CULTURAL DIFFERENCES IN THE UNDERSTANDING OF WATER RESOURCE SYSTEMS IN NEPABUNNA ABORIGINAL COMMUNITY

Meryl Pearce[1], Eileen Willis[2], Carmel McCarthy[2]

[1]Flinders University, School of Geography, Population and Environmental Management
[2]Flinders University, School of Medicine

Abstract

This paper highlights the role of cultural differences in the understanding of a component of the earth system, namely water resource systems, with specific reference to Nepabunna Aboriginal community in South Australia. Nepabunna lies in a semi-arid region characterised by extended droughts, an absence of surface water resources, and highly mineralised and low-yielding aquifers. Results of this investigation show a number of distinct differences in the way in which the Aboriginal understanding of water resources varies from that of non-Aboriginal Australians. Firstly, Aboriginal people in Nepabunna tend to not differentiate between the groundwater resource and the household water supply hence they find it difficult to understand why they should pay for their water when they already own the land and water. Secondly, when the community was told that at the current rates of abstraction their groundwater resources are expected to only last a further ten years their response was 'why wasn't a hole drilled that would last 50 years?' illustrating a lack of understanding of the paucity of the regional groundwater reserves. In their previous nomadic lifestyle there was a strong water conservation ethic, whereas the westernised housing that they now live in has water-hungry fittings, resulting in much greater water consumption. Furthermore, with the advent of colonisation the community was established in its current location, yet the site is not a place the people would have traditionally inhabited, or if given the choice—chosen—due to its lack of a sustainable water supply.

Keywords: water scarcity, Australia, cultural understanding

1. Introduction

Aboriginal society in Australia has strong connections to the environment which they refer to as 'country'. Rose (1996, as cited in Howitt, 2002, p. 303) defines 'country' as encompassing "people and place (homeland); here and now and horizon; dreaming and lived experience". In Aboriginal society people exist as an integral part of the natural ecology (Gould, 1969; Pelczynski, 1996; Jackson, 2006). Aboriginal people view themselves as custodians of the land and water and all that depends on water rather than owners, and become 'at one' with it in both their sacred and daily life (Rose, 1999). Rose (2004) describes this as a non-human centred view of the cosmos that incorporates a strong land ethic. The Bama Aboriginal people of north-eastern Australia see the world as a 'biogeography of human and non-human presences, some living and mortal, and some spiritual and ever present' (Langton, 2002, as cited in Howitt 2002, p. 308). By contrast, western society has largely viewed the environment as separate from the people. While this may be viewed as a cultural difference in the understanding of earth systems, there has been a recent move in some sectors to reintroduce the emphasis between people and the environment with reference to new disciplines such as environmental sociology (Redclift and Woodgate, 2000), ecological anthropology and cultural ecology (Scoones, 1999); or the spiritual and the environment (Ashley, 2007), through terms such as 'wilderness spirituality'. The need for the emphasis on human relationships to the environment has arisen because it has been humans who have caused the environmental degradation (Howard, 2000, as cited in Kurz *et al*., 2005), and likewise, who are responsible for environmental management (Kurz *et al.*, 2005). Kurz *et al*. (2005) add that social psychology can facilitate the promotion of environmentally sustainable practices by gaining an understanding of how people's attitudes towards environmental problems can be translated into behavioral changes when developing environmentally sustainable practices.

This paper does not debate the use of semantics nor terminology between past and present eras, or different cultures, but rather provides an analysis from a case study of an Aboriginal community in South Australia on how differences in cultural understanding of water resources translate into current-day practices, and the

implications for the sustainability of water resources. While results from Nepabunna Aboriginal community (Figure 1) in remote, semi-arid South Australia are presented here—with reference to the environmental issues faced and cultural perceptions—they are similar to many other remote Aboriginal communities across Australia.

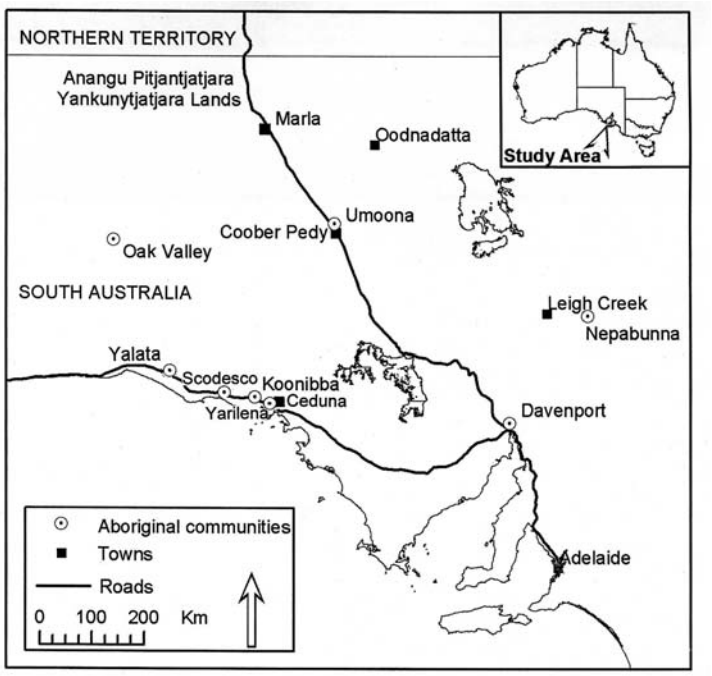

Figure 1. The location of Nepabunna Aboriginal community, South Australia. The metropolitan city of Adelaide, and Yarilena Aboriginal community (discussed later in the paper) are also shown.

2. The study area

Nepabunna community is situated in the rugged terrain of the Northern Flinders Ranges, 600 km north of Adelaide (Figure 1). Rainfall (218 mm/annum) is highly variable and characterised by lingering periods of drought, with occasional high rainfall events. Temperature variation is extreme with the mean daily summer temperatures exceeding 33ºC and frequently above 40ºC. Daily winter maxima fall below 17ºC, while minima drop below freezing (Bureau of Meteorology, 2008a). Much of South Australia has experienced below average rainfall in recent times, receiving between 40 to 60% of their mean annual rainfall over the past 12 months, with 50 to 70% of their long-term mean rainfall falling in the 24-month period prior to 2007 (Bureau of Meteorology, 2008b). Water restrictions have been in place since December 2002 and are likely to remain for the foreseeable future. The prolonged drought, or climate change, is impacting on secondary components of the hydrological cycle, with a decline in aquifer recharge (Dodds and Sampson, 2002). Groundwater resources are not sustainable beyond the next 10 to 15 years–a situation exacerbated by the increased frequency and severity of droughts. Nepabunna is thus facing an uncertain water future.

The community relies on meager rainfall for its sole potable supply. A highly mineralised, non-potable supply is obtained from two low yielding boreholes outside the community (Morgan *et al.*, 2003). A small creek, which is now dry, used to supply the community with water in the ‘old days’ during the Mission era prior to groundwater exploration. Otherwise, there are no permanent surface water resources; the creek flows briefly immediately following periods of high rainfall (which is associated with the occasional deep intrusion of intense tropical storms to the far north of the country).

The land uses in the region are pastoralism, mining and conservation, and in the southern parts—tourism. There are no commercial activities within the community; the nearest shop and school are in Leigh Creek approximately 65 km to the west. Attempts to establish a native food-plant (commonly known as ‘bush tucker’) nursery have been thwarted by a lack of water to establish the seedlings and a healthy labour force capable of enduring outdoor work during the extreme summer temperatures. Nepabunna's population at the time of this

study was 53, though it varies (from 46 to 64 people), as do many remote Aboriginal communities. There were a reported (Australian Bureau of Statistics, 2002) 18 people over the age of 25. Our research was conducted among the adults of Nepabunna.

3. Methodology

The research employed a qualitative case study approach based on a semi-structured, focus group interview with adult members of the community. The focus group session was semi-structured, that is participants were not asked 'pointed' questions that might pre-empt specific answers. The researchers had a predetermined list of topics (cultural relationships to water; quality of the resource; sustainability; user pays) that, if towards the end of the focus group session had not been discussed by the participants, were raised by the facilitator. Focus group interviews provide a complex account of the richness of community attitudes, experiences and desires of individuals and groups (Cameron, 2000), and enable the researchers to engage with the community (Willis *et al.*, 2005).

Approval to conduct the research was gained from the South Australian Aboriginal Health Council and the Flinders University Social and Behavioural Science Ethics Committee, and an Aboriginal reference group guided some aspects of the research. The focus group was taped, transcribed and returned to participants for verification. The transcript was analysed by the research team for emerging themes and a community report was produced. The community then verified the report. In addition to the focus group, the research team conducted field visits to examine the local water resources and related supply infrastructure. In the following section results are provided together with discussion.

4. Results

4.1 Differences in the understanding of water resources and water services

Given the context of the relationship between Aboriginal people and water (see Introduction), some Indigenous people make little distinction between the natural resource, which they consider a cultural resource, and water at the end of a reticulated water supply system. As the land and water (resources) are theirs, they find it difficult to understand why they should have to pay for what they already own. The community currently does not pay for their water services. The difficulty in understanding the need to pay for water services (to ensure the protection and efficient use of water resources), arises partly from the cultural understanding of water resources, partly because they have not had to pay for water (service provision) in the past, but they would also find it difficult to pay for water given their current financial position. The total weekly income of the average family (2 adults and 1 child) at Nepabunna is only 3% above the Australian poverty index (of $536.13; Melbourne Institute of Applied Economic and Social Research, 2006 which is based on Henderson, 1975) for remote locations, with 82% of the family income spent on basic food, utilities and health costs (Pearce *et al.*, in prep).

The inability (or reluctance) to distinguish between water resources as a natural right, and a service provision that should be paid for is not limited to the inhabitants of Nepabunna (Pearce *et al.*, 2007). Internationally there is much documented evidence of the debate as to whether people should have to pay for water which is an integral part of their land (Schur 1994; Rogerson, 1996; Reed and de Wit, 2003). Black (1998) and Department for International Development (DFID, 1997), however, argue that even in areas of poverty, it is fair to pay for such services where there are technical devices, water delivery infrastructure or treatment processes between the natural water source and the consumer, and further, that payment for water services does not necessarily run counter to poverty alleviation. The issue of how to achieve cost recovery is complex, particularly where compounded by poverty (Komives and Prokopy, 2000; Rahm *et al*., 2006).

4.2 Differences in understanding of water resource reserves

The traditional nomadic, subsistence lifestyle of Aboriginal people in remote and rural Australia largely disintegrated under colonisation. With the advent of colonisation Nepabunna community was established in its current location. The last few decades has seen an increase in the number of Aboriginal communities which can be attributed in part to the development of outstations, but also a result of the availability of groundwater

supplies made possible by technological advances in water resource exploration, drilling and treatment (Knott and MacDonald, 1983). The location of Nepabunna, however, is not a site the people would have traditionally inhabited, or if given the choice—chosen—due to its lack of a sustainable water supply. Despite a history of water shortages, and it being largely devoid of 'traditional' value (Brock, 1993), the community was shifted to the site in 1931 when a mission managed to negotiate a lease of the land from the local pastoralists and State government (Willis *et al.,* 2004). The community was formalized in 1973 with the building of permanent housing and supporting infrastructure (Raynes, 2002). The growth in Aboriginal community housing brings new resource challenges (discussed in section 4.3), with expansion and further development of remote Indigenous and non-Indigenous settlements restricted by the paucity of water resources.

Despite the technological advancements in water resource exploration, advancements in water service provision at Nepabunna are constrained by the regional water resources: surface water expressions are intermittent and variable in association with infrequent rainfall events. Aquifers tend to be small, localised, hard to find and highly mineralised (Clarke *et al*., 2000; Martin and Dillon, 2002), rendering technology such as reverse osmosis purification, or aquifer storage and recovery inappropriate, and further exploratory drilling–– financially prohibitive. The two boreholes that were developed for the community's non-potable water supply in 1999 have been pumped at what was considered to be sustainable pumping rates, nonetheless, since their initial production were only expected to last 10 to 15 years. According to Dodds and Sampson (2002), however, 'water production [from the bores] has been 20% lower [in 2002] suggesting that maintaining the water supply has been difficult'. One of the bores has a very slow recovery rate after pumping, and the bore has not been given sufficient rest from pumping to allow the groundwater levels to recover since monitoring began in October 1999, leading Dodds and Sampson (2002) to comment that '…current pumping regimes are beyond the sustainability of this well'. While the second bore is capable of sustaining a pumping rate that is double to treble that of bore 1, there is concern over a lack of evidence of any recharge replenishing the groundwater stores since December 1999, even following sizeable rainfall events (for example, 55 mm in 2 hours). With maximum sustainable extraction rates of the boreholes unknown (DWLBC, as cited in Morgan *et al.,* 2003), and the decreasing rainfall (outlined earlier in the paper) and recharge there are concerns over the sustainability of the community. When the issue of the water supply only lasting another decade was raised with participants in our study, the response, which illustrates a lack of understanding of water resource systems, was as follows:

"How do you know it's only going to last 10 years?... If they knew that the bore was only going to last 10 years then why didn't they dig out another bore that'd last for 40 or 50 years or something like that? Instead of digging a hole that will last only 10 years". (Participant 11).

Drought and water scarcity is not a new phenomenon in remote semi-arid Australia (although the impacts of global warming are). In the traditional nomadic days Aboriginal peoples would move according to the availability of water holes and rock mounds, allowing time for sites to recover. A participant in this study recalls:

"Like the olden days, like the old people, when they use to live here, they'd live here and when everything's dried up they'd go and set up camp somewhere else where there was water and plenty of food, until this place come back [*recovered*]" (Participant 10).

"Like little rock holes we used to go along and weed, we use to never carry water, because we know where the waters are, and they used to cover it up with rocks. But I don't know, they've dried up now … there's no rain I suppose, to keep them full" (Participant 10).

When querying why their water was "so bad" another participant commented: "I think it is where we just live. Maybe if we were living in flat areas, flatter ground, might be better water maybe than in the hills. No one knows…" (Participant 8).

These perceptions nonetheless translated into a feeling that it is the responsibility of the Government to provide more water. Again, these feelings are not dissimilar to other parts of the world. Rahm *et al*. (2006) discuss the challenges facing water resource managers in Botswana under the term 'cultural impediments' to achieving a balance between sustainability and economic development in the rural areas. They found that the Tswana people had an expectation that the Government should provide a plentiful and inexpensive water supply, and a disbelief that their water supply would run out.

4.3 Incompatibility of local water resources and westernised infrastructure

Precolonisation, the quantity of water required by nomadic groups was minimal. With reference to the more recent past, Kunoth-Monks (2007, p.3) states that "in the past …the old people had the ability to read the environment and know when shortage of…water or some other life giving force was imminent. They would tell us something was in short supply and we would tighten our belts as it were. We were instructed not to hunt or take certain species until they had regenerated. In these times there was a reason for discipline…sacred songs and performance of ritual because it strengthened survival".

Similarly, our study found that there was a good water conservation ethic among the older participants at the focus group. Nonetheless, records indicated that water use was high in the community and warranted further investigation. Pearce *et al.* (in prep.) conducted an audit of water use in all the community buildings at Nepabunna over a 365-day period from September 2005 to September 2006. The average per capita water use during this period was 435 L/p/day. A seasonal analysis of this figure shows that water use during the cooler winter months was 295 L/p/d. This water use is only marginally higher than the average Australian domestic daily water use of 282 L/d (ABS 2005), and that of metropolitan Adelaide where the 2004 data show an average domestic per capita consumption of 268 L/d (SA Water, 2004). During the hotter months however, when daily average temperatures are above 30^{o}C and maximum temperatures exceed 40^{o}C, the average water consumption at Nepabunna rose to 600 L/p/d.

Evaporative cooling systems were identified as the reason for the high summer water use. Evaporative cooling systems come as a standard fixture on the public housing provided; they are simple to operate, have low technical requirements, and low energy use. Housing at Nepabunna comprises the 'typical' older, westernised style found among most Indigenous and non-Indigenous towns in regional Australia that tend to lack passive cooling features. Evaporative coolers can consume over 40 L/hr of water and during the hot months are commonly in operation for 24 hours a day. While evaporative cooling systems can be operated on more efficient settings, where the feed water is highly mineralised (as in the case of Nepabunna) they need to operate on a full flow of water to prevent salt build-up. Our findings are similar to those of Karpiscak *et al.* (1998) who found that in Phoenix, Arizona, USA where temperatures in the hottest month range from 37^{o}C to 43^{o}C and where the mineral content of the water supply is high (that is, a similar climate and water quality to Nepabunna) cooling is needed for around 214 days in the year—evaporative coolers can consume as much as 66.8% of the total summer water use.

Technological advancements are seen by some Aboriginal groups as having improved the quality of life (Jones, 2006). An increase in the standard of living, however, results in a greater water use (Sullivan, 2002). The problem at Nepabunna is that the style of housing and air cooling systems are incompatible with the paucity of water resources. Refrigerant-based air conditioning has no water requirements but high initial outlay and energy costs; householders pay for their electricity but not for water.

Another Aboriginal community in semi-arid South Australia—Yarilena (Figure 1)—offers some simple initial solutions to these problems. Houses at Yarilena make use of passive cooling features such as wide verandahs, shade cloth barriers on sun-facing walls, vegetation barriers, and solar hot water systems. The use of the solar hot water systems offsets the higher energy costs associated with the use of refrigerant-based air conditioners (which use no water); extensive rainwater harvesting (rainfall at Yarilena is 298 mm/annum) provides most of their water use during the wet winter months and a lesser proportion during the dry summer. There is scope for both communities (and others in South Australia) to use solar energy to provide all their energy needs as they receive an average of 8 to 9 hours of sunshine a day on an annual basis (Bureau of Meteorology, 2008c). Furthermore, Yarilena could harvest wind-generated power because they experience consistent high wind speeds. The monthly average 3 pm wind speed exceeds 19 km/hr throughout the year, with the annual average 23.6 km/hr (Bureau of Meteorology, 2008d).

5. Closing statement

Traditionally Aboriginal people held strong views of being custodians of 'country' (which incorporates water resources). The scarcity of water resources (due to the location), a decline in water resources (due to climate change) and the supposition of a water-hungry westernised style of housing and water service infrastructure has led to concern over the sustainability of the water supply to the community. According to Beard (2007, p.7) "the

challenge in remote settlements [*in Australia*] is to utilise smarter (lower cost, more efficient, user-friendly) and more regionally-appropriate (to climate, geography, local skills) ways of gaining the basic services required to support healthy lifestyles, without the negative consequences of wasting valuable water and economic resources". The water service provision in the remote Aboriginal communities in South Australia were assessed in 2004 by the States predominant water service provider and considered to be 'best practice' and appropriate to the harsh desert conditions. Apart from the air cooling systems in the houses, water fittings are efficient. The local community is acutely aware of the drought, particularly since their sole potable supply is dependant on the meager rainfall. There is, however, scope to harness renewable energy resources and design housing to maximize the benefits offered by their locality, and minimize the constraints. Perhaps the best advice to the community (and the Government service providers) is summed up in the words of respected Aboriginal leader Rosalie Kunoth- Monks (2007, p.4), which were made with reference to the sustainability of remote communities:

"We can no longer be tied to the land through the old ways, although there are many… who think romantically that we should always respond to new situations through customary eyes and practices without adopting new approaches…we need new knowledge [*because*] the situations we face are new situations".

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