Introduction

> What happens when the cistern doesn't flush and there isn't any water at the household tap? The solar bore is pumping, but water is only just trickling into an empty storage tank. A household water supply splits, sending a fountain of water into the air. You'll have to isolate the whole water main because you can't find the isolation valve at the branch. The valve box is hard to find. You think it's near the generator shed under a mass of grass and vegetation, though there aren't any markers to identify where. Eventually, you find the remains of the valve box, broken by a bobcat during a rubbish clean-up. The valve shaft is filled with soil and the area is contaminated by waste engine oil, which was dumped on the ground after the generator was serviced. And now the phone connection has dropped out again …

All communities require suitable and sustainable infrastructure. Attempts to build the capacity of a community are hampered when infrastructure is inadequate, inappropriate or malfunctioning, because these limitations affect fundamental social services such as health and education. To create sustainable communities in remote Australia and to build the capacity of Indigenous communities, it is critical to understand infrastructure provision.

The *National Indigenous Infrastructure Guide* provides an integrated framework for understanding major infrastructure provision issues for remote Aboriginal and Torres Strait Islander communities. It focuses on how to install and maintain infrastructure that is appropriate and sustainable for remote Indigenous communities across Australia. Integral to the Guide is an emphasis on community involvement, especially in the maintenance and management of infrastructure.

The *National Indigenous Infrastructure Guide* was inspired by the success of the *National Indigenous Housing Guide*. Communities and those working with them expressed a need for a similar resource to promote an understanding of sustainability and service issues beyond the house. The *National Indigenous Infrastructure Guide* complements both the *National Indigenous Housing Guide* and the *Environmental Health Handbook*. There is some overlap in the material covered by these guides; however, the *National Indigenous Infrastructure Guide* provides more comprehensive information than has previously been available in one volume on technology choice, design, installation and support for a range of remote community infrastructure.

The *National Indigenous Infrastructure Guide* brings together existing research, codes and standards, resources and information on community infrastructure. Rather than being a comprehensive 'how to' manual, it seeks to provide the user with an awareness of the issues that need to be considered when working with various aspects of infrastructure. Its modest technical scope can be expanded as demand requires.

The *National Indigenous Infrastructure Guide* is available in hard copy and electronically at **www.icat.org.au/niig**. Comments and suggestions for improvements are welcomed, and can be lodged online at the same location. It is proposed that the electronic version will be updated annually to reflect input from users and changes in regulations, legislation, standards and the policy context. The hard copy will be updated every three years, depending on use, data availability and funding.

The *National Indigenous Infrastructure Guide* has been sponsored by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA). It has been compiled by experienced practitioners at the Centre for Appropriate Technology (CAT); CAT has been researching and designing technological solutions to promote sustainable livelihoods for Indigenous communities since 1980. Consultants, service providers and community workers have also been included in developing and testing the Guide. The next edition will be shaped by user experience over the next two years.

How to use this guide

The *National Indigenous Infrastructure Guide* (the Guide) will assist people who are working with infrastructure in Indigenous communities: community managers, local and state government officers, and those working in planning and developing infrastructure projects. 'Infrastructure' in this context refers to the fixed physical assets used to deliver a service to a community or region.

What readers want from the Guide will vary, depending on their needs. Those working in Indigenous communities may want an overview so that they are better informed in the choice, design, installation, function, maintenance and management of infrastructure. Technical personnel (project managers, essential services officers) may want to know how to best incorporate their technical knowledge into Indigenous community projects.

The *National Indigenous Infrastructure Guide* deals with similar topics to those dealt with by the *National Indigenous Housing Guide* at the household level. When there is an overlap in the subject matter of these guides, such as with new housing installation, readers should refer to both guides. References to relevant sections of the *National Indigenous Housing Guide* have been provided.

Overall structure

The document is divided into two sections, A and B.

Section A provides context for the Guide, explains why comprehensive, planned approaches are beneficial, and outlines the objectives and appropriate strategies for engaging effectively with communities to ensure the smooth functioning of infrastructure over the long term. Section A includes overviews of activities that are important for sustainable infrastructure in Indigenous communities. These are:

■ community involvement

■ project management

■ management and maintenance.

Section B focuses on the key components of infrastructure in Indigenous communities in remote settings. These are:

■ water

■ stormwater

■ wastewater

■ waste

■ energy

■ telecommunications

■ transport.

Users of the Guide should become familiar with the concepts outlined in Section A, and refer to them when considering the specific infrastructure components in Section B.

The chapters in Section B have the following structure:

1. Introduction

2. Current service delivery arrangements (including relevant standards and guidelines)

3. Involving the community

4. Appraising requirements

5. Choosing appropriate solutions (including maintenance and installation requirements that should be considered when selecting infrastructure solutions)

6. Managing and maintaining services

7. Useful terms

8. Further reading.

The structure represents a staged approach to infrastructure development that should be followed. Case studies have been included to help identify the sorts of factors users should consider in seeking solutions to infrastructure issues.

> *Checklists*
>
> Points of significance are presented using an 'ensure/consider' framework, as in the *National Indigenous Housing Guide*:
>
> ■ 'ensure' points are vital for infrastructure function and/or safety
>
> ■ 'consider' points are desirable, but not vital.
>
> Both categories can be used as checklists in the course of an implementation or maintenance program.

Lists of further reading

The Guide does not claim to be a comprehensive, detailed engineering design guide, especially given the diversity of infrastructure projects in remote Indigenous contexts. There are already technical manuals and texts for service professionals in each area; these are available in state government or service provider offices.

The lists of further reading included at the end of each chapter or topic should be used as a starting point for consulting technical details, codes and standards. Not all industry or Australian Standards are listed; rather, the reader is referred to the most relevant. Details are only provided in special cases where particulars are vital to issues such as safety or quality control, and can be consistently applied across all Australian jurisdictions.

A sustainable approach

Sustainability is the foundation of the Guide; this approach is supported by a number of guiding principles that are outlined below. The Guide also contributes to the implementation of the principles embodied in the national partnership agreements on remote indigenous housing and remote service delivery.

National Partnership Agreements

The national partnership agreements on remote indigenous housing and remote service delivery were agreed by the Australian and select state and territory governments in November 2008. The agreements outline the driving principles for development of remote Indigenous communities over a 10-year period, in conjunction with other national agreements, such as the National Indigenous Reform Agreement. These principles include addressing the issue of social inclusion in the context of Indigenous disadvantage, and meeting Council of Australian Governments (COAG)-endorsed targets, including 'Closing the Gap'. With regard to housing, the Agreement seeks to reduce severe overcrowding, increase housing supply, improve housing conditions and ensure that rental houses are well managed and maintained.

The remote services delivery model outlined in the National Partnership Agreement on Remote Service Delivery clearly identifies service standards, roles and responsibilities and service delivery parameters. This will ensure that Indigenous Australians living in remote communities receive and participate in services that close the gap of disadvantage. Access to government services such as health, housing and welfare will be through a single government interface. The objectives of the Agreement are to:

■ improve the access of Indigenous families to a full range of suitable and culturally inclusive services

■ raise the standard and range of services delivered to Indigenous families, to be broadly consistent with those provided to other Australians in communities of similar size and location

■ improve the level of governance and leadership within Indigenous communities and Indigenous community organisations

■ provide simpler access and better coordinated government services for Indigenous people in identified communities

■ increase economic and social participation wherever possible and promote personal responsibility, engagement and behaviours consistent with positive social norms.

Guiding principles

The Guide endorses and integrates the following guiding or good practice principles that contribute to the sustainability of communities:

■ access and equity

■ environmental health

■ health and safety

■ appropriateness

■ affordability

■ sustainable livelihoods.

Access and equity

Every resident of Australia should have access to an equitable share of available resources, particularly resources managed by the government on behalf of the community. Programs and services should reflect this principle and be culturally and physically accessible, recognising the diversity of regional, remote and urban needs.

To make the principles of access and equity a reality for Indigenous Australians in relation to services, strong and effective action is needed. This principle must take into account the remoteness of many Indigenous communities. A program or service that is appropriate for an urban community is not always appropriate in the remote context; thus, standards are to be broadly consistent, but not identical.

Environmental health

The Australian Charter for Environmental Health (*National Environmental Health Strategy 2007–12*) declares:

> The quality of life and the health of Australians are underpinned by having clean water and air, safe food and housing, protection from pollutants and a program to intervene in the environment to prevent and control disease. (p. 4)

Ensuring a healthy environment includes actively protecting the community from problems in the environment and encouraging healthy living practices. In Indigenous communities in particular (see Stephenson 2003), it is promoted through activities including:

■ maintaining housing standards (as described in the National Partnership Agreement on Remote Indigenous Housing)

■ effective rubbish collection and disposal

■ drinking water treatment and supply

■ sewerage and disposal

■ animal control

■ insect (disease vector) control

■ food safety

■ dust and pollution control.

Health and safety

For those who maintain or upgrade community infrastructure, the community is a workplace. Ensuring worker safety contributes to the sustainability of the infrastructure. Health and safety are important considerations for employers, employees and everyone whose actions may have an impact on working and living environments.

Working in remote areas does not mean that occupational health and safety (OH&S) issues are less important, although it may seem more difficult to adhere to occupational health and safety priorities. The priorities identified by the *National OH&S Strategy 2002–2012* to achieve short and long-term OH&S improvements are applicable to workplaces everywhere: urban, regional, remote and very remote. The five priorities are to:

■ reduce the impact of risks at work

■ improve the capacity of business operators and workers to manage OH&S effectively

■ prevent occupational disease more effectively

■ eliminate hazards at the design stage

■ strengthen the capacity of government to influence OH&S outcomes.

Appropriateness

Appropriate technology and infrastructure solutions contribute to sustainability through:

■ incorporating actual needs and user behaviours in infrastructure design

■ improving wellbeing

■ enabling people to apply their resources and skills

■ facilitating work, enterprise and trading

■ helping to secure these opportunities.

Affordability

It is important to ensure that infrastructure projects in remote areas have adequate funding and resources for both development and ongoing maintenance. For example, developing a detailed response to a problem that has very restricted funding may create unrealistic expectations, result in funds being spent on management rather than works, and be unsustainable over the long term. Careful planning that takes into account the initial budget and the community's ability to pay for maintenance over the life cycle of the product should be part of planning any new or upgraded infrastructure. Upgrades should not mean that communities are disadvantaged financially beyond the usual cost of an upgrade.

Sustainable livelihoods

Infrastructure should support the development and maintenance of sustainable livelihoods. These are the range of activities that support improved wellbeing through work, enterprise and trading, and that can be maintained without undermining the natural resource base.

The sustainable livelihoods approach takes into account the skills, status and possessions of people. It seeks to understand the interconnectedness of these assets and how they can be deployed to meet people's various needs and aspirations. A livelihood is sustainable when it can cope with and recover from stresses and shocks, and maintain and enhance its capabilities and assets both now and in the future.

Indigenous community distribution and size

Much of Indigenous Australia is defined in terms of its remoteness and small community sizes. In 2006, 1008 discrete Indigenous communities (85%) were located in very remote areas. Just over three-quarters (76%) of these very remote communities had a population of fewer than 50 people (ABS 2007). (For definition of remoteness areas, determined by road distance from urban centres, see ABS 2001 and Figure 1). Of the people living in discrete Indigenous communities, 45% were in the Northern Territory, with 30% in Queensland and 15% in Western Australia (ABS 2007).

Figure 1: Discrete Indigenous communities and remoteness areas
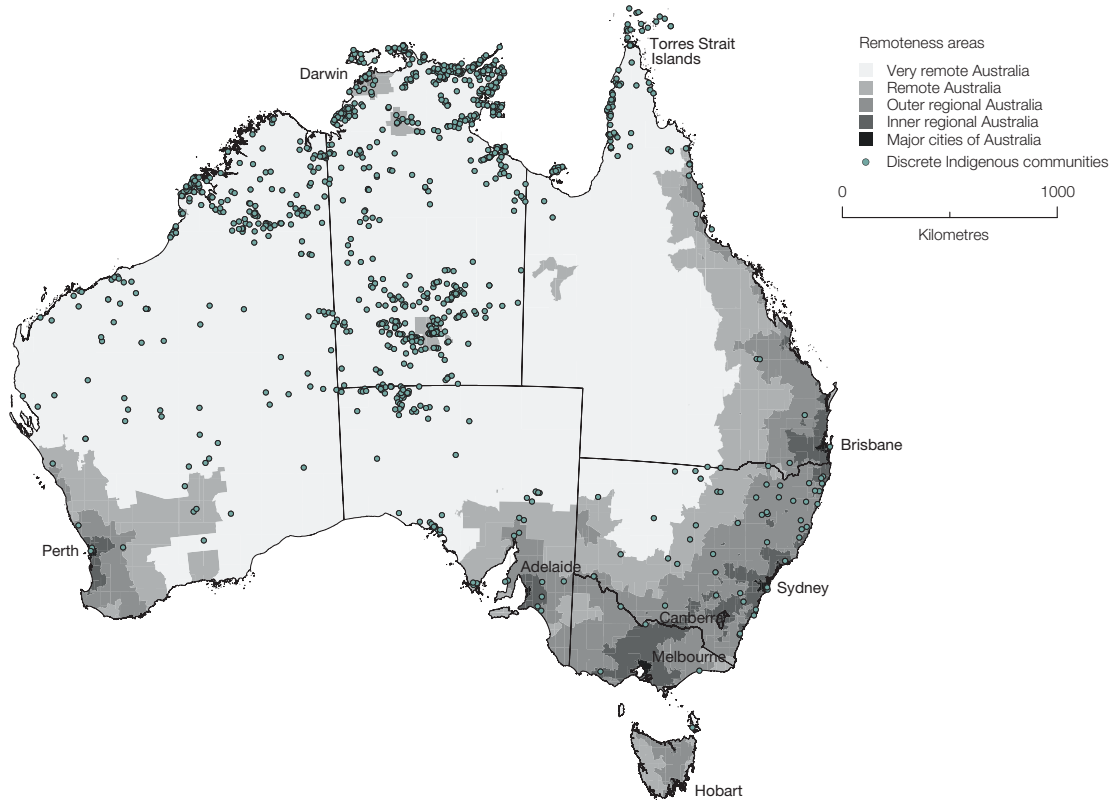
Note: Remoteness areas refer to Australian Standard Geographical Classification Remoteness Structure 2001.
Source: Australian Bureau of Statistics (2006)

What is 'community'?

In the Guide, the term 'community' refers to:

- the residents of a particular location
- the agencies, bodies and individuals who support residents' interests and future prospects (who may or may not be residents).

In policy discussions about remote areas, communities are often described in terms of population size, rather than spatial area or number of dwellings. Population size is an important factor in determining the levels of service delivery, and knowledge of and control over infrastructure in a settlement.

Typically, the larger the community or settlement:

- the more access a community is likely to have to services such as health, schooling, social security and policing, as well as commercial and technical services
- the less likely it is that residents have a working knowledge of infrastructure.

The following is a general outline of community sizes as they relate to service provision type. It should be noted that there can be some variation depending on the service; for example, the water supply system is often determined by whether community size is above or below 100 people, rather than the more general 200 people as described below.

Major communities generally have a core population of at least 200 people, with a permanently staffed office, school, clinic and store. These communities operate as service centres for surrounding outstations and usually have obligations to them for essential and municipal services.

Most essential services to major communities are delivered through state or territory arrangements, with standards of service provision similar to those for towns and cities. Mainstream standards are achieved by technical specialists, working in accordance with developed procedures and practices. A locally employed essential services officer usually provides day-to-day management and maintenance.

Minor communities are settlements of fewer than 200 people. As a result of reduced access to funding, residents often have greater responsibility for and knowledge of their infrastructure, and less servicing by resource agencies or contractors. Therefore, there tends to be a greater history of self-reliance.

Minor communities are more likely to have stand-alone power and water systems, which they own or which are owned on their behalf by a resource agency. These systems are usually managed through local service support or by the associated resource agency. There are some exceptions in which minor communities and outstations are connected to reticulated mains power, water and sewers with mainstream consumer service levels and obligations.

Homelands and outstations (these terms are used interchangeably) are usually the smallest settlements. The term 'outstation' refers to an Indigenous settlement that relies on another community or resource agency to manage municipal or essential services, grant funding and associated service delivery. An outstation may have more than 50 residents, but is distinguished from a community in that it does not operate as an organisational centre from which services are provided. (In rare cases, small outstations grow to the population size of minor and even major communities, but are still subject to the same resourcing arrangements as other outstations.) Some outstations have associations with resource agencies that are located in townships.

What services are relevant to communities?

Table 1 lists the three types of technical services relevant to communities: essential, municipal and domestic (or household).

Table 1: Types of technical services

Essential services	Water supply
	Power supply
	Sewerage
	Telecommunications (traditionally telecommunications are not defined as an essential service, but they provide essential lifelines in the case of remote communities)
Municipal services	Waste management
	Access (access roads, internal roads, airstrips, barge landings)
	Amenity (dust control, stormwater management, landscaping)
Domestic services	Housing maintenance
	Yard maintenance
	Liquid waste management (de-sludging septic tanks)

The Guide focuses on the technical services — essential and municipal — that support infrastructure, rather than social services such as health, education and welfare. Although the capacity to access these technical services is largely experienced at the domestic level, their operation and management can affect entire populations. Social services such as schooling, clinics and stores can be interrupted when essential and municipal services fail or become unavailable.

Awareness of the relationship between effective isolation (some communities are more 'remote' than others classified in the same category), settlement size and organisational co-location (for example, some communities are also responsible for outstations and homelands) is required to understand technical service provision to remote settlements (Table 2).

Table 2: Characterisation of technical services by settlement size and type

Population	Settlement type	Technical services
10	Family outstation	Household water supply Household power supply Household septic system
20	Outstation	Household/reticulated water Household/reticulated power Household septic system
50	Outstation or a minor community	Reticulated water Reticulated power Household septic system
Less than 200	Minor community — may have a resource agency or services manager with responsibility for housing, Community Development Employment Projects (CDEP) program, outstations, etc	Reticulated water Reticulated power Household septic system
More than 200	Major community (usually with staffed office, school, clinic, store) — service centres for outstations	Reticulated water Reticulated power Sewer or common effluent system

Further reading

ABS (Australian Bureau of Statistics) (2001). *Australian Standard Geographical Classification (ASGC) — 2001,* Cat. No. 1216.0, ABS, Canberra. www.abs.gov.au

ABS (Australian Bureau of Statistics) (2006). *4710.0 Housing and Infrastructure in Aboriginal and Torres Strait Islander Communities*, ABS, Canberra.

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Stephenson P (2003). *Environmental Health Planning and Action: A Handbook for Indigenous Practitioners*, Batchelor Press, Batchelor.