Realising economies in the joint supply of health and environmental services in Aboriginal central Australia

David Campbell
Jocelyn Davies
John Wakeman

September 2007
Realising economies in the joint supply of health and environmental services in Aboriginal central Australia

David Campbell
Jocelyn Davies
John Wakerman

September 2007
Contributing author information

David Campbell is the Senior Economist at the Centre for Remote Health, Alice Springs. This position is jointly funded by the Centre for Remote Health and Livelihoods inLand™ project of the Desert Knowledge Cooperative Research Centre.

Jocelyn Davies leads the Livelihoods inLand™ project of the Desert Knowledge Cooperative Research Centre. She works as a geographer and Principal Research Scientist for CSIRO Sustainable Ecosystems, Alice Springs.

John Wakeman is Professor and Director of the Centre for Remote Health, Alice Springs, a joint centre of Flinders University and Charles Darwin University.

Desert Knowledge CRC Working Paper #11

Information contained in this publication may be copied or reproduced for study, research, information or educational purposes, subject to inclusion of an acknowledgement of the source.

ISBN: 1 74158 048 X (Web copy)
ISSN: 1833-7309 (Web copy)

Citation

The Desert Knowledge Cooperative Research Centre is an unincorporated joint venture with 28 partners whose mission is to develop and disseminate an understanding of sustainable living in remote desert environments, deliver enduring regional economies and livelihoods based on Desert Knowledge, and create the networks to market this knowledge in other desert lands.

Acknowledgements

The Desert Knowledge CRC receives funding through the Australian Government Cooperative Research Centres Programme; the views expressed herein do not necessarily represent the views of Desert Knowledge CRC or its Participants.

For additional information please contact

Desert Knowledge CRC
Publications Officer
PO Box 3971
Alice Springs NT 0871
Australia
Telephone +61 8 8959 6000   Fax +61 8 8959 6048
www.desertknowledgecrc.com.au

© Desert Knowledge CRC 2007
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>1</td>
</tr>
<tr>
<td>Introduction</td>
<td>2</td>
</tr>
<tr>
<td>Predisposing factors to poor health</td>
<td>4</td>
</tr>
<tr>
<td>Social determinants of health</td>
<td>4</td>
</tr>
<tr>
<td>Responding to predisposing factors</td>
<td>6</td>
</tr>
<tr>
<td>The social benefits of addressing Aboriginal health</td>
<td>6</td>
</tr>
<tr>
<td>Being on country</td>
<td>7</td>
</tr>
<tr>
<td>A holistic approach to Aboriginal health</td>
<td>9</td>
</tr>
<tr>
<td>The economic meaning of a holistic approach</td>
<td>10</td>
</tr>
<tr>
<td>Complementarity</td>
<td>10</td>
</tr>
<tr>
<td>Scoping economies</td>
<td>11</td>
</tr>
<tr>
<td>Public goods and private goods</td>
<td>12</td>
</tr>
<tr>
<td>Are health benefits an externality?</td>
<td>12</td>
</tr>
<tr>
<td>Selecting appropriate policy mechanisms</td>
<td>13</td>
</tr>
<tr>
<td>Facilitating the supply of public goods</td>
<td>15</td>
</tr>
<tr>
<td>Dealing with market imperfections</td>
<td>17</td>
</tr>
<tr>
<td>Behavioural incentives</td>
<td>18</td>
</tr>
<tr>
<td>Longer term benefits from the joint provision of health and environmental services</td>
<td>19</td>
</tr>
<tr>
<td>Conclusion</td>
<td>20</td>
</tr>
<tr>
<td>References</td>
<td>23</td>
</tr>
</tbody>
</table>
Abstract

Questions exist as to whether the delivery of health and environmental services to remote Australia is adequate. This is particularly so in regard to Aboriginal people living on their traditional country. The respective State, Northern Territory and Commonwealth governments are looking at how the delivery of these services might be improved. At the same time, increasing recognition is given to the health benefits that Aboriginal people obtain through the provision of environmental services – looking after country through activities such as controlling feral animals and traditional patch burning. Improved health outcomes may arise from the impact of engagement in looking after country, in the longer term from the psychosocial determinants of health, and from the more immediate impacts of improved diet and exercise. Further, Aboriginal capacity to look after country and to participate in the wider economy is expected to increase as a result of improved health.

There has been little attempt to look at the economic advantages and possible improvements in health and environmental outcomes obtainable through the joint supply of health and environmental services. Because of the social determinants of health, the joint supply of these services can result in benefits including improved psychological and social wellbeing, increased income, and increased involvement in constructive activities with a related decrease in drug taking and other forms of destructive behaviour. The economic implications of these relationships and means of achieving them are reviewed in this paper.
Introduction

The Australian Institute of Health and Welfare (AIHW 2006a) paints a dim picture of the health of Indigenous Australians in both relative and absolute terms. Over the period 1996–2001, the life expectancy at birth for Indigenous males was 59 years and that for Indigenous females was 65 years. For the total population, over the period 1998–2000, the expected average life expectancy for males was 77 years and that for females was 82 years (p. 222). In the same period, the general admission rate of hospitalisation for Indigenous Australians was four times that for other Australians, while admission of Indigenous Australians for dialysis care was 17 times that of other Australians (AIHW 2006a:225). In a later report the Institute (AIHW, 2006b) notes Indigenous Australians suffered an infant mortality rate in 2004 of 11.4 per 1,000 live births, relative to the national infant mortality rate of 4.7 per 1,000 live births. While the national infant mortality rate is middle of the range among developed countries, the infant mortality rate for Indigenous Australians is much higher than that suffered by the Maori in New Zealand, and by Native Americans in Canada and the United States of America.

For central Australia, the Centre for Remote Health (Mitchell et al 2005) estimated the standardised mortality rate for the central Australian Aboriginal population in 1997–2001, was three times that of the total Australian population. While circulatory and respiratory diseases were identified as the primary causes of death, injury was found to be the second most common cause. It was, however, the leading cause of death for Aboriginal people 1–34 years of age and the greatest cause of years of potential life lost. Injury was also reported to be the leading cause of hospital admission in Alice Springs for men 15–44 years of age and for women 30–44 years of age. While there has been a slight decrease in Aboriginal mortality rates in the Northern Territory, the disparity with the remainder of the Northern Territory population has increased (AIHW 2006c, Thomas et al 2006).

Although expenditure on health for Indigenous people is slightly more than that for the rest of the Australian population, a history of neglect, isolation, the trauma of colonisation and the greater health needs of Indigenous people requires increased input to achieve a status equivalent to the rest of the Australian population. The necessary funding to achieve an equivalent status was estimated by the Australian Medical Association (2005) at $460 million per annum. A number of regional studies have documented the gap between identified needs and current service delivery. For example, the Central Australian Allied Health Planning Study found a shortfall of some 32 allied health workers and of 17 community-based workers (Ramsey et al 2005). This would involve an estimated increase in annual cost of $7.71 million in the first year and of $6.24 million and $6.41 million for the second and the third years respectively.

The poor status of Aboriginal health in central Australia is not unrelated to concern for the environmental condition of the central Australian rangelands. The existing standing crop of vegetative cover gave the first non-Aboriginal settlers an impression of high productivity, which they responded to by introducing domestic livestock. This has resulted in ecological degradation (Gale and Haworth 2005; Lunt et al 2007), manifested in soil loss, decreased vegetative cover, and loss of native species. Other ecological impacts since settlement result from an invasion of feral species such as camels, horses, donkeys, foxes, cats and buffel grass (Cenchrus ciliarus) and from changed fire regimes. An important factor in understanding the changed conditions following non-Aboriginal settlement is that the characteristics of the central Australian ecosystem were established through thousands of years of Aboriginal management. Over this time, Aboriginal
people had developed a range of practices that they carried out over their country according to cultural norms. Non-Aboriginal settlement in central Australia has resulted in a changed relationship between many Aboriginal people and their country, and has contributed to a decline in ecosystem services as well as to poor Aboriginal health.

The impacts of non-Aboriginal settlement clearly extended to Aboriginal economies. The disconnection of Aboriginal people from country and the decline in ecological services started an ongoing impact on the Aboriginal budget by removing access to traditional commodity resources and access to cultural connection and interests. As Campbell (2000, 2001) shows, such takings, without compensation, contributed to the decline in the physical and mental health of Aboriginal people. The loss of culture is important as it is the basis for the institutional structures laws, rules, norms and customs of Aboriginal social behaviour. Even with the re-establishment of access to traditional country, the uptake and application of traditional practices has been disjointed, due, in part, to the sense of powerlessness from a history of dispossession (see Whiteside et al 2006) and a history of externally driven and constantly changing government policy.

There is increasing recognition of the importance of re-establishing traditional land management practices. At the same time there is an increasing loss of Aboriginal social memory and physical capacity to manage country due to poor health and premature death, and the changing priorities of Aboriginal youth (Davies 2004). In many areas we are arguably seeing a negative feedback loop between country and health leading to a downward spiral of poor ecological health of country and poor relative human health, resulting in a national net social loss.

In this paper we explore some of the issues that determine health outcomes of Aboriginal people in central Australia and the supply of central Australian–based environmental services. In particular we provide economic argument for how, under certain conditions, the joint supply of environmental and health services by a single provider results in scoping economies. Such economies occur when the supply of two or more services by separate providers would cost more than if all the services were to be provided by a single provider. The interconnection between environmental and health services, and the economic efficiency issues in how they may be best supplied, is relevant at the higher levels of government policy making, such as for treasury. It reveals what policy options may best be applied to efficiently generate improved outcomes in both environmental and health sectors.

In this paper, we use the term ‘environment’ to refer to the natural environment rather than to the built environment, in contrast to the way the term is commonly used in the health literature. ‘Environmental services’ refers to the supply over time of commodity and non-commodity services from the natural environment. Another term for the same concept is ‘ecosystem services’, but ‘environmental services’ has a better established usage in the economic literature. The term ‘health services’ is usually taken to mean the services provided by health and allied professionals and associated infrastructure, but we use the term somewhat differently. Our usage recognises that a range of other factors contribute to individual and community health, including social and psychological factors and people’s behaviour. We expand on the nature of such factors in the paper in arguing that the participation of Aboriginal people in traditional land management provides a flow of environmental and health services.
When we use the term ‘traditional’ in this paper to refer to Aboriginal ways of living and land management practices, we mean customs and practices whose origins pre-date non-Aboriginal settlement. Such customs and practices are not static or unchanging. In common with most other features of contemporary Indigenous cultures, they have adapted to integrate new knowledge, technologies and behaviours. We recognise that knowledge and application of traditional customs and practices may be important, though not in itself sufficient, to the social recognition of Aboriginal people’s property rights in relation to land and resources. However the subtleties of property rights in relation to traditional Aboriginal ownership and resource use are not immediately relevant to our argument in this paper.

Predisposing factors to poor health

The causes of excess morbidity and mortality in the Aboriginal population of central Australia are complex. They include upstream, social determinants (‘exogenous’ factors in economic terminology), as well as downstream, behavioural (‘endogenous’) factors. While infectious diseases are still significant, chronic disease (Thomas et al 2006) and injury/interpersonal violence have a greater impact on morbidity and mortality. The downstream risk factors for these conditions relate to endogenous behaviour factors affecting the incidence of chronic disease such as smoking, alcohol abuse, poor diet and lack of exercise. Behavioural factors leading to injury and interpersonal violence include drug taking such as alcohol and solvent abuse and unsafe driving.

Pearson (2007) has argued a ‘radical centrist’ view that Aboriginal people have rights to health, but also must take responsibility for current circumstances in order to take control and modify the ‘endogenous’ behaviour that affects health. At the same time, however, Aboriginal people do not always have an equivalent opportunity or capacity to address the exogenous predisposing psychological and social determinants of health (Cass et al 2004, Irwin and Scali 2005, Marmot and Wilkinson 1999). For this reason, it is important to address the predisposing exogenous conditions in cooperation with and in support of Aboriginal people’s taking control of the behavioural factors affecting their health.

Social determinants of health

The importance of social and psychological factors on health has been the subject of increasing recognition and research over the past twenty years. For western societies this involved the increasing relative importance of social and psychological factors following the mitigation of health determinants such as public hygiene and biological factors. There is a large international volume of work on the social and psychological impediments to health (for example the collection of papers edited by Brunner and Marmot 1999 and the steps taken by the World Health Organization in setting up the Commission on Social Determinants of Health (2005) to bring a greater focus on the effect of social factors on health outcomes). The social determinants relevant to this paper are those set out by Krieger (2002) in the discipline of social epidemiology which involves the study of how society and different forms of social organisations influence health and wellbeing of individuals and populations.
As an indication of the importance being given to psychosocial determinants of health, the Australian Productivity Commission, in reporting on labour force participation, observed ‘... a mental health or nervous condition, when averted has the largest positive impact on labour force participation (Laplagne, Glover, and Shomos 2007). While the report emphasised the importance of psychosocial factors across the whole Australian population, the longer term (exogenous) psychosocial factors are particularly relevant to the health and wellbeing of Aboriginal people in remote central Australia (Carson et al 2007a). In this case, however, the relative importance is not due to the mitigation of public hygiene and biological determinants, which continue to be important determinants of health, but due to the seriousness of psychosocial factors. The monograph by Carson et al is part of a small but growing body of literature linking Aboriginal health outcomes and their social determinants.

In assessing the impact of social determinants on health outcomes it is important to understand that although some impacts are short term and directly linked to health outcomes, other determinants have a longer term impact, are more difficult to isolate, and may be of a psychological nature. For example Cass et al (2004), in assessing the link between disadvantage and end-stage renal disease for Indigenous Australians, identify a complex pathway consisting of multiple short-term and longer term layers that connect the experience of disadvantage with end-stage renal disease. Overall, the social and psychological layers that impact on health outcomes include:

- Harm due to poor living conditions, such as overcrowded sleeping conditions.
- Indirect linkages via psychosocial factors, such as biological responses to environmental stress. High unemployment rates, low educational attainment, social isolation, alienation and low income lead to a lack of control over one’s life. All of these are precursors to stress and the biochemical manifestations thereof. Added to the social and psychological factors affecting western health outcomes, Indigenous Australians suffered the additional trauma of colonisation involving physical and cultural genocide, marginalisation, discrimination, and removal from their country. Ashdown (2007) makes the general point that the social impact and trauma of such events take societies in the order of 200 years to overcome. That there are Aboriginal people alive today who were alive when their families were involved in such matters in remote Australia indicates there is a long way to go before the impact of these events have worked their way through the community.
- Indirect and intergenerational linkages, with Australians of lower socioeconomic status in general, and Indigenous people in particular, being more likely to smoke, to be overweight and inactive. Remote Indigenous communities also have poor access to affordable and healthy food.
- Indirect factors via the health system, with socioeconomic disadvantage and racial discrimination being associated with decreased access to health care.
- Cultural factors such as cultural differences affecting communication, and the cultural value of being on and maintaining cultural associations with country. Indigenous people removed from their natural family were found to provide a poorer assessment of their health status than those Indigenous people who had remained with their natural family (Australian Bureau of Statistics 2004).
- Government/corporate policies. While governments have on numerous occasions initiated a number of large-scale housing, sanitation, and water infrastructure programs, they have often proven to be unsustainable. These programs were usually initiated and developed from outside rather than with the communities and were thus set for failure.
Responding to predisposing factors

The National Aboriginal and Torres Strait Islander Health Council 2003, National Strategic Framework for Aboriginal and Torres Strait Islander Health: Framework for Action by Governments, presented its priorities to the Australian Health Minister’s Conference according to three branches.

- Physical wellbeing:
  - Prevention of death or improvement in an individual’s illness and symptoms, independence in everyday living, and improvements in the physical senses.

- Emotional/mental wellbeing:
  - Anxiety/depression
  - Perceived wellbeing, cognition

- Empowerment of the individual:
  - An increase in an individual’s sense of self-mastery, motivation to engage in change, sense of optimism and hope for the future
  - Knowledge, skills and confidence to self manage own needs
  - Undertake usual activities (for example, work, study, housework, family, leisure).

Consistent with this broad-ranging framework is the observation made by the Steering Committee for the Review of Government Service Provision (2007) that among ‘the things that work’, has been the inclusion of cultural studies within the school curriculum, and access to traditional lands, or being on country. Further, the Department of Health and Ageing (2004), lists as the first of the guiding principles in The National Strategic Framework for Aboriginal and Torres Strait Islander Peoples’ Mental Health and Social and Emotional Wellbeing 2004–2009 that:

> Aboriginal and Torres Strait Islander health is viewed in a holistic context, that encompasses mental health and physical, cultural and spiritual health. Land is central to wellbeing. Crucially, it must be understood that when the harmony of these interrelations is disrupted, Aboriginal and Torres Strait Islander ill health will persist.

There is a small but significant body of literature that provides evidence of the observed health benefits of people living on and carrying out traditional practices on their country, including eating bush foods (Garnett and Sithole 2007; Burgess et al 2005; McDermott et al 1998; Altmann 1987; O’Dea 1984, McCarthy and McArthur 1960). However, while the benefits of such activity for environmental services are becoming better recognised, the benefits for health services continue to be poorly accounted for.

The social benefits of addressing Aboriginal health

The national commitment to ensure delivery of a shared base level of social services, including education, communications, housing and health, is part of federation and nation building. While there has been a history of successful service delivery for the non-Aboriginal population, there is a history of failure in the delivery of social services to Aboriginal Australians. In addition to the base level commitment of the Australian state to its citizens, there are strong horizontal and vertical equity and human rights arguments for the importance of addressing Aboriginal health. Horizontal
equity is where those who have an equivalent need for health services are treated equally. Vertical equity is where those who have a greater need would receive greater access to health services. Horizontal and vertical equity in the provision of health services would bring all people to comparable standards of health.

A number of economic studies indicate improved health outcomes for Indigenous Australians in general, and for Aboriginal people in remote central Australia in particular, would result in broad-based national benefits. Internationally, the Commission on Macroeconomics and Health estimated the expected benefit from raising the life expectancy of people in low income developing countries from 59 to 68 years of age would result in an annual increase in economic growth of 0.5% (Sachs 2001, p. 108). The Canadian Royal Commission on Aboriginal Peoples estimated an annual loss due to the marginalisation of Native Americans of 1% of gross national production (1996, vol. 5, chapter 2). This was based on social costs associated with the economic marginalisation of Aboriginal people (foregone income) and costs incurred by governments in attempting to address social problems through remedial programs.

Nationally, the Productivity Commission in its 2006 report to the Council of Australian Governments (COAG) on the potential benefits of the National Reform Agenda (NRA) observed that:

\[\text{enhancement of workforce participation and productivity through the NRA stream directed at health promotion and illnesses prevention, education and work incentives could potentially result in increased GDP of around 6 per cent and 3 per cent, respectively, after 25 years or more (Laplagne et al 2007, p. xxviii).}\]

While there is no direct economic study of the health benefits for central Australia, Barnes et al (2006) estimated the annual social opportunity cost to the Northern Territory of the social disadvantage suffered by Aboriginal people in 2001 was $1.4 billion. The approach used was the same as that used by the Canadian Royal Commission on Aboriginal Peoples (1996, pp. 14–5). The Territory Government and its agencies have identified Aboriginal disadvantage as a key parameter influencing labour productivity and gross state productivity (Northern Territory Government 2007, Barnes et al 2006).

**Being on country**

For Indigenous people, involvement in managing country can result in confirmation of identity and cultural authority, social activities, provision of purpose, teaching and sharing knowledge, exercise and food. The Maori, Ahukaramu Charles Royal, provides a helpful explanation of what it is to be an Indigenous person with cultural attachment to country by comparing the world view of Indigenous peoples with that held by others: The Western (Judaeo-Christian) view is of an external god in heaven above. An Eastern view has an internal focus of reaching within through meditation and other practices. An Indigenous view, by comparison, is where people are seen as integral to the world and having a seamless relationship with nature (in Cunningham 2003, p. 403).

Contemporary Aboriginal people’s attachment to country is expressed in various ways including:
• People living on their country following traditional custom
• People living outside their country but visiting on an occasional or more systematic basis
• People having partnerships and collaborations for management of country such as through government support for establishment of Indigenous Protected Areas, co-management of national parks and reserves, and participation in specific environmental management programs including with non-government organisations and firms. Some programs can involve a number of participants, such as conservation of the Great Desert Skink north-west of Alice Springs, which involves the Nyirripi community, Tangentyere Council, the World Wide Fund for Nature and the Natural Heritage Trust (Partridge 2006).
• People using knowledge and skills and connection to country to engage in privately managed commercial activities, such as cultural tours, commercial bush food harvesting and contract provision of land management services to non-Aboriginal landowners.

Properly initiated and supported, such linkages have the potential to support the maintenance and reintroduction of traditional environmental management, and reverse negative feedbacks between the health of people and of the environment, as discussed further below. It is important that Aboriginal people have ownership of how activities that express their relationship with their country and environmental management are set up, managed and run. Such a sense of control over one’s life is a factor in the social determinants of health and is also critical to motivation and institutional stability. The importance of this relationship is well recognised in the broader economic development literature. Ostrom (1992) provides a useful lesson in this regard in her discussion on the breakdown of irrigation developments associated with World Bank irrigation projects in Pakistan. She shows the breakdown occurred as a result of the project institutional structures being imposed from outside the affected communities, and how the involvement of local people in the planning and development of new institutions turned this around.

The practices that Aboriginal people undertake in managing their country include:
• low intensity patch burning
• harvesting of bush foods
• control of feral pests and weeds
• fencing off and cleaning out waterholes
• rehabilitation of eroded areas
• ecological and cultural tourism activities
• maintenance of language and the ecological knowledge embedded in language and art.

The public receives a number of benefits from such practices in the form of environmental services. For example, traditional patch burning mitigates intense, more destructive fires which pose greater risks to fire sensitive habitats and generate relatively higher rates of release of greenhouse gases. By promoting habitat diversity it thus contributes to the maintenance of biodiversity, and may promote regeneration of fire adapted species.

The private benefits to Aboriginal people from engaging in traditional land management practices may include:
• food
• exercise and recreation
• enhanced emotional and psychological health from improved cultural knowledge and status within the community, leading to greater capacity to assert control
Motivation of Aboriginal people to undertake traditional land management practices, such as patch burning, can be high. The discussion by Bird et al (2005) of the relationships between food production and patch burning by the Martu people in the northwest section of the Western Desert illustrates this. They observed that women did most of the burning and that burning revealed the tracks and dens of smaller burrowing animals such as lizards, pythons and feral cats, providing an immediate return in improved hunting efficiency. They note the mosaic or patches of burnt areas resulting from women’s use of fire is important to mitigating wild fires in the summer months and to sustaining biodiversity in the Western Desert. However, the environmental services from such practices were unintended, or intramarginal to the intended outcomes. It is the private benefits, rather than the public benefit provided through the environmental services, that are the motivator.

Aboriginal people have less incentive to undertake some management practices, such as the control of feral animals, than they do for patch burning and other traditional practices. Even where motivation is strong, Aboriginal people face a range of impediments in undertaking environmental management (Davies et al 2007). In some regions traditional practices are no longer being carried out. Such an outcome may be a result of the private benefit to Aboriginal people being insufficient to overcome impediments to undertaking these practices. Such factors lead to environmental services that were once supplied by Aboriginal people, and are currently desired for their public benefit, being under supplied.

A holistic approach to Aboriginal health

Discussions of how improved Aboriginal health and wellbeing might be achieved often emphasise the importance of using a ‘holistic approach’ (Anderson 2004; Carson et al 2007b; Department of Health and Ageing 2004; National Aboriginal and Torres Strait Islander Health Council 2003; Steering Committee for the Review of Government Service Provision 2007). The medical use of the term refers to the treatment of the whole person rather than to a particular manifestation of disease or symptom. In common usage, a ‘holistic outcome’ occurs when a whole (the outcome) is of greater magnitude or value than the sum of the parts (inputs) applied to produce that outcome. In regard to Aboriginal health outcomes, the parts (inputs) need to include both primary health care and action to address the range of psychological and social factors affecting the behaviour and wellbeing of Aboriginal people.

A holistic approach to improving Aboriginal health requires coordinated provision of a range of inputs. The need for such an approach has been widely established. The 2006 four-year review of the Council of Australian Government’s trials on improved service delivery to Indigenous people found that, in addition to requiring a 10–20 year commitment, overcoming Indigenous disadvantage requires an integrated approach rather than a program-driven silo approach (Morgan Disney 2006, p. 4). Clapham et al (2007) observe that ‘... a large number of health determinants lie outside the formal health sector.’ They suggest that ‘[s]olutions to Indigenous health and development problems need to come from many sectors, not just the health sector’ (p. 272). Two of the nine
key result areas, set out in the Department of Health and Ageing’s (2004) *National Strategic Framework for Aboriginal and Torres Strait Islander Peoples’ Mental Health and Social and Emotional Wellbeing 2004–2009*, note the importance of strategies outside of the health sector, including their cultural connection with their country. The importance of Aboriginal people living on their customary lands and engaging in management of those lands is discussed below.

**The economic meaning of a holistic approach**

Environmental management services that were once provided as a result of Aboriginal land management are undersupplied, notwithstanding the contribution such involvement can make to Aboriginal health, as highlighted by the discussion above. Before exploring the choice and application of policy mechanisms to mitigate the under supply of health and environmental services through a holistic approach, we need to consider the economic characteristics of a holistic approach and of health and environmental services.

**Complementarity**

The first of two possible economic explanations of holistic approaches is when inputs used to produce something are complementary: that is, there is a technical link between the inputs which requires them to be used in some form of combination. An economic test of complementary inputs is that a price increase for one input results in a *decrease* in the quantity demanded for all inputs. Complementary inputs need to be distinguished from substitutable inputs. Usually, when a number of inputs are used to achieve a desired outcome, a price increase for one input will result in a *decrease* in the use of that input and an *increase* in the use of the other inputs. That is, substitutable inputs are different from complementary inputs in that, in the case of substitutable inputs, a price increase for one input results in a *increase* in the quantity demanded of other, alternate, inputs.

A truck and a truck driver, for instance, are complementary inputs to the supply of transport services because it is not possible to substitute more truck drivers to compensate for an increase in the price of trucks. Hospital buildings, equipment and medical staff are complementary inputs to the supply of acute care health services. It is not possible, for instance, to substitute more hospital buildings to compensate for an increase in the cost of medical staff and still maintain the supply of health services. In each of these examples the services cannot be efficiently supplied without all of the complementary inputs.

Although complementary inputs need to be used together, the relative amount of each input is not fixed and may vary in different circumstances (Jovanovic and Stolyarov 2000). For example, the numbers of medical staff, or the amount of hospital equipment, can be altered without changes to the hospital buildings.

The poor outcomes and high cost of health delivery to Aboriginal people in remote central Australia, relative to the situation for the rest of Australia as a whole and to the rest of the remote central Australian community, is consistent with a failure to provide complementary inputs. Notwithstanding any improvements in medical and allied health infrastructure and staffing, we can expect improvements in Aboriginal health and wellbeing to be sub-optimal unless the social
and psychological determinants are also addressed. This is because infrastructure, staffing and action on social and psychological determinants are complementary inputs to Aboriginal health and wellbeing.

Scoping economies
A further economic characteristic of some complementary inputs is when the joint provision of goods and services results in scoping economies, or economies of scope. Scoping economies are achieved when the cost of providing two or more services jointly by a single supplier is less than the cost would be if these services were provided by separate suppliers. Scoping economies in the supply of health and environmental services can occur when the cost of providing certain health services (such as improved diet and exercise) in conjunction with the supply of environmental services (occurring as a result of traditional land management practices, such as patch burning) is less than the cost of providing these services through separate approaches to health promotion and environmental management.

Normally scoping economies occur as the result of shared inputs, particularly fixed capital inputs, used in the production of two or more outputs. However, in the provision of health and environmental services the potential for scoping economies arises because of a technical relationship between the means used to provide environmental services and the derived health benefits. The technical relationship arises because Aboriginal people are providing knowledge and labour inputs to the supply of environmental services through the use of traditional land management practices. In doing so, Aboriginal people receive a range of biophysical health benefits (such as through exercise) and psychosocial health benefits (such as enhanced self esteem through recognition by others of the value of their knowledge and effort). In this way, health services and environmental services are produced jointly. Policy makers may also manipulate the relative supply of health and environmental services through the choice of policy tools.

One of the advantages of taking a holistic approach is commonly explained to lie in the existence of synergies. Synergies are assumed to exist when the whole (outcome) is greater than the sum of the parts (inputs). However, it is important to an economic analysis to distinguish between synergistic and complementary inputs. At a given level of investment, the marginal returns from the set of inputs will be greater if the inputs are synergistic, than if the inputs are not synergistic. However, if the inputs are complementary a range of possible relationships exists. At one extreme, production will not be possible unless all inputs are present. For example, if you have trucks and no truck drivers, you can not produce a transport service. In other situations, production will occur but productivity will be less than it would be if all complementary inputs were provided at optimal levels. For example, if you have doctors but no medical equipment and hospital buildings, some outcomes for acute health care will be produced, but these will be much less than if well-equipped hospitals were also available. Economies of scope only occur when dealing with complementary inputs, although the presence of complementary inputs does not necessarily lead to scoping economies. It is just that economic inefficiencies will occur without the provision of complementary inputs.

The economic relationships among various inputs are important to policy makers faced with determining the allocation of taxpayer dollars between competing demands. The complementary relationship between Aboriginal health and environmental services highlights the need to consider
the delivery of health services from a broad perspective. Failure to provide all complementary inputs will result in a loss of economic (and technical) efficiency. Such failure can help to explain the high cost of, and poor outcomes from, health services provided to Aboriginal people in remote Australia.

Public goods and private goods
Economics differentiates goods and services according to whether they are private goods or public goods. A public good is one that is non-rivalrous in consumption or use, which means that consumption of the good by one individual does not reduce the amount available to be consumed by another individual. Television signals, information, and defence are examples of public goods. Pure public goods have a further key characteristic of non-excludability: that is, it is not possible to effectively exclude a person from using that good. Air for breathing is an example of a pure public good. In contrast, private goods are those goods which, when consumed or used, are no longer available to others; that is, they are rivalrous in consumption. Food and fuel are examples of private goods.

Environmental services can provide public benefits (such as biodiversity) or private benefits (such as firewood). However, many environmental services have joint private and public good characteristics. For example, Aboriginal people’s work in cleaning desert waterholes and fencing them to exclude feral animals generates private benefits for those Aboriginal people who drink the water or who hunt wildlife sustained by the waterhole. At the same time it can generate broad public benefits, such as supporting maintenance of biodiversity. The provision of health services also often involves the joint supply of public and private goods. For example, health treatment that cures someone who has an infectious disease has private benefit for that individual and a public benefit in removing a source of infection.

Are health benefits an externality?
When the health benefits generated through the supply of environmental services by Aboriginal people are not accounted for by policy makers, these health benefits comprise an externality. An externality is a cost or benefit from an activity that is not accounted for when assessing the benefits and costs of an activity. Pollution of air or water by industry, where such pollution goes unpriced, is a common example of a negative externality. Externalities may also be positive as in Meade’s (1952) classic example: bees owned by an apiarist pollinate fruit trees and thereby generate benefit for the orchard owner, while the apiarist receives the benefits of the fruit tree pollen. If either the pollination services provided by the bees, or the supply of pollen to produce honey are not included in the apiarist and the orchard owner’s accounting, then these benefits are positive externalities.

Goods and services that result in negative externalities will be oversupplied. For example goods and services that are produced in a way that pollutes air and water will be able to be produced at a lower price than if the industries producing them had to include the social cost of the pollution in the production process. As pollution is not accounted for in the price of the goods and services, the excess profits that can be made from such goods and services act as an incentive for excess production. Conversely when the provision of goods and services results in unpriced positive externalities, these goods and services will be undersupplied. Taking Meade’s example, because the apiarist is not paid for the pollination service provided by the bees, the pollination service is likely to be under supplied.
Patch burning is one land management activity undertaken by Aboriginal people in central Australia for private benefit that also generates public benefit. This public benefit may be considered to be a positive externality derived from the reduced risk of major intense fires. The occurrence of intense fires have a negative impact on biodiversity as well as reducing the biomass of trees and shrubs and reducing the capacity of the ecosystem to maintain carbon sequestration. When these positive externalities are not taken into account, the environmental services derived from Aboriginal people’s patch burning are likely to be undersupplied.

The health benefits generated by Aboriginal people’s engagement in the provision of environmental services may be seen as a positive externality in that these benefits are not fully taken into account by policy makers in making investment decisions about environmental services. As a result, both environmental services and health services are undersupplied. We argue, however, that the economic relationship between environmental and health services is more robustly described in terms of these services being jointly produced through actions by Aboriginal people on country that build on complementary inputs to health. That is, the involvement of Aboriginal people in land management practices is a complementary input to the provision of health services. Jointness in the supply of the environmental and health services provided through this activity makes particular economic sense because of the resulting scoping economies.

Selecting appropriate policy mechanisms

While some Aboriginal people carry out traditional land management practices, others, for a variety of reasons, do not. Even when environmental and health services are produced from traditional land management practices, the supply of these services may continue to be less than what is socially optimal. That is, the net social benefit of the stream of environmental and health services from Aboriginal land management is under supplied. This is the likely situation in central Australia.

The policy tools available to policy makers interested in correcting this shortfall include positive incentives, negative incentives, knowledge (research, education and extension), and correcting for institutional failure. Selection of cost-effective policy tools depends on the extent to which a private (Aboriginal) land management practice results in public benefits. One method for selecting the appropriate policy tool is the use of the cost-effectiveness plane, shown in Figure 1. This policy decision tool has been used in a number of different policy arenas where a mix of public good and private good benefits exist, including health (Willan and Briggs 2006), water resource management (Grafton 2007) and land management (Pannell 2006). Here we use the cost effectiveness plane to identify the economic conditions in which public action to promote or facilitate traditional Aboriginal land management practices is likely to be warranted and when disincentives may be warranted.

Figure 1 represents the full range of benefits attributable to all possible land management practices. The vertical axis shows public benefits, which can be positive or negative. The horizontal axis shows private benefits, which can be positive or negative. Because the activities that Aboriginal people carry out on country can have negative public or private impacts as well as positive public or private impacts, Figure 1 is divided into quadrants. Private benefits are the benefits less the
costs incurred by Aboriginal people from their land management practices. Public benefits are the benefits that accrue to the broader public from Aboriginal land management practices less any costs that the broader public incurs as a result of these practices.\(^1\)

![Diagram of the cost-effectiveness plane](image)

**Figure 1: Application of policy tools in an otherwise perfect market**

Figure 1 is divided diagonally into two halves. Below the diagonal line the sum of private benefits plus public benefits result in a negative total social benefit. In the shaded area above the diagonal line the sum of private benefits plus public benefits results in positive total social benefit.

For example, points L and M represent two land management possibilities.

For point L (located below the diagonal line in Figure 1) there is a negative private loss of \(0L_{\text{private}}\) and a net public benefit of \(0L_{\text{public}}\).

The total social benefit of L, given by equation (E1), is shown to be negative.

Social benefit \(L = (0L_{\text{public}}) - (0L_{\text{private}}) < 0\). E1.

Hence this land management practice should not be carried out.

---

1 In this application of the cost-effectiveness plane, we assume that the benefits to the broad Australian public from Aboriginal land management practices are public goods, and that the benefits to the Aboriginal people undertaking traditional land management practices are private goods. While land management practices will result in public goods, such as cultural benefits, that will accrue to the Aboriginal community, we are, we are including these as boriginal private good in order to streamline the explanation.
For point M (located above the diagonal line) there is a negative private benefit of $0M_{private}$ and a net public benefit of $0M_{public}$. The total social benefit of M given by the equation (E2) is shown to be positive. Hence this land management practice should be carried out.

\[
\text{Social benefit } M = (0M_{public}) - (0M_{private}) > 0. \quad \text{E2.}
\]

Facilitating the supply of public goods

A perfect competitive market is a situation where people have perfect knowledge and there are no impediments to the movement of resources and trade, such that prices represent relative social opportunity cost. Here we assume the market is perfect except that there is under supply of public good or benefits from Aboriginal land management.

In segment 1A (such as at point L), there is a negative private benefit to landowners – that is, a private loss – from undertaking land management practices. Although there is a public benefit, the private loss exceeds the public benefit, so that the net social benefit is negative. This is indicated by this segment being located in the unshaded area of Figure 1, below the diagonal line. The private loss means that private land management practices with these characteristics are not undertaken by landowners.

In segment 1B (such as at point M) there is also private loss and public benefit. However in this segment, the public benefit exceeds the private loss, such that the net social benefit of undertaking the land management activities is positive. Nevertheless because there is a private loss, land management practices in this segment will not be undertaken by landowners without policy intervention. The appropriate policy tool is an incentive where the value to landowners is at least equal to the private loss incurred from undertaking the land management activities. The rate at which the incentive generates increased private land management will depend on the extent to which the value of the incentive exceeds the private loss. It is important, though that the cost of applying the incentive is less than the value of the increased public benefit. Although the incentives applied in policy interventions are typically financial, they need not be.

A possible example of Aboriginal land management is the control of feral animals. Controlling feral animals incurs private costs including the costs of fuel, firearms, other equipment, and the opportunity cost of time that could have been spent in alternate activities. Less tangible costs, such Aboriginal people losing status or respect within their own community, may arise from conflict with customary norms and values that preclude killing animals without utilising them. In most circumstances Aboriginal people do not engage in feral animal control, which suggests a private loss occurs from this activity. There is, however, positive public benefit from Aboriginal control of feral animals because of the impact of feral animal populations on biodiversity, amongst other environmental services. Such circumstances are located in segment 1B and it is appropriate for policy makers to introduce incentives for Aboriginal people to control feral animals. It must be realised, tough, that in some circumstances, where feral animals are having a minor impact on environmental services, the positive public benefit that might be gained from Aboriginal control would not outweigh the private loss. To do otherwise would result in a net social loss. Such circumstances are located in segment 1A.
In segment 2 landowners realise a private benefit from undertaking land management practices and these practices also generate public benefit. The net social benefit is positive, as indicated by the location of segment 2 above the diagonal line. Landowners will engage in these land management practices because of the positive private benefit, and public benefits are also consequently realised. Hence there is no need to apply any policy intervention. Examples when this may occur include traditional Aboriginal land management practices such as patch burning. Such activities can occur without the need for any policy intervention, indicating that the private benefits, in terms of enhanced access to bush foods and psychosocial benefits from enhanced attachment to country, are greater than the private costs such as for transport. The positive public environmental services from this activity, as previously discussed, are improved biodiversity and the mitigation of major wildfires. We noted in an earlier discussion that traditional Aboriginal land management practices are undersupplied in contemporary central Australia. There may be a number of factors affecting this outcome, in addition to private costs, including different forms of market failure, as discussed below. A further example in segment 2 is the provision by Aboriginal people of contract land management services to rehabilitate mine sites.

In segment 3, there are positive private benefits from land management practices, but negative public benefits. In segment 3A the public loss is greater than the private benefit, such that the net social benefit is negative, as indicated by the location of this segment below the diagonal line. Landowners will implement the land management practices that are located in this segment because of the private benefit they gain, despite the negative social benefit. One possible policy option would be for public resources to be used to pay landholders to not carry out these practices. However, such a response risks a perverse outcome, with landowners initiating land management practices in the expectation they will then be paid to stop carrying them out. The appropriate policy option, to avoid socially harmful land management practices, is to implement some form of negative incentive or sanction, such as a fine. To provide an effective deterrent, the cost to landowners from such sanctions needs to be at least as great as their private benefit from carrying out the practice multiplied by the probability of being caught and sanctioned.

For segment 3B, the private benefit from engaging in land management practices is greater than the public loss, as indicated by the location of this segment above the diagonal line. As a result the net total social benefit from land management practices located in this segment is positive. Thus, in spite of public loss, it is appropriate for these land management practices to occur and no policy intervention is warranted.

In segment 4, both the private and public benefits from land management practices are negative – there are both private and public losses. Because private benefits are negative, landowners will not undertake land management practices located in this segment. Hence no policy intervention is required. An example would be the wanton killing of animals by Aboriginal people with no intention of using the animal for food. Aboriginal people do not engage in this practice, which indicates that the private benefit of the practice is negative. Hence it would be a waste of public resources to develop and apply sanctions against this practice.
Dealing with market imperfections

In many cases we are dealing with imperfect markets. At the very least there is imperfect knowledge. In addition, market failure may exist due to inappropriate or inadequate institutional structures and technical (non-pecuniary) impediments to the movement of resources. Policy makers need to identify such impediments and apply appropriate policy tools to overcome them. Although the cost-effectiveness plane may still be applicable in an imperfect market, the choice and application of policy tools is not as simple as when operating under the assumption of a perfect market. In many cases, though, the cost of correcting market imperfections is such that no action is undertaken and policies will be carried out as if for a perfect market.

Imperfect knowledge includes the lack of knowledge of change over time and the associated risks from an uncertain future. It is sometimes possible to identify sources of risk and uncertainty that impact on the relative relationship between private and public benefits, such as the effect of climate change on health and ecosystems, and change in relative prices, social preferences and technology. However, quantifying the associated risks can be difficult. Responses to imperfect knowledge include information gathering, education, the provision of extension services and risk assessment using available information and alternative risk profiles.

An economic characteristic of knowledge is that it is a pure public good, which, when provided, can increase both private and public benefit. Conversely, lack of knowledge can have an impact on all land management options and choices. The information that might be important to increase the knowledge of Aboriginal people includes the nature of demand for particular land management practices from outside their own community and the likely benefits and costs of meeting that demand. Enhanced Aboriginal knowledge of these factors could enhance marketing of bush foods, eco- and cultural tourism, and art and craft products to private purchasers. Information needs of Aboriginal people also include ensuring that others are aware of the importance of their culture and traditional land management practices to their own community and the broader public benefit of these practices, including the environmental and health services that these practices generate.

Structural impediments can occur in a number of different ways, including policies that inhibit the movement of Aboriginal people onto their country to carry out traditional practices. For example, policies that promoted the concentration of Aboriginal people into large settlements impeded people having access to carrying out traditional land management practices, resulting in reduced private and public benefit. The outstation movement of the 1970s and 1980s which saw Aboriginal people initiate the establishment of dispersed small family-based settlements, initially attracted public investment, presumably because the net social benefit of Aboriginal people being on country was assessed to be positive. Renewed Aboriginal engagement with traditional land management practices occurred in conjunction with the outstation movement (Cane and Stanley 1985). Over the past fifteen years, progressive withdrawal of policy support from small outstations in favour of larger settlements has contributed to the social dysfunction amongst Aboriginal families of central Australia. This dysfunction inhibits Aboriginal people putting time and other private resources into carrying out land management practices on their country (Davies et al 2007, Scrimgeour 2007).

Whether dealing with a perfect market or a non-perfect market, the assessment and application of policy interventions directed at achieving increased environmental and health services need to take the costs of the intervention into account. Such transaction costs include the costs of information...
gathering (research), negotiation, establishing the necessary institutional structures, monitoring, control and enforcement. These costs are unlikely to be trivial and must be accounted for when assessing the initiation, application and extension of land management programs.

Also important is the possible loss in social benefits due to government failure when this occurs as a result of self-interested behaviour by government bureaucracies and short-term political self interest (Mueller 2003). Inconsistencies and changes in government policy are important risk factors for Aboriginal landholders. Government transparency in decision making with the full involvement of Aboriginal people in policy development and the application of evidence based policy are important steps in mitigating government failure.

**Behavioural incentives**

The effectiveness of policy mechanisms aimed at optimising economic outcomes from the joint supply of environmental services and health services depends on assumptions regarding human preferences and behaviour. Aboriginal people are likely to have different preference functions to the non-Aboriginal community. This provides additional emphasis to the importance of Aboriginal people having control over how environmental services and health services are provided. If we expect Aboriginal people to take control of the endogenous behavioural factors affecting their health, it is important that policy actions are compatible with Aboriginal cultural practices.

Peterson (2005, p. 7), among many others, comments on the importance to Aboriginal people of ‘holding onto their culture’. In particular, such literature refers to the relative importance placed by Aboriginal people on the establishment and maintenance of social relationships, rather than personal financial gain and value maximisation. Peterson (2005) notes the movement to and maintenance of outstations on country as a means of maintaining cultural attachment. Being on outstations is not costless as outstation residents have less access to social services and work opportunities than residents of larger remote settlements, and commodities are also more expensive. That some Aboriginal people make the choice to live on outstations demonstrates the value to them of their attachment to country (Campbell 2000, 2001).

Aboriginal attitudes towards work and incentives to undertake work have assumed increasing political importance in 2007 as governments have turned their attention to addressing the negative social impacts that are apparent after decades of an Aboriginal ‘welfare economy’ in central Australia. A number of commentators have noted the apparent lack of social cohesion and social capital, or anomie, that exists in some Aboriginal settlements (Baume 2007). Governments are applying new incentives and sanctions to increase labour market engagement by Aboriginal people of central Australia in response to such social environments. Nevertheless, Walter and Mooney (2007) describe ‘workfullness’ amongst Aboriginal people as involving engagement in activities within their own community rather than in a labour market. Although they suggest that the relationship between being gainfully employed in the workforce and workfullness and health is unclear and deserves further enquiry, they comment that such ‘in-community’ activities provide Aboriginal people with feelings of self respect and self-esteem similar to those that non-Aboriginal people often attribute to market employment (2007:156–157).
Anderson (2007) asks: ‘[t]o what extent should we consider work to be a central organising feature of Indigenous sociality’ in comparison with the organisational impact of work for the rest of Australian society? He proposes that ‘it is not unreasonable to hypothesise that Indigenous extended families continue to have a more significant influence on Indigenous sociality (than the social world of ‘work’) as [Aboriginal] people continue to negotiate social relationships within a system of reciprocity’ (p. 26). As noted by Austin-Brooks (2003), the relationship between Aboriginal reciprocity and the social world of ‘work’ as constructed by non-Aboriginal people does not sit comfortably for many central Australian Aboriginal people as they address the dilemma of adjusting to a dominating commodity-based market culture rather than a place-based culture. We note that design of incentives to promote the joint supply of environmental and health services needs to be developed with critical awareness of this context, but also that the relationship between Aboriginal reciprocity and non-Aboriginal society’s construction of ‘work’ is not static and will be influenced by appropriately designed incentives.

The design of incentives – what they are applied to, their extent, timing and how they are applied – is critical if they are to be effective in the joint supply of environmental and health services. Compatibility with Aboriginal culture and preferences is important if Aboriginal people are going to appropriately respond to the proposed incentive.

A range of different policy incentives have been provided in recent years to promote Aboriginal land management practices and which have resulted in positive social benefit. These have included vehicles and fuel for Aboriginal people to travel out of larger settlements to more remote parts of their country to carry out traditional land management practices, and wages and materials for community ranger groups to carry out land management practices. Garnett and Sithole (2007) comment on the status and confidence derived by community elders from their involvement with community-originated, culturally based ranger programs in western Arnhemland. Such impacts contribute to addressing the psychosocial determinants of health. In central Australia, Davies et al (2007) observe that working in land management generates pride for young people, and this becomes a motivator. Young people working as a group motivate each other, laughing and swapping yarns. Confidence, identity and experience of employment habits are broader benefits. Further, such experiences may stimulate the interest and confidence of young people for other employment roles. Contracts for community ranger groups for environmental management tasks such as rehabilitation, weed control, or for fire management at mine sites, in national parks and on pastoral stations, may lead to interest in other work roles in these industries.

Longer term benefits from the joint provision of health and environmental services

The joint provision of health and environmental services promotes economic efficiency through the existence of scoping economies. The health outcomes that result will have flow on effects for further increases in net social benefits through:

- Increased fitness and wellbeing enhancing the capacity of individuals and families to participate in a range of activities, including both traditional land management practices and market employment
• increased capacity to manage and provide input to a range of other services required for management of remote areas of central Australia
• increased lifespan, resulting in a greater return from human capital and training. Even if Aboriginal people have limited involvement in the work force, increased lifespan can result in a number of non-market benefits, including support in the raising and training of children.

The facilitation of land management programs can be a culturally informed means by which Aboriginal people connect with the broader work force. Participation in working on country can contribute to building up social capital and providing a basis for addressing broader community behavioural issues.

The experience of the Commonwealth Department of the Environment and Water Resources through the Indigenous Protected Area Program has been an important component to this. This program has proved to be a very cost effective means of contributing to the Australian Government’s commitment to the establishment of a national system of protected areas representative of all biogeographical regions across Australia. It has also provided:

... a suitable vehicle for facilitating the transfer of traditional knowledge and engaging young people in positive educational experiences centred on the equitable exchange of western science and traditional knowledge (Gilligan 2006, p. 3).

A long-term policy focus is needed to achieve such outcomes. Youth programs are critical. For example, the Canadian concept of a junior ranger program might contribute to acknowledging and integrating Aboriginal children in working on country. This could be integrated with other programs such as the Family Wellbeing Program developed by the Aboriginal Education Development Branch, Department of Education, Training and Employment, South Australia (Whiteside et al 2006) and potentially with programs to address employment skills.

Conclusion

Aboriginal health continues to fall behind that of the rest of the Australian population. At the same time there are a number of environmental concerns in central Australia, including the loss of biodiversity. These are two significant areas for national concern. We draw here on literature from a number of disciplines to show it is important to address the predisposing exogenous psychosocial predeterminants of health in cooperation with and in support of Aboriginal people’s taking control of the behavioural factors affecting their health. As part of this, we show that Aboriginal participation in land management practices can result economies through the joint supply of the environmental and health services. Supporting Aboriginal land management practices is likely to be a cost effective way to achieve improved health and environmental service outcomes because of the existence of scoping economies. This is important given the increasing budgetary demands for investment in both health and environmental services in central Australia.

The cost-effectiveness plane is introduced in this paper as a decision tool that can be used by policy makers to select which policy tool to apply to various Aboriginal land management practices. Under the assumptions of a perfect market, incentives should be applied when the total net social benefit is positive and the private benefit to Aboriginal people provides insufficient motivation.
for them to carry out land management practices. The cost of incentives needs to be less than the increased public benefit obtained as a result of the land management practices. Disincentives or sanctions should be applied when the private returns to Aboriginal people from undertaking land management practices are positive but total net social benefits are negative because public losses exceed private benefits. Other policy tools, such as information and education, and correcting institutional failure and impediments to the movement of resources also need to be considered, depending on the circumstances.

It is commonly believed that a holistic approach should be taken to delivering health services to Aboriginal people because synergies exist. However the economic argument for taking a holistic approach is due to the existence of complementary inputs rather than synergies. Involvement of Aboriginal people in generating environmental services complements other health services resulting in more cost-effective health outcomes. Conversely, failure to deliver complementary inputs will result in decreasing effectiveness in the delivery of health services. Scoping economies can be realised through the joint supply of environmental services and health services and it is these scoping economies that can result in synergies, whereby the whole – improvement in Aboriginal health – is greater than the sum of the inputs.

For policy makers to generate evidence-based policy, it is important that information shortfalls on the relationship between engagement in land management practices and health outcomes continue to be addressed. One outstanding need is an economic assessment of the total national social benefit from Aboriginal engagement in land management, including a comparison between the net social benefit of Aboriginal people in central Australia living in dispersed outstations, larger remote townships and regional centres. This is particularly important because of the policy tensions which exist between joint production of health services and environmental services through Aboriginal people living on country, and efficiencies in the provision of housing and health and education infrastructure through consolidation of populations into larger towns.

The Centre for Remote Health and Desert Knowledge Cooperative Research Centre are currently involved with Charles Darwin University in carrying out an economic analysis of the health benefits for Aboriginal people in their carrying out land management practices in west Arnhemland. This work will go some way to meeting the current information shortfall by providing economic analysis of the benefits from Aboriginal land management.


Anderson IPS 2004, ‘Recent developments in national Aboriginal and Torres Strait Islander health strategy’, *Australia and New Zealand Health Policy*, and Biomed Central at: http://www.anzhealthpolicy.com/content/1/1/3.


AIHW 2006b, *National Summary of the 2003 and 2004 Jurisdictional Reports Against the Aboriginal and Torres Strait Islander Health Performance Indicators*, AIHW cat. no. 16, Canberra.


Campbell D 2000, *Economic issues in valuation of and compensation for loss of native title rights*, Issues paper vol. 2, no. 8, Native Title research Unit, Australian Institute of Aboriginal and Torres Strait Islander Studies.

Cane S and Stanley O 1985, *Land use and resources at desert homelands*, Australian National University, North Australia Research Unit, Darwin.


