogitating institutional causality.

This shows clearly that the power of the framework in guiding researchers (though all potential interpretational freedom) leads to significant analytical properties of the IAD framework. By forcing researchers to capture 'the bigger picture', *causality* is based on a broader foundation, which potentially increases the validity of the research undertaken.

5.2.4.4 Compatibility with dynamic methodology

Section 5.2.3 identified that the assessment of the IAD framework depends on the purpose of its application. Four types of research questions are listed and the discussion above is based on questions 1 and 2. Research questions of type 3 aim for institutional solutions, which can be based on understanding the context (i.e. by applying the IAD framework) and, for instance, on the design principles. The framework and the design principles together provide an effective toolbox for identifying promising avenues of institutional change.

Two of the case studies documented above show the requirement of 'what-if' capacity in the institutional context. The Daly River region faces the question about consequences of a market for tradable water quotas. The Etheridge Shire context included strategies already identified by stakeholders.

Such a requirement for scoping out potential impacts of institutional changes defined a challenge for the IAD framework. The static-comparative properties of the IAD framework limited its effectiveness in a dynamic research context. However, linking the structuring value of the framework to animating methods like agent-based modelling proves to be a promising approach, especially if current weaknesses of agent-based modelling regarding capturing contextual factors are balanced by using, for instance, field experiments.

The game-theoretical characteristics of the IAD framework (Ostrom, Gardner, and Walker 1993) requires a clear definition of players relevant to a situation. This meets fundamental requirements of quantitative modelling approaches like, for instance, agent-based modelling. Similarly, the differentiation between exogenous and

endogenous variables defines an advantage that feeds into an additional modelling step.

Experiences during the two case studies that involved agent-based modelling emphasised that defining the methodological approach early in a research process allows 'fine tuning' of the field work. While the general approach of the IAD framework allows an agent-based model to be defined adequately, the calibration of such a model in regards to individual strategy choices, motivations and cognitive processes demands an additional level of specification. However, the framework has proven to be highly compatible with agent-based modelling as a specific means to animate institutional arrangements in what-if scenarios.

6 RESULTING RECOMMENDATIONS

The implications of these research findings and the application of these three principles for policy makers, natural resource managers, and researchers are discussed in order to improve the outcomes of institutional arrangements in outback communities. The recommendations centred on eight key areas:

1. Institutional change to devolve centralised power
2. Improve local capacity to participate
3. Improve transparency of the decision making process
4. Improve fairness of the process
5. Ensure processes can both manage conflict as well as accommodate a variety of inputs
6. Improve accessibility of information
7. Recognise the local context
8. Establish effective monitoring.

6.1 *Recommendations for policy makers*

From this research a number of recommendations can be made for policy makers concerning issues of both power and process, such as knowledge sharing, capacity building, monitoring, and transparency.

Policy makers should enhance long-term collaboration between all groups in a region by institutional changes that decentralise power. They need to ensure that resource boundaries are clearly defined and based on credible and reliable science that has established a threshold level to signal to all resource users what are the environmental targets. They also need to assess the political feasibility of developing transferable, enforceable and tradeable private property rights, and in minimising government intervention.

Through the process of policy development, policymakers need to legitimise the role of the community and appreciate values of all stakeholders, especially local stakeholders. This should include capacity building programs (for individuals, groups and institutions) within the community: programs that build community leadership, capacity, skills as well as an inclination to stay and contribute to the community. Such capacity building programs should be based on a 'soft systems' approach that recognises the roles of a wide range of players and different types of knowledge and expertise, not only scientific or technical knowledge. Also required are capacity

building activities that recognise, value, and accommodate people's differences including different values and aspirations: for example strategies that build the capacity of key individuals (i.e. leadership) as well as key stakeholder groups.

Policy makers also need to find ways to reduce conflict, for example, through structuring negotiations over resource allocation problems which may help to accommodate differing viewpoints and aspirations. They also need to take account of local context and note potential ways in which outback regions may function differently to 'more settled' regions where most policy is made and tested. They also need to develop community engagement processes tailored for conditions of the Australian outback – most regions have large travel distances and low population density. Such processes may support development of more acceptable policy options as well as robust monitoring programs.

Processes need also to be transparent by ensuring information is accessible in terms of availability and content. For example, policy documents need to be available in plain language: terms used should be simple and clear and, where necessary, the relationship between terms explained. Feedback should be given about how the information provided by the local community is or was to be used by decision makers.

In more practical ways policy makers could develop an information 'hub' to support implementation of legislative and institutional responsibilities. Also they could set up networks and processes for transparency and responsiveness on the part of government to create trust and long term relationships which would benefit individuals, communities and institutions with an interest in the region.

Policies should be monitored through early development of a comprehensive and negotiated monitoring system to enhance trust and improve perceptions about agencies' ability to equitably and efficiently manage the resource.

6.2 *Recommendations for managers*

Similarly this research suggests a number of recommendations can be made for natural resources managers: most of these recommendations concern issues of community capacity building and knowledge sharing as well as ensuring inclusivity and fairness.

Resource managers need to be able to build capacity in the communities through a variety of capacity building initiatives, particularly through support for all sectors within regions to develop their own planning and management capacity. They can also provide a range of facilitation skills, techniques and processes to support negotiation and capacity building and knowledge sharing within and between different sectors. Through building such networks amongst resource uses will also increase trust and facilitate information sharing around data, processes and best practices.

Resource managers need to support knowledge sharing in practical ways. For example, they need to ensure communication is formalised to generate adequate and accessible information as well as trust in the process. By working with the local

community they can determine appropriate and acceptable level of exchange of information & communication and ensure that information provided is in an accessible format and language with minimal jargon. In addition they can provide clear and timely information to all residents of the Shire about relevant institutional arrangements and the impacts of and opportunities arising from changes in legislation. It is also important to ensure that those not directly involved in the process are kept informed of progress and have the opportunity to become involved, perhaps by using a range of communication medium.

Monitoring in a community section can be challenging and so resource managers can support monitoring programs to be established and be effective. Ideally monitoring schemes need to be transparent, consistent and credible to all participants and participants have the capacity to implement them. It is also important to have effective incentives that support local participation in monitoring schemes. Ensure these incentives are well communicated and transparent.

6.3 *Recommendations for researchers*

This research also suggested a number of recommendations for social and economic researchers.

There are some research practice issues that are important for all researches but that have a particular impact in small and remote communities. Researchers need to coordinate and engage with the needs of the community in mind and to generate research findings that meet their needs yet do not 'burn out' the local community. Importantly researchers and funding agencies need to make a long-term commitment and investment in a region. Through thoughtful research practice research teams can assist capacity across the spectrum from collecting baseline data to develop process technologies and decision support tools that can be used to structure negotiation and are applicable to a wide range of natural resource conflicts. They can undertake participative research to determine how communities can move from a piecemeal institutional system to one that is holistic and strategic.

Another related key issue, particularly in sparsely populated areas such as the Australian outback, is the existence and access to data both for use by the community and by researchers. Researchers can assist this by collecting essential baseline data on which to base monitoring plans. They need to provide reliable, accurate and accessible information on resource boundaries and limits.

In addition, some specific research area are suggested:

- The influence of the role played by individuals and personal mental models in institutional change.
- Institutions and processes that support remote and sparsely populated communities to effectively manage their resources.
- Methods for accurate pricing of water as well as changing attitudes including increasing demands for higher financial returns from water use as well as increasing demands from higher social, ecological and cultural benefits from water. Further investigation is needed about how these goals can be achieved in parallel, as well as the individual and societal costs and benefits (and distribution of these) associated with these goals.

- Conceptual models for incorporating social and economic information around measuring capacity for change of communities within regions. These can inform regional negotiation processes as well as assess the impact of policy change.
- Information flows on levels of participation of community members, sustainable outcomes, and management practice.
- Instruments such as market-based instruments and their influence pastoralists' abilities to manage their land for production and conservation outcomes.

7 CONCLUSIONS

A complex mix of institutional arrangements across the federal-state-local system and related roles and responsibilities influence the activities and aspirations of individuals and communities in the harsh environment of the Australian outback. Its difficult environmental conditions, especially the low rainfall and little available surface water, and difficult social and economic conditions, such as low population density and enormous distances in turn support and constrain human activity and opportunities in this landscape.

The IAD framework was able to provide an effective means for structuring an institutional analysis in this type of environment. Although the application of the framework in this instance across the four case studies made it challenging to compare across cases especially when comparing different stakeholder driven processes and analysing cross-scales feedbacks and institutional dynamics.

The case study analyses found a disjunct between the alignment of formal government legislation and regulations with individual and community actions and aspirations. This stemmed largely from two key aspects of the current institutional arrangements: the lack of power of community members in decision making processes and the lack of rules to stipulate and govern the monitoring of water use.

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