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SANITATION AND WATER FOR ALL

Water conservation in Australian indigenous communities

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INDIGENOUS AUSTRALIANS HAD an extremely sensitive water care ethic as part of their traditional nomadic lifestyle particularly in the more arid regions (Flood, 1983). The move to sedentary lifestyles occurred as the result of earlier forced relocation into missions, government settlements and pastoral stations. Today there are many remote discrete indigenous communities in the arid regions of Australia. There were 367 communities recorded in Western Australia (WA) in 1997 by the Federal Government's Aboriginal and Torres Strait Islander Commission which included large settlements, town reserves, small outstations and seasonal camps. Without the latter this may be 260 as the WA State Government has recorded.

The development of water supply and sanitation in these communities over the last 100 years has not been dissimilar to that which occurred over a much longer time period in the European cities of the Industrial Revolution commencing some 200 years ago. Water supply without adequate quality or wastewater treatment characterised both cases with appalling public health conditions. The last 10 years have seen considerable improvement to housing and infrastructure in many remote indigenous communities and although gains have been made in public health standards there is still much progress that needs to be made before these become equivalent to mainstream health indicators (Pholeros *et al.*, 1993).

The approach to this improved level of service in the remote indigenous communities has generally been to adopt the same technology-practice as that used in urban areas when the money finally becomes available for such works. Equality of inputs, the technological hardware for water and sewerage, has been understood by city-based engineers and bureaucrats as the means by which to achieve 'equity'. However, the result of this approach has not always been equality of outcomes - an acceptable quality of life, similar health indicators and the sustainable management of resources (Race Discrimination Commissioner, 1994). Nevertheless, this technology transfer is not usually a simple process and during consultation engineers and bureaucrats, without understanding the longer term impacts of technology choice, often respond directly to the felt needs of community residents. These needs are often perceived by engineers to be the same as those for non-indigenous Australians in urban areas.

Consequently, hardware has often been delivered to the communities without the management and maintenance systems to support it; without institutional capacity building. The need for the latter has not been recognised both within indigenous and government organisations - it was made quite clear in the recommendations of the 1991 Royal Commission into Aboriginal Deaths in Custody, but has not been adequately followed up by government. Rather the formation of regional indigenous organisations to support housing and infrastructure autonomously as a means of self-determination, training delivery and employment generation as well as appropriate technology-practice has at times been thwarted by State governments.

Moreover, issues of sustainability of water resources have generally been ignored in the development and expansion of remote indigenous communities in arid regions. However, as there are still many communities where considerable housing and infrastructure works need to be undertaken one can argue there is greater scope for the introduction of holistic water conservation strategies than in the large Australian cities where poor technology and lifestyle practices are well established. It is this subject which is the focus of this paper.

Background

Unlike many of the large urban areas of Australia Aboriginal communities in arid lands do not have a diverse range of water sources. Typically there are groundwater sources whose sustainability in the face of growing populations is uncertain. Yandeeyarra in the Pilbara and Jigalong in the Western Desert of Western Australia are examples of communities that may have limited opportunities for further social and economic development due to limited groundwater supplies. At Coonana in the Goldfields where there is no groundwater, only dams harvesting from very unpredictable rainfall, water shortages have been extreme (Race Discrimination Commissioner, 1994). However, there has always been drinking water available there due to the installation of large rainwater tanks on each house. With the current water supply schemes in these communities it is not possible, for example, to have swimming pools or grassed football ovals. These are highly sought after recreational opportunities.

Water conservation may not immediately realise these recreational opportunities but it may allow development in other areas such as future population growth, revegetation, small areas of lawn in houseyards, and plant propagation nurseries. If water conservation strategies are adopted alongside community development the necessary improvements to living conditions can occur while enhancing the sustainability of groundwater resources.

The Remote Area Developments Group (RADG) has commenced research to identify the needs and opportunities for water conservation in remote Aboriginal communities; prepare promotional materials including a booklet and video; and to establish some trials of new technologies.

Approaches to water conservation

Water conservation can be tackled from three angles:

- Lifestyle changes (e.g. take short showers, fix leaking taps and cisterns);
- Improve efficiency of appliances (e.g. AAA efficiency-rated appliances, mulching); and
- Introduction of new methods and technology (e.g. greywater recycling, swales).
- Management and maintenance.

Whether these are appropriate to the particular setting and can be adopted requires:

- An understanding of the current situation;
- Raising awareness at an individual and community level for improved practices;
- Trialing a range of new methods and technologies; and
- Changes to government policies and/or regional indigenous capacity building.

The matrix below in Table 1 is an example of what may work for one particular community:

Three case studies

Although urban areas may not be the example or source of innovation for water conservation there are precedents across Australia that are well worth considering (McLaren *et al.*, 1987). For example, the WA Water and Rivers Commission's water efficiency program in Kalgoorlie (Botica and White, 1996) involved the supply of dual-flush toilets and water efficient fittings to all houses to avoid outstripping the supply capacity of the pipeline from Mundaring Weir. This has become a world-class project with millions of dollars worth of water and energy having been saved after investing only some 2 million dollars. Other examples include: lagoon effluent reuse for sports ovals occurs in many country towns of WA; dual-flush toilet cisterns now required on all new houses in WA; the use of mulch in home gardens, municipal tree planting and roadside revegetation is now commonplace throughout the Perth metropolitan area and many WA regions; the WA State Government has now permitted domestic greywater recycling on a trial basis only for 12 months in three shires. However, there is still an immense amount of change that needs to occur before water use in Australia becomes anywhere near sustainable.

This paper will now focus on achievements in remote indigenous communities of WA. Specifically, it will describe three key case studies: the simple tap (as an example of lifestyle and local maintenance); the evapotranspiration system (as an example of improved efficiency); and the

Table 1. Matrix of options for water conservation strategies

more detailed design input for water harvesting as part of landscaping in the house yard and wider settlement (as an example of a new technology for remote indigenous communities).

Where a standpipe, or any other water supply fitting, has been provided without adequate drainage ponding follows and where dogs and children then use this as their recreation so does disease. A solution for the standpipe has been a gravel filled sump below the tap to contain leaking taps and even taps left running. Ceramic disc and anti-vandal taps have also been trialled. These have often failed because the spring-loaded mechanism wears out due to high use and they can only be fixed with proprietary tools which the local maintenance worker usually does not have. These taps are very expensive as are replacement parts which are generally not readily available in regional areas. The **standard brass tap** as well as being low-cost is very easy to repair. Highly mineralised water can cause these taps to fail very quickly if not maintained. If leaking from the mouth all it needs is a washer replacement but if this is not done soon enough the seat below the washer will need to be reground with a hand-held reseating tool. If leaking from the stem of the handle all it needs is a new O-ring to the stem - once again readily available in regional centres. Such tasks can be easily completed at low cost by the householder or the Environmental Health Worker. A leaking tap can result in the loss of 200 litres/day and a number of them represent a major waste of water. Combined with a standpipe sump (or used throughout the dwelling) and an effective local maintenance program the standard brass tap is a low-cost and easy-to-maintain water supply solution.

Septic tanks and leach drains are often the solution for wastewater management in many parts of Australia. However, the transfer of this technology directly to remote indigenous communities has not usually been appropriate. Soils in remote areas are often tight, clayey and of low permeability. During times of high visitor numbers, say during traditional ceremonies, dwellings experience high wastewater production and the standard leach drain will overflow. Moreover, they can become blocked with oils and fats. The tendency has been for engineers to recommend sewers to lagoons as the population grows and money becomes available. This has improved public health, at a great cost, but results in enormous waste of water. The **evapotranspiration (ET) system** (McGrath *et al.*, 1991) constructed to a similar profile as a leach drain (2000 mm wide x 800 deep) but with graded gravel and sand instead of backfilling with the local soil does not rely on infiltration into the surrounding soil. Evaporation at the surface and transpiration from trees and shrubs planted on top and around provides improved performance as well as irrigation for revegetation for shade and shelter or fruit trees. These systems were initially constructed to the same dimensions as leach drains in communities across WA and no overflow has been recorded at any site. In several current research projects the ET system has been redesigned with a shallower profile (600 deep, 300 wide at base and 2000 at top) to improve the success of revegetation efforts. Performance will be monitored. It is expected that sewerage costs can be reduced, planting's made more productive, and enormous water savings made with the use of ET instead of lagoon systems.

Rainwater harvesting in the landscape to improve revegetation efforts and to simplify and reduce the costs of stormwater drainage has been trialled in regional areas of WA (Western Australian Water Resources Council, 1986). This technique has been integrated with the close packing of plants using permaculture principles for more productive house yard and settlement landscaping designs (Orion, 1996) and may result in lower water use for the same levels of productivity. The technique has been researched at one site in the arid sub-tropics of WA over the last 12 years, implemented at one indigenous community further north, and is currently being designed as part of settlement upgrades in several other communities in the region. This more detailed approach to water harvesting requires detailed design on site firstly and then earthworks to be the first part of the landscaping works. The design requires a series of shallow retention basins of increasing size finally discharging off site. The design must integrate ET systems and 'sector analysis' (Mollison, 1988) of solar paths, prevailing winds and required views for the most effective placement of windbreaks, shade trees and food species. Combined with suitable species considerable water savings can result and further research is necessary to quantify this. Of concern is the requirement to keep soil moist in some regions to avoid termite attack on the roots of some exotic species which results in a higher water demand for these planting systems. However, given their success over other revegetation attempts in these arid regions it can be argued that the shade, shelter and fresh fruit provided by these systems which may ultimately result in improved health and nutrition are an effective and justifiable use of limited water supplies. Particularly, if made in conjunction with a community wide water conservation program that results in savings in other areas.

Conclusions

Water conservation for the effective management of limited water resources in remote indigenous communities can occur through implementation of a wide range of strategies. Changing lifestyles coupled with improved management and maintenance; the introduction of more efficient technologies; and the use of a holistic design approach to house yards and the settlement as a whole encompass a broad range of techniques and systems that must be considered for sustainability and improved public health.

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