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Indigenous livelihoods

Background paper

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The North Australian Indigenous Land and Sea Management Alliance Ltd. (NAILSMA) delivers large-scale initiatives across northern Australia and is committed to finding practical solutions that support Indigenous people and the management of their lands for future generations. Its culture-based economy approach aims to assist Indigenous people through livelihoods and employment on their country. NAILSMA is an Indigenous owned and managed not-for-profit company. It has a strong track record of delivering award-winning programs in challenging and complex settings.

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Indigenous Livelihoods Background Paper

Peter J Whitehead

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Report

prepared for the

North Australian Indigenous Land and Sea Management Alliance Ltd.

(NAILSMA)

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1 Summary

Indigenous people in northern Australia appear well-placed to develop rewarding livelihoods based on renewable natural resources. They have title to large areas of land and associated waters, in regions where resources have not been excessively depleted and landscapes remain structurally intact. Indeed, many continue to depend on customary harvest for a significant part of their "income". But in regional and remote areas, sustainable livelihoods based on interactions with the cash economy, whether through paid employment or development of Indigenous enterprise, have proved problematic.

A review of related literature found few outstanding examples of unambiguously successful enterprises based on use or management of renewable resources that do not depend substantially on public funding. Comprehensive and robust statistical information on Indigenous employment in land and resource management has yet to be collected, but favourable employment outcomes appear to have been achieved mostly with government-funded "caring for country" work.

There is great scope to expand work of this sort: to deliver environmental services offered to private buyers by Indigenous enterprises, under what have been labelled as payment for environmental services (PES) arrangements. Recent change in the array of services in which there is an interest and, more significantly, the array of would-be purchasers has fundamentally altered the choices available to Indigenous landholders; and the information they need to make good decisions.

The commitment to on country work is exemplified by the early, spontaneous creation of Indigenous Ranger groups, in advance of the formal Working on Country and Indigenous Protected Area programs, which now provide most of the resources they need to operate. These co-investments of Indigenous effort and commitment, and access to public funds have developed the human, social and physical capital needed to take up important new, offset-based options. These can, if appropriately designed, direct compensation for environmental damage caused at a development site to remote areas where equivalent environmental benefits can be delivered by Indigenous people.

The Carbon Farming Initiative has the potential to drive development of significant Indigenous businesses across large parts of northern Australia. Interests of some NGOs in purchasing environmental services schemes add to options. Nonetheless, continued public support for Indigenous Rangers, Indigenous Protected Areas and similar programs will be needed to address different federal, state and territory government conservation and resource management objectives and to continue development of new groups and opportunities.

Land, sea and resource management enterprises and employment provide services of enduring value in their own right. Importantly, they also provide entry points and pathways to other opportunity that would otherwise be inaccessible. Support for land, sea and resource management programs should be treated as integral to more diverse employment and workforce development programs.

A scan of other potential livelihoods based on consumptive use of the renewable resources available to Indigenous people identifies many possibilities, but also identifies substantial barriers to their realisation. Chief amongst these is the sheer difficulty of establishing private businesses or obtaining

employment outside the public sector in regions that have limited local economies. Combined with the dominance of biophysical environments that are often unfavourable to orthodox land use, the challenges of operating in remote, infrastructure-poor regions have frequently thwarted Indigenous and non-Indigenous entrepreneurs.

Another important barrier to creation of Indigenous businesses drawing on natural resources is the failure of land rights laws to link rights in renewable resources to rights in land. Rather than working from a position of strength as owners of large land areas, Indigenous landholders again find themselves in the position of mendicants, seeking the commercial access to resources like water, native vegetation, fish and wildlife needed to draw income from ownership of land. Often they lack the financial capital to acquire or develop those resources under prevailing laws governing allocation.

Limited experience of remote and regional Indigenous people in business and paid employment, perhaps associated with particular views of what constitutes an acceptable livelihood also impedes access. Aspirations, so far as they are known, cluster around livelihood activities to which people have had past exposure (e.g. pastoralism) or which permit or facilitate maintenance of obligations to country, family and other kin (e.g. caring for country).

Indigenous landowners should not, however, be consigned solely or primarily to land and sea stewardship roles or niche activities like supply of bush-foods, arts and crafts or cultural tourism, or treated as low cost lessors of land. Many individuals and groups will wish to examine options for mainstream livelihoods on their lands, provided they are not excluded by prior allocation of renewable resources like water and wildlife (including fish).

But present planning frameworks for regional and remote development offer no new pathways to Indigenous livelihoods, whether orthodox or emerging. They often appear as little more than bland restatements of actions already proposed or underway. Many fail to recognise emerging opportunities or to consider how they and more orthodox economic activities can be brought together in productive ways.

No single action or single class of actions is likely to overcome all barriers and accelerate development of rewarding and sustainable Indigenous livelihoods based on renewable resources. Significant issues that will need to be part of any serious and well-considered response from government, Indigenous organisation and the wider north Australian society are readily identified. The most important include:

- resource management laws that recognise commercial rights in resources including water, wildlife and fishes for Indigenous people recovering lands;
- environmental offsets policies and laws that foster provision of services by Indigenous enterprises; incentives for industry to source its offset obligations with Indigenous people;
- development of coherent federal, state and territory policy around payment for environmental services (PES), going beyond carbon to include other classes of resource;
- development of Indigenous business skills and related governance systems around demonstrated land and resource management capability and commitment;
- devolution of formal regulatory and surveillance roles to appropriately skilled and trained local Indigenous groups;

- fostering realistic pathways to employment of the sort recently proposed by Aboriginal Peak Organisations (NT), drawing on interest in land management to encourage entry and skills development that will also be useful in other roles;
- properly-resourced regional development planning based on a commitment to implement the most favourable Indigenous livelihood strategies emerging from such processes;
- investment of Indigenous groups in country-based planning that positions them to take advantage of existing and emerging opportunities, in partnership with other sectors of regional communities; and
- linkage of regional development, Indigenous livelihoods and conservation programs so that they all inform the others and, specifically, require development plans to include environmental management responses and show how they will be funded and, preferably, carried out by Indigenous people.

New Indigenous livelihoods of the sort canvassed here require many of the skills required in jobs presently filled on communities by non-Indigenous staff. Although the reasons for this have been considered from many angles, there may be value in examining these questions more closely on a sample of communities, with a view to implementing strategies to overcome barriers. This would most productively be done in association with other livelihoods development trials.

Many economic and livelihood development options for northern Australia have important implications for water management. Proposals for impoundments will, if implemented, challenge maintenance of river values and of floodplain wetland systems. Scattered, "mosaic" intensification of agriculture to include irrigation will increase extraction of surface and ground-waters and increase pollution risks. Problems in managing invasive plants will increase. Poorly regulated and (un)accounted use of water for mining will add to pressures on the water resource and its management.

Unfortunately incentives for landholders to protect water availability and quality are weak and will be weakened further by uncoupling water rights from land ownership to create efficient water markets. Indigenous landholders who own and manage significant portions of many northern catchments receive no statutory recognition for the value of the water originating in that land, whether through rights of access for commercial use, or payments for environmental services. In addition to change in law, Indigenous people must play major roles in water allocation decisions to protect both economic opportunity and the water dependent cultural and environmental values important to them.

1.1 Principle recommendations

(1) Serious regional development planning involving all levels of government is required to encourage Indigenous livelihoods development.

(2) Land Councils and other relevant Indigenous organisations should participate fully in regional development planning as an essential input to Indigenous livelihoods development.

(3) Support for planning by Government and Indigenous organisations must be backed by commitment to facilitate implementation of favourable livelihood options emerging from the planning process.

(4) Regional development plans should provide context for and link to:
- employment and workforce development programs;
- market-based environmental services purchases by government;
- offset policies;
- regional conservation initiatives, including contributions to larger scale (e.g. corridor) proposals; and
- water allocation processes.

(5) Funding for regional planning should incorporate livelihood development trials to properly tests promising options and offer real prospects of effective implementation; e.g. the pilot study approach agreed for the North Australian Beef Industry Strategy may offer a suitable model.

(6) Local and regional Indigenous organisations should position themselves to take advantage of improved support for regional development through "country-based planning".

(7) Utility of land and sea management work as pathway to other employment and enterprise should be formally recognised in regional development plans, and in related employment and workforce development plans.

(8) Land Councils and equivalent bodies should review processes for analysis and approval of commercial land use agreements to reduce unnecessary complexity, costs and delays.

(9) When sought by Indigenous landholding groups, support should be provided to prepare the equivalent of property management plans for Indigenous land holdings:
- matched to context provided by regional development and conservation plans; and
- to help streamline approvals for development proposals.

(10) In all regional development planning and livelihoods development, Indigenous views of favourable livelihoods and ways of assessing success should influence program or project design and judgments about viability.

(11) Water allocation planning should be strengthened in all jurisdictions to:
- secure meaningful Indigenous participation;
- take context from regional development and conservation plans;
- deal with all significant uses and users, including mining and petroleum exploration and extraction;
- include well-informed analysis of likely development pathways; and
- protect water-dependent cultural and ecological values.

(12) Laws governing access to renewable resources should be reviewed to link title to rights to use renewable resources commercially.

(13) Simplification of law and policy for commercial use of renewable resources, better matched to real sustainability needs, should be initiated in all jurisdictions.

(14) Indigenous organisations and state/territory jurisdictions should seek input to the Department of Regional Australia, Local Government, Arts and Sport (DRALGAS) study of market-based provision of environmental and land management services, to ensure that:
- implications for Indigenous people are fully understood;
- successful public sector programs are not compromised; and

- any tendency to regress to a simplistic single "best" model that does not meet the needs of northern Australia is resisted.

(15) Indigenous organisations should seek support to improve governance systems for regional Indigenous enterprise to cope with increased demand for services (including environmental services) and more frequent interaction with open markets, additional to continued engagement with government programs:
- a substantial cross-jurisdictional study of durable Indigenous business models that successfully manage integration of commercial activity with social and cultural obligations, would be useful; and the
- role of collaborations among smaller Indigenous enterprises and service providers (cooperatives) should be explored to improve capacity to supply reliably and to realise economies of scale.

(16) Indigenous organisations should work with communities on equitable approaches to distribution of benefits from PES schemes that recognise the social value of employment on country.

(17) Governments and Indigenous organisations should work together on devolution of regulatory and associated surveillance, monitoring and evaluation roles:
- particular attention should be paid to fisheries and co-management of wildlife species especially significant to Indigenous people.

(18) Research funding bodies, research agencies and Indigenous organisations should collaborate on better research management processes to ensure that obligations of all parties to livelihoods research and development are well understood.

(19) Governments, Indigenous communities and industry should work together to explore ways of building incentives for private investments in Indigenous enterprise on Indigenous lands.

(20) Support should be sought for systematic development of regional knowledge centres accessible to Indigenous communities under protocols developed to meet their specific needs and obligations. Centres should draw on the capabilities of the National Broadband Network.

(21) Further studies of the benefits of branding and fair trade mechanisms for trade in Indigenous products should be completed, including their relationship to national and international standards in environmental services.

(22) In developing employment pathways, support should be sought from government and NGOs for Indigenous scholarships in natural resource management.

(23) Controls over use of exotic plants (and associated assessments of invasiveness and impacts) should be reviewed and strengthened given the prospect of expansion of improved pastures and biofuels into new areas.

Other recommendations on specific livelihood options and issues are highlighted in Section 8.

2 Introduction

This project is about Indigenous livelihoods. Put simply, it considers how the Indigenous people of north Australia might access new and better ways of making a living: and the actions they and governments might take to facilitate that access. It focuses particularly on the opportunities available in ownership of land and their waters and the renewable resources they provide.

2.1 Background and context

The potential to accelerate development of northern landscapes is a recurring theme in Australian political life and civil society. The most recent renewal of interest was triggered by concerns about the capacity of southern Australia's agricultural systems - and in particular the Murray-Darling Basin - to maintain production for local consumption and export to meet anticipated increases in global food demand. Proponents of accelerated development for the north promote visions of huge tracts of unused land and the potential production from enormous quantities of freshwater now discharging to the sea. These views are challenged by counter-narratives about the repeated failures of large-scale agricultural schemes, coupled with sober assessments of the poor quality of much soil and the practical difficulties and environmental impacts of capturing and using surface waters in land of subdued relief and extraordinarily high rates of evaporation.

In addition to urgings from distant sidelines, there are local imperatives driving interest in northern development. North Australia's remote Indigenous populations are often severely disadvantaged, with low incomes and high unemployment, poor health, failed education systems and communities damaged by variable levels of social dysfunction. Responses to date have mostly been about the essentials: improving basic services like housing, health and education. Such existing industry as does appear in remote locations has a poor record of directing economic benefits to local populations, with much of the benefit from mining and agriculture flowing to other parts of the country (Stoeckl et al. 2011). Initiatives to stimulate sustainable enterprise and employment (livelihoods) and to capture the benefits in remote and regional settings are needed urgently.

In 2009, the Northern Australia Land and Water Taskforce summarised arguments for accelerated agricultural and related development (Ross et al. 2009), drawing on a comprehensive CSIRO-coordinated review of formal scientific knowledge of the biophysical and social environments (CSIRO 2009). Details of that review will not be repeated here, but it is perhaps worth summarising its critical features to provide context for consideration of Indigenous livelihoods. Arguably the most important issues for Indigenous livelihoods are:

- developments requiring significant modification of the landscape or substantial extraction of renewable natural resources always confront tradeoffs, even in relatively undeveloped regions;
- cumulatively significant areas of soils suitable for irrigated or rain-fed agriculture exist but are scattered in mosaics rather than large, uniformly favourable tracts of country; most of the region lacks suitable combinations of soils and water for broad-scale agriculture;
- options exist for productive livelihoods in delivery of ecosystem services and tourism that do not depend on major modification of landscapes or ecosystem processes;
- recognition of tradeoffs does not presently capture Indigenous views of values that demand protection nor the nature and position of acceptable tradeoffs; and

- in many parts of north Australia, existing Indigenous livelihoods do not depend entirely on monetary exchange and those aspects of livelihoods should not be compromised.

And in regard to water, connected arguments are:

- there is no waste water: runoff supports wetlands, estuaries and other coastal systems that are highly productive and support existing livelihoods, so in addition to socioeconomic benefits, redirection of water to other uses always has social, economic and environmental costs; and
- the volume of water realistically available for agricultural or mining use is constrained - by these tradeoffs and topography poorly suited to impoundment - to a small proportion of the apparently available volumes.

Based on such considerations and projections of existing trends, the Taskforce drew broad conclusions about the type and scale of plausible development options, expressed as a vision for 2030. The Taskforce's vision saw about a 40% increase in the value of agricultural production, chiefly in the pastoral industry, supplemented by relatively modest potential for increases in irrigated agriculture in patchily distributed mosaics rather than major broad-acre developments. They projected a substantial shift from employment in the government sector to other, chiefly non-agricultural industries. Tourism, mining, marine-based and environmental service industries are projected to account for 90 per cent of the gross value of production, compared with approximately 60 per cent in 2000.

This summary of the Task Force's considered view of the future of the north provides essential perspective for identification and analysis of options for livelihoods, but perhaps warrants some further discussion to show why it is necessary to do more than wait for that future to arrive.

2.2 Indigenous employment and enterprise

Over much of northern Australian land mass, especially outside the major centres, most of the population is Indigenous. The proportion will continue to increase (Taylor et al 2006) over the time horizon adopted for the Task Force report. Those demographic realities increase the obligation to seek creative solutions to existing unacceptably high levels of socio-economic disadvantage.

Finding solutions is rendered more difficult by the fact that many centres in which services are now aggregated were established primarily to administer Aboriginal welfare policies through the state or missions. They had no economic base when established and many have none now (e.g. McCrae-Williams and Gerritsen 2010) except as centres for delivery of basic services. In the Northern Territory, some of these centres have been ambitiously designated as "growth towns"[1], despite an absence of plausible economic development pathways.

2.2.1 Employment

The Top End of the Northern Territory, Cape York, Gulf of Carpentaria and Kimberley are sites of entrenched Indigenous socioeconomic disadvantage (Biddle 2009). In the established economies of the major centres in these regions, Indigenous unemployment rates are much higher and labour force participation rates lower than in the non-Indigenous population. Indigenous people with lower educational attainments are outcompeted in these labour markets (Welters 2010) or are often

[1] http://www.growingnt.nt.gov.au/growing_centres/growth_towns.html

unable to seek employment due to poor health or obligations to care for others (Hunter and Gray 2012).

Outside major centres, labour force participation rates can be extraordinarily low (e.g. 16.7% in 2006 at Wadeye in the Northern Territory). Where participation rates are higher (e.g. 75.8% in Hope Vale in Cape York) most employment is in the public sector (93.8%). Private sector presence is negligible (Welters 2010). Here the lack of labour demand exacerbates a mismatch between Indigenous skills and market requirements. In a conclusion that applies to many other areas of the tropical north, Taylor (2003) argues that "the Northern Territory has a serious economic development problem—around one fifth of its resident adult population remains impoverished, structurally detached from the labour market, and ill-equipped to engage with it".

Rapid and sustained improvement will be challenging, given the demography of remote and regional Indigenous populations. In the absence of positive regional development interventions, increase in the Indigenous population of working age in remote and very remote areas is likely to outstrip plausible rates of job creation (Taylor 2003; Biddle et al. 2008). Entry of major developments like mining into regional and remote settings will not lead automatically to increased employment because of skills gaps and the trend for companies to import many components of their workforce through fly-in fly-out arrangements (Cheshire 2010). Programs to increase local employment in major mines are getting better and now have some impact, but the total numbers involved are too small, benefits too unevenly distributed, and the effects too short term to make enduring differences to local economies (Stanley 2010).

In the absence of major changes in approaches to regional development and employment strategies, disengagement of large proportions of the Indigenous population from labour markets appears likely to continue (Welters 2010).

2.2.2 Enterprise

Little is known about Indigenous-owned and managed businesses in Australia (ATO 2009). Nationally about 6% of employed Indigenous people run their own businesses, about 1/3rd the non-Indigenous rate. Only 11% of self-employed Indigenous people were outside major cities and it is likely that fewer still would be operating in remote locations.

The need for better information on Indigenous business has been recognised. The Australian Bureau of Statistics has recently completed a process to define Indigenous small to medium-sized businesses (ABS 2012) with a view to collecting statistics based on its definitions at some future time. It is worth noting that the definitions will exclude most community organisations because they "are not part of the market sector".

Failure rates of smaller businesses can be high (Bickerdyke et al. 2000), but there has been no systematic examination of whether businesses in remote areas or operated by people identifying themselves as Indigenous are more or less likely to fail. There are suggestions that prejudice against Indigenous businesses may compromise success (Foley 2006; ATO 2009).

Irrespective of rates of small business failure, promoting creation of new Indigenous businesses as a significant pathway to greatly increased Indigenous engagement with the mainstream economy is an optimistic notion, given that entrepreneurs will face all of the challenges already outlined for those seeking employment, plus an array of business financing, regulatory and operational hurdles. A

spontaneous irruption of sustainable Indigenous (or non-Indigenous) businesses is improbable, given the present state of regional and remote economies and despite the resources boom which has in many situations failed to reach marginalised groups (Langton and Mazel 2008).

2.3 Land, waters and renewable resources

The scientific summaries supporting the Task Force report (see Appendix 1 for references) provide rich detail on the natural resources of northern Australia. That detail will not be repeated here, but a few features warrant re-emphasis from a livelihoods perspective.

First, much of the landscape is structurally intact. Relatively little land has been cleared for agriculture or other purposes. State and territory jurisdictions now seek to contain broad-scale land clearing, although scope remains for removal of native vegetation for agricultural development on favourable sites with relatively low conservation values.

Second, rivers are mostly unregulated and in relatively good condition. Substantial degradation has occurred in a few sites associated with irrigated agriculture, overgrazing and urban development. Constructing and operating large impoundments is complicated by often unfavourable topography and high evaporation rates, although there are apparently serious proposals at a few suitable sites, with a least one in each political jurisdiction.

Although it is possible to identify a few sites where development is more likely, there are no compelling candidates for very large nodes of new agricultural development. Instead, more dispersed, patchy intensification of use is predicted where conjunctions of water (often groundwater), suitable soils and infrastructure (for access) are particularly favourable. Similarly, mining developments will be patchily distributed, although for some resource types (e.g. coal) the operational footprint might extend over quite large areas (e.g. Canning Basin, WA) or cumulative impacts from numerous individual mines (e.g. acid drainage from hard rock mines in the Pine Creek Geosyncline NT) have the potential to affect water resources over larger areas.

Nonetheless, over the 20 year horizon adopted by the Task Force, dramatic shifts in the structure and gross function of most landscapes appear unlikely. Aside from the prospect of a number of new large impoundments, structural changes are expected to be incremental and mostly localised, as they were during much of the 20th century.

Past incremental change, even though it has left most of the gross biophysical structure in place, has nonetheless been damaging. There has been diffuse and pervasive loss of some function, arguably through weak management of ubiquitous pressures like wildfire, grazing and invasive plants and animals. Key resources for wildlife have been run down, leading to declines in biodiversity (Franklin 1999; Franklin et al. 2005; Whitehead 2000; Whitehead et al. 2002; Woinarski et al. 2007). Adding additional sets of dispersed pressures, even if relatively benign in terms of their effects on gross landscape structure, risk adding to the accumulation of decades of gradual decline.

The north therefore faces two key natural resource management challenges in its quest for environmentally sustainable development: to arrest existing pressures on landscape function, and to design new developments to avoid too much additional pressure. But an essential social obligation, to support Indigenous people to improve their well-being by participating in shaping and delivering stronger northern futures, should not be compromised in meeting these challenges.

Identifying and finding pathways to better and more sustainable Indigenous livelihoods could make a critical contribution to reconciling the inevitable tension between economic growth and environmental and natural resource condition. But the pathways to a healthy biophysical and social resolution are far from obvious: options are contested on both ideological and practical grounds. Concerted, systematic efforts will be needed to secure sustainable northern and Indigenous economic development.

2.4 Project genesis and context

The work of the Northern Taskforce set out some of the areas where that systematic effort would be needed. Their report was accompanied by commitments to undertake further assessments of opportunity and constraint. The resultant Northern Australia Water Futures Assessment (NAWFA) comprises four programs: water resources (sustainable yields); ecological (focusing on high conservation value wetland sites); cultural and social (values and practices relating to water); and a knowledge base (providing ready access to information).

The Cultural and Social Program includes a project titled **Identifying tools and processes to capture/articulate Indigenous social and economic aspirations with respect to water in northern Australia.** This project will develop knowledge and understanding of Indigenous social, cultural and economic aspirations with respect to land and water management and development in northern Australia. This information will feed into government initiatives that will inform policy-setting. The project consists of four connected sub-projects.

- A **background paper** on sustainable Indigenous livelihoods which will include north Australian Indigenous peoples' aspirations for economic development and identification of opportunities and strategies that will contribute to achieving these aspirations. The paper will feed into the first Indigenous Sustainable Development Forum, run by the Office of Northern Australia.
- An **Indigenous Livelihood Implementation Strategy and a Research and Development Agenda**. Both of these will build on the background paper to develop practical strategies to support and develop sustainable Indigenous livelihoods into the future.
- **Case studies** which will evaluate the barriers and opportunities for a whole of government approach to policy development, program management and service delivery with respect to Indigenous livelihoods.
- Two case studies in each of the Top End and Cape York regions which will capture Indigenous knowledge of water management, use and means and test the application of these in planning processes and policy decision making.

This project pursues the task to prepare the **Background Paper** to inform preparation of an Indigenous Livelihood Implementation Strategy and a Research and Development Agenda. In particular, it lays out an approach to review of relevant literature, the array of literature to be reviewed, tentative conclusions from that review, important questions, and some recommendations for consideration by government and Indigenous organisations active in development of livelihoods.

3 Project Scope

The project description, as contracted, is to:

> ***Project Objective:***
> *Prepare a background paper on sustainable Indigenous livelihoods that will form the foundation to regional ONA forums. The paper will draw together existing business models, past research experience and Indigenous perspectives documented in other research, especially TRaCK Theme 6 work.*

The paper should support:

> ***Project Outcomes:***
> - *an enhanced understanding of north Australian Indigenous peoples' aspirations for economic development driven by their values, perceptions and priorities in natural resource management;*
> - *establishment of the range of economic development opportunities that could contribute to sustainable Indigenous livelihoods in natural resource management;*
> - *better knowledge on the inputs required to achieve a balanced triple bottom line outcome in northern Australian development i.e. ensuring socio-cultural aspects receive requisite recognition;*
> - *development of practical strategies to contribute to sustainable Indigenous livelihoods in natural resource management;*
> - *identification of research needs to support sustainable Indigenous livelihoods in natural resource management; and*
> - *input to the creation of innovative government policy to support sustainable Indigenous livelihoods in natural resource management.*

To inform and develop arguments, this paper:

(1) collates and reviews relevant literature on livelihoods in general and Indigenous livelihoods in northern Australia in particular;
(2) sketches, drawing on that literature, a basic conceptual frame for describing and analysing livelihood options;
(3) describes the assets available to Indigenous people to support livelihoods and the potential they offer;
(4) identifies the array of activities that can generate livelihoods by drawing on those assets;
(5) describes the opportunities and constraints on engagement in those activities, including issues for sustainability;
(6) outlines what is known of the aspirations of Indigenous people for livelihoods development;
(7) proposes responses to aspirations, opportunities and constraints, with particular emphasis on options available to governments and Indigenous organisations to facilitate livelihoods development;
(8) makes recommendations for consideration in other components of the Cultural and Social Program, especially the sub-project for development of an Indigenous Livelihood Implementation Strategy and a Research and Development Agenda;
(9) makes recommendations for consideration in forums organised by the Office of Northern Australia; and

(10) consolidates all of the above in this discussion paper raising the principal issues and summarising options for future action by Government, Indigenous organisations and other interests.

The approaches I adopt for these tasks and influences on them are set out below.

3.1 Approach to literature review

The fundamental goal of NAWFA's Cultural and Social program is to "understand the socio-cultural values, beliefs and practices associated with water and how they may be affected by changes in water availability". The assumptions made in responding to this brief are that:

(1) interest relates primarily to freshwaters and hence to non-marine environments but does not exclude important interactions; and
(2) the phrase "associated with water" is interpreted broadly to include any value, belief or practice potentially affected by freshwater availability and motivating or requiring activities affecting water availability (including effects of variation in water quality).

The description of the overarching **tools and processes** project refers to "Indigenous social, cultural and economic aspirations with respect to land and water management and development …". The reference to land recognises the fundamental importance of interactions between land and water management demonstrated by formal science. It also recognises the Indigenous worldview: that all elements of natural systems are inherently linked and can only meaningfully be considered and managed together. The language used requires two other assumptions to define the task clearly, namely:

(1) aspirations extend beyond desires for economic benefits - to include meeting social, cultural and economic obligations and responsibilities imposed under statute law and customary law and practice; and
(2) most types of land management and development actions fall within the brief because any land management action on a significant scale has the potential to affect water availability or quality in ways that are likely to be of interest to Indigenous people.

The sub-project's aim to identify and discuss "sustainable Indigenous livelihoods and …. aspirations for economic development and …. (contributing) opportunities and strategies …." does not explicitly limit interest to water-based livelihoods. Given the context just established, livelihoods that have a readily identifiable dependence on or impact on water should clearly be emphasised. But as already noted, any livelihood that influences patterns of natural resource use and land use arguably will have some sort of effect on water and cannot be entirely ignored.

The review of relevant literature and ultimately the background paper will therefore touch on a wide array of livelihoods, most often based on use or management of renewable natural resources (see Table 1 and related text below), but including some with apparently tenuous connections to water. Whilst this interpretation will complicate and enlarge the task, it has the virtues of ensuring (1) that considerations of livelihood options are comprehensive and (2) require justification to exclude from consideration any option identified as important by Indigenous people.

Moreover, I do not intentionally exclude from consideration any livelihood based on natural resources with the exception of mining, which is considered outside the scope of this project. Mining

is, however, considered as a potential source of support for livelihoods based on other parts of the natural resource base and their proper management.

Relevant literature was identified as:

- material held and provided by the North Australian Indigenous Land and Sea Management Alliance (NAILSMA), particularly relating to Indigenous aspirations for livelihoods development;
- Google searches for annual reports or other statements from north Indigenous organisations including local resource agencies, arts centres, land councils, Indigenous associations, and business development groups;
- Google searches for other "grey" literature using search terms "Indigenous, livelihoods, employment, and enterprise" individually and in various combinations;
- search of ISI Web of Knowledge using similar search terms plus an array of terms for all of the livelihood activities identified (e.g. aquaculture);
- browsing recent issues of relevant journals like *Community Development Journal*, *Journal of Rural Studies* and *Development and Change*;
- records held by the author; and
- in general, literature published in the last 15 years was considered.

3.2 Defining livelihoods

So far I have assumed a common understanding of a livelihood as a "means of maintaining life" (Delbridge et al 1997). To reduce ambiguity, bound the scope of the task and facilitate analysis, a clearer definition connected to some sort of conceptual framework is needed, supplementing statements of the "means of maintaining life" that are excluded from consideration.

The Sustainable Livelihoods Approach (SLA: see DFID 2001) and associated framework provides a useful starting point. For a definition of livelihoods as used in the SLA, I use a variant put by Ellis (2000, p. 10):

> *A **livelihood** comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by (an) individual or household.*

This definition has the virtue of laying out a framework for considering the means of earning a living: in particular, the assets on which they draw, which is particularly well suited to the NAWFA context with its focus on a particular natural asset in water. The definition also draws attention to the role of institutions in determining access to assets, a factor of particular interest in current and emerging policy in water management, including rights of Indigenous people. I have already used some of the language used in this definition in framing the tasks required to prepare the background paper.

Although less obviously embraced by this definition, incomes gained by permitting others to use assets in which Indigenous people have formal rights, like land ownership and (potentially) water allocation and water access entitlements, will also be considered as contributing to livelihoods. Examples would include the lease of land or temporary trades of water rights or assignment of rights to others to take living resources (e.g. timber or wildlife) from Indigenous lands. Receipt of royalties for mineral extraction is not, however, considered as a livelihood.

I have assumed that reference to livelihoods in this sub-project could embrace means of gaining a living other than earning a cash income, and hence recognise customary activities like harvest of plants and animals from the wild as important contributors to local economies and quality of life (Altman 2003; 2007). Nonetheless, despite the potential inclusiveness of the term livelihood, it seems to me that those framing the program were more interested in orthodox economic development and hence mainstream, cash-based livelihoods.

I therefore do not deal directly with the variety or scale of customary livelihoods. This focus on livelihoods that connect people directly with the cash economy provides convenient simplification for the present purpose. But this decision should not be taken to imply that customary livelihoods are regarded as less important. They develop and maintain knowledge and skills, embody connection with country, and underpin Indigenous engagement in the hybrid economy of many remote regions (Altman 2001). Motivations for many Indigenous people to work on country may be more strongly related to social and cultural obligations to ancestors and to land, rather than receiving individual payments (McCrae-Williams and Gerritsen 2010).

3.3 The Sustainable Livelihoods Approach (SLA)

The sustainable livelihoods framework (DFID 2001) is frequently used to organise consideration of issues in livelihoods development. It was developed principally as a tool for organising policy analysis for community development, and informing decisions of donors regarding choice and deployment of investments to achieve optimal benefits. It provides context for systematic exploration of community and individual aspirations and ideas, and constraints and opportunities when community goals and preferences are known. It provides a common language for different disciplines to collaborate in analysis and action.

The framework is often summarised in diagrams, but for the present purpose is perhaps more accessible as a simple text-based summary. Table 1, also taken and modified from Ellis (2000), outlines inter-relationships among assets, activities and factors that influence access to and the ability to deploy assets to generate livelihoods. Those components of the framework highlighted will be the foci of this paper.

The SLA is useful principally as a framework for identifying all of the matters that need to be considered in developing ideas about livelihood opportunities. As indicated in Table 1, it is outside the scope of this review to seek to deal with every issue with some potential to influence livelihoods, but the use of the framework identifies those areas that have been considered as well being clear about those that have not.

Table 1: Detail of components of livelihoods to be considered in a north Australian Indigenous context. NR=natural resources. Modified from Ellis (2000). Shaded cells show the areas of focus for this review, although other issues are touched on as necessary (outlined).

Platform	**Access modified by**	**In context of**	**Resulting in**	**Composed of**	**With effects on**
Assets (capital)	***Social relations***	***Trends***		***NR-based activities***	***Livelihood security***
natural human social financial physical	gender class age ethnicity	population migration technological change relative prices macro policy national economy world economy	***Livelihood Strategies***	hunting and gathering commercial harvest cultivation (food and other) livestock arts and crafts environmental services transfers (royalties)	income level income stability seasonality degree of risk
	Institutions	***Shocks***		***Non-NR-based activities***	***Environmental sustainability***
	rules and customs land tenure markets in practice	drought flood pests diseases conflict policy reversals		rural trade other services rural manufacture remittances welfare other transfers (royalties)	soil condition landscape stability water availability & quality rangeland forests biodiversity
	Organisations				
	associations NGOs local government state agencies federal agencies				

3.3.1 Assets

Given a focus on natural resource-based livelihoods, literature relating to the nature and quality of the natural capital of northern Australia and the contribution has or could make to Indigenous livelihoods is central, as it was for the Northern Australia Land and Water Task Force report. Exploration of important features of the natural resource base draws on the Task Force report and the accompanying science reports from CSIRO (Ross et al 2009; CSIRO 2009a,b).

Human and social capitals are also important foci, because they determine ability to take up existing livelihoods or develop new ones. Social capital is particularly critical in the context of communal title to much Indigenous land. Access to natural capital often depends on collaboration and formal and informal agreement among groups with ownership or obligations for the management of land and its resources. Traditional knowledge and practice are also valuable cultural assets in creating and sustaining some livelihoods (e.g. Garde et al. 2009).

Physical and financial capitals are lesser foci and usually considered in conjunction with human and social capital, or where their absence presents a particularly significant obstacle to useful livelihood options.

3.3.2 Activities

Activities deploy assets to create or maintain livelihoods. I do not attempt to deal with all of the classes of activities through which Indigenous people may seek livelihoods. Only those that can be construed as based on renewable natural resources (Table 1), defined to include land, waters, plants and animals, are considered. Employment in mining and other extractive activities are treated not as a source of livelihoods relevant to this work, but recognised as activities with the potential to affect (both positively and negatively) the availability and status of assets available to pursue other livelihoods. Livelihoods in health or education, local government services, transport and construction and maintenance of built infrastructure are not considered directly. And as already noted, customary activity is considered chiefly in relation to other cash-based livelihoods.

3.3.3 Access

In the context of Indigenous livelihoods, institutions affecting access to and ability to deploy assets operate in two distinct domains: the formal and the customary.

Federal, state, and territory law and local government bylaws can promote, discourage or completely deny access to some potential livelihoods. Laws relating to use of wildlife provide clear examples (Whitehead 2000), where, for example, successive federal Minister's have exercised discretion available under federal law to prevent hunting of crocodiles for trophy fees[2] on Indigenous land in the Northern Territory. Customary law and norms also strongly influence the rights and obligations of Indigenous people in the use and management of natural resources and may support or inhibit some livelihood options. Understanding the influence of customary obligations and roles on attitudes to and ways of benefiting from some livelihood options will be an important component of the review. As noted earlier, cultural heritage can also make important positive contributions to livelihoods and should be treated as a key asset. Both the formal and customary domains are considered.

[2] See for example, http://www.environment.gov.au/minister/archive/env/2005/mr06oct05.html

Access is also determined by the capacity of individuals and groups to take up options. Regulatory regimes, finances, formal and informal policy settings, and political concerns can all strongly influence access to opportunity. These issues are considered primarily as context for other drivers (natural, human and social capital); although it is acknowledged that they can be powerful determinants of accessibility of opportunity (Scoones 2009).

3.4 Categorisation of livelihood activities

Categorisation of livelihood activities is potentially useful to help explore their interactions with each other and with the natural resource base, including water. The categorisation I deploy here is based on:

- the natural asset that creates the opportunity: here I break natural assets into: landscapes and landforms; living resources (biological diversity); water; native vegetation and carbon;
- the types of services and benefits provided by those natural assets, using terminology drawn from the Millennium Ecosystem Assessment (2005); and
- the human and social capital that positions Indigenous people to draw livelihoods from those assets: knowledge and skills; formal (legal) rights and institutions.

To summarise the range of interaction types, I follow Courtney et al (2006) but modify their language. I identify three classes of activity that vary in the extent to which they actively maintain, consume or depend on non-consumptive use of natural and cultural assets (human and social capital).

(1) **Custodial** - actions to care for and secure the good condition of assets and protect the interests of their own and future generations in them:

- examples are management of national parks or other protected lands or delivery of environmental services, including payment for ecosystem services; and
- custodial roles for cultural assets include protection of culturally important (sacred) sites or arts sites, and transmission of knowledge and custom.

(2) **Consumptive** - where assets are used directly and deliberately to extract benefits:

- may include taking wildlife plants and animals) from non-intensively-managed lands or waters for commercial use; and
- pastoralism, horticulture or other farming using natural capital (vegetation, landscapes and soils) for commercial production, usually in more intensively managed systems.

(3) **Contingent** - assets are not consumed or actively managed for the livelihood purpose, but the livelihood depends on or is improved by assets in good condition:

- wildlife tourism is a generally non-consumptive use of natural capital that is contingent on or enhanced by healthy natural heritage that may not be actively managed for that purpose; and
- tourism based on interest in different cultures may generate livelihoods contingent on opportunities to interact with strong, distinctive but uncontrived expressions of culture, such as customary land management.

Benefits of adding the nature of the interaction with the natural assets to a system of livelihood classification were threefold. First, encompassing all the ways people interact with natural assets promoted identification of the full array of livelihoods, ranging from those with relatively weak to very strong dependence. Second, by covering livelihoods based on intangible through to consumptive use of assets, it fostered explicit consideration of the likelihood of change in the status of the asset through the livelihood activity. Third, it promoted consideration of interactions among livelihood types by making explicit the connection of livelihoods of all types to cultural assets and hence human and social capital. In short, it encouraged consideration of tradeoffs inherent in the choices of favoured livelihoods and their assembly into individual, household or community-level livelihood strategies. A consideration of tradeoffs lies at the heart of the NAWFA's Cultural and Social Program, within which this subproject is positioned.

3.5 Indigenous culture, livelihoods and economic aspirations

The NAWFA program, project and sub-project descriptions make repeated references to culture (e.g. socio-cultural values, beliefs and practices, cultural aspirations) without defining terms. I understand culture to be "the system of shared beliefs, values, customs, behaviours, and artefacts that members of society use to cope with their world and with one another and which are transmitted from generation to generation through learning" (Bates and Plog 1990).

I attempt to understand and articulate the influence that Indigenous culture may exert on the way options for economic development are received and acted on, but acknowledge that my treatment is likely to be imperfect. I argue that strong commitment to cultural norms should not be treated as primarily an obstacle to participation in (or access to) the contemporary mainstream economy or the development of new enterprise and economic opportunity. Various aspects of cultural preference and expression of difference may be important assets in design and achievement of improved livelihoods (Daskon and Binns 2009). Dockery (2010) summarises evidence for positive associations between strength of attachment to traditional culture and various socio-economic indicators, including employment. Culture may be part of the solution to Indigenous disadvantage.

Promoting Indigenous economic development in ways that emphasise compatibility of economic aspirations with - and draw on the strengths of - Indigenous culture have been articulated under the rubric of a "culture-based economy" (Armstrong et al. 2006). Critical features of this concept are that it embraces existing mainstream economic opportunities based on use or management of lands, waters and natural resources, as well entirely new or emerging options in delivery of environmental services.

Armstrong and Morrison (2007) outline the concept as encompassing:

- definition and protection of values important to Indigenous people;
- rejection of limitations on Indigenous capacity to engage with the contemporary economy based on external notions of customary beliefs and behaviours;
- commitment to take advantage of mainstream opportunities while maintaining the cultural base of Indigenous people as custodians of large areas of land and their resources;
- engagement in existing industries under terms acceptable to Indigenous people; and
- engagement in new or emerging industries from a position of strength, whereby Indigenous people and their interests drive and shape development, particularly on the Indigenous land estate.

This and other statements of Indigenous views of relationships between cultural values, natural resources and economic development constitute important expressions of the aspirations of Indigenous people "with respect to land and water management and development". Accordingly, in pursuing this aspect of the project I have sought out broad statements of interest from Indigenous individuals and groups, as well as publicly available statements of specific livelihood goals. I also had access to the material generated from workshops conducted in the sub-project for an **Indigenous Livelihood Implementation Strategy and a Research and Development Agenda**.

4 Livelihood options

A great number and diversity of livelihoods can be built on use of lands and seas and the renewable resources they support.

4.1 Description of assets

The North Australian Land and Water Taskforce and its associated studies have described the natural resources of northern Australia (see Attachment 1 for a full list of reports) and those details will not be repeated here. However, it is worth noting that their treatment necessarily emphasised the mainstream and the large scale. In addition to that very orthodox treatment, emerging options in payments for emissions abatement and carbon storage, biodiversity conservation, water availability and quality and other ecosystem services were mentioned but not substantially developed, aside from the potential for abatement of methane and nitrous oxide emissions from fire (Heckbert et al. 2009) which omitted options for increase sequestration through improved use of savanna fire (Murphy et al. 2009). Many of these sorts of options depend on the better use of natural capital in native vegetation, functionally and structurally undamaged landscapes, and human and social capital through customary knowledge and skills, rather than on substitution for other mainstream activities.

In the broad, the principal assets most readily deployable by Indigenous people for developing livelihoods in north Australia are:

- ownership of large areas of land (natural capital);
- native title interests in much of the north Australian land mass, coasts and seas (natural capital);
- deep knowledge of lands and seas and their resources (human capital);
- long experience and high levels of skill in managing critical aspects of northern lands and seas (human and social capital); and
- a strong culture with enduring norms and institutions to support livelihoods based on use and management of natural resources (human and social capital).

More detailed consideration of the assets for realising livelihood options is picked up through identification and discussion of classes of livelihood activities, rather than attempting a separate comprehensive cataloguing of individual assets.

4.2 Livelihood activities

An array of potential livelihood activities drawing on assets available to Indigenous people identified from Australian and international literature is summarised in Tables 2 and 3. In addition to the available literature, identification of options was based on personal knowledge of opportunities, including aspirations of some groups. A summary of statements of Indigenous aspirations in livelihoods is given in Section 5 *Indigenous livelihoods aspirations* below.

5 Indigenous livelihoods aspirations

Indigenous aspirations for livelihoods have not been comprehensively catalogued across northern Australia in this or any other project, although individual communities have expressed views in particular contexts. And even if such work had been systematically and comprehensively done, its value would also depend on the extent to which informants themselves had or were offered information about the array of opportunities. And that array will itself change through time with shifts in technology, markets and attitudes to resource use.

Acknowledging those constraints, I consider here several sources of guidance on aspirations. First, statements from a few individual Indigenous leaders and their organisations. Second, formal statements from forums of Indigenous people brought together by their leaders, government, or NGOs. Third, some views put in workshops and other gatherings of Indigenous people about aspirations of their individual communities. This treatment is necessarily incomplete, because many groups do not publicly report their aspirations and concerns; but it is perhaps sufficient to provide some sense of direction and a preliminary base for comparison of the list of livelihoods outlined above (Table 2) with expressed Indigenous interests.

5.1 Statements from Indigenous leaders and organisations

North Australia's Indigenous communities have been characterised as land rich but dirt poor (Vanstone 2005). Some Indigenous leaders see the land as a source of incomes to overcome disadvantage. Kim Hill, Chief Executive of the Northern Land Council, argues that by "value adding, not just selling, the rich resources … (on) … Aboriginal lands and seas, Aboriginal peoples can build their own economies, create their own jobs and, most importantly, secure their own futures" (NLC 2011). Others are less convinced, regarding the land recovered and its natural resource base as incapable of creating viable local economies. Or as encouraging continued state involvement in local futures in ways that perpetuate dependency and disadvantage.

Noel Pearson of the Cape York Institute for Policy and Leadership takes the view that welfare systems as presently available to Indigenous communities are "poison" (Pearson 1999). He cites descriptions of publicly-funded land management or conservation programs for Indigenous people as "green welfare" (Pearson 2010), implying that they are also poisonous. He argues (Pearson 2005) that Indigenous people should be prepared to move from homelands to access work but to return or contribute financially to their communities: to "orbit", with homelands as the emotional and spiritual centre. This proposition challenges those who argue that land, sea and natural resource management in savannas require a continuous human presence (Yibarbuk and Cooke 2001; Yibarbuk et al. 2001; Whitehead et al 2002). These apparently competing positions raise important questions about the place of livelihoods based on management of natural resources in securing Indigenous well-being.

In a discussion of options for payment of ecosystem services, Winer et al. (2011) provide a detailed statement of the Cape York Institute's concerns about present approaches to natural resource-based livelihoods. The core of that argument relates to over-regulation of land use, weak or no property rights in resources associated with land, and approaches to regulation that transfer the benefits of well-managed Indigenous lands to society, without compensation. The most obvious example of the last issue is Australia's strategy to meet Kyoto targets through state and territory legislation that

prevents or inhibits land clearing for agricultural development. Recognition of reduced emissions from land use change (the "Australia clause" in the Kyoto Protocol: Hohne et al. 2007) enabled emitters of greenhouse gases to maintain their use of fossil fuels at no additional cost, arguably at the expense of the rights of Indigenous landholders to develop their recently-recovered land or to benefit from decisions to avoid deforestation.

At the risk of over-simplification, the position put appears to be that Indigenous landowners should be able to make choices about livelihoods based on lands and their natural resources, free of constraints that are unfair because they affect Indigenous people disproportionately, take too little account of the history of dispossession and oppression, or are built on unreasonable assumptions about the most appropriate use of Indigenous lands. Government programs to support management of land for conservation goals are seen to be clumsily constructed and implemented; and to disempower landowners.

These sorts of views of misapplication of policy framed for over-developed southern Australia and poor program design are not unique (e.g. Whitehead and Storrs 2003; Altman and Whitehead 2003). However, the apparent conclusion - that engagement with government land management programs is inherently and irredeemably disabling - is less widely shared. There is a clear CYI preference for uses and livelihoods in the mainstream ("real") economy or, in the case of the emerging green economy (see UNCTAD 2011), for services purchased by the private sector (CYI 2011).

In a submission to a federal government review of remote participation and employment services[3], an alliance of peak Indigenous organisations in the Northern Territory, comprising land councils, legal and medical services, has set out detailed approaches to livelihoods (APONT 2011a). They put a model for remote employment and economic participation starting from the position that "the best way to inspire participation and engagement is by creating and supporting sustainable livelihoods for Aboriginal people in the places where they live".

They propose a three tiered approach, which recognises significant educational disadvantage in remote areas and so requires access to transitional pathways. The first tier is an entry point offering basic opportunities. At this level, participants develop and maintain formative skills and experience for mainstream work. A basic level of income and activity support is provided. In the second tier, participants and providers work together to design a livelihood pathway tailored to the participant's aspirations and capabilities. Participants are matched to established or emerging employment and enterprise opportunities in the local economy. A higher level of income and activity support is provided subject to achievement of a set of agreed skill-based goals. The third tier engages participants directly in the employment or enterprise opportunity identified in their livelihood pathway. There is an initial period of intensive support with government, employers and enterprises combining to contribute to the income.

People are encouraged to enter, move through and eventually exit the scheme to take up mainstream employment. The model depends on creation of social enterprise organisations**,** funded through a mix of public support and incentive funding, to support people moving along the pathway. It assumes ongoing public investment in both labour supply (education and training) and labour demand (government purchase of services), acknowledging that "investment of private capital in many parts of remote Australia will be limited in the foreseeable future". Similarly, traditional

[3] see http://www.deewr.gov.au/Employment/Consultation/Pages/RemoteServicingReviewConsultations.aspx

owners in the Carpentaria Land Council (CLCAC 2010) expressed "overwhelming support" for declaration of wild rivers on their country and so acknowledged a role for government in creating demand for some livelihoods.

Acceptance of an ongoing positive role for the state is at odds with the Cape York Institute's disquiet about state involvement in creation and support of local livelihoods. APONT's view also differs in detail in concluding that mobility in search of employment "faces limited prospects" and that emphasis should remain on developing local opportunity and capability.

Livelihoods based on land and natural resource management, however funded, are well matched to the APONT "pathways" model because entry and useful contributions may not require high levels of numeracy and literacy (Section 8.17 *Pathways*). In northern Australia, those with land management skills and the authority to transfer them to others are often older people with little formal education. But facilitating their contribution to the local economy, to identity, to self esteem and to self-reliance is important. They can support others to enter and negotiate the pathways initially as land managers, but with the option of later taking on a wider variety of roles. Land and natural resource management should not be the only or necessarily lifelong employment. But land and sea management can perhaps provide an essential entry point for many (Whitehead 2002).

Mick Dodson (with Diane Smith; 2003) also raises weak or absent property rights in resources for commercial use as obstacles to Indigenous economic development and livelihoods. Poorly coordinated and inefficiently designed federal, state and territory government programs are described as a grant-funding "drip-feed, overloaded with inappropriate program objectives and performance indicators, and onerous 'upwards accountability' burdens". Indigenous organisations are hampered by "unworkable or externally imposed structures and constitutions".

The result is that Indigenous entrepreneurs and their communities have direct control over very few of the levers needed to build viable local economies. Approaches that leave all of the important decisions to government are fundamentally at odds with decades of national and international research showing that effective governance systems should provide local control over those issues that require local knowledge and authority for resolution. Present arrangements in regard to natural resources, despite the long history of Indigenous management of them and their fundamental place in Indigenous culture, too often disempower and so perpetuate dependence.

Patrick Dodson (2009), in a Kimberley Institute submission on water management, starts from the position that northern Australia will not repeat the large scale non-Indigenous settlement that shaped southern Australia. Good government, sound nation building and sustainable use of northern Australian lands and waters calls for a governance regime reflecting the social, cultural and environmental reality. That is, a strongly Indigenous reality.

He proposes a water reserve within the consumptive pool of water allocations for Indigenous economic development. This sort of proposal is consistent with arguments put by others about the failure of policy to deal effectively with property rights or Indigenous interests in the control of resources needed to encourage enterprise and other engagement with the mainstream economy.

Peter Yu has expressed views on livelihoods issues in conjunction with the creation and operations of NAILSMA. He urges development of a culture-based economy (Yu 2007; Yu et al 2008; Section 3.5 *Indigenous culture, livelihoods and economic aspirations* above), for pursuit of emerging economic opportunities, including delivery of environmental services, in tandem with mainstream options

matched to community norms, customary interests, skills and capabilities. Land and sea management are areas of highly developed customary interest, knowledge and skill and so should be particularly targeted for development of pathways to commercial opportunity (Armstrong and Morrison 2007).

As Chair of the Northern Task Force, Joe Ross (Ross et al. 2009) endorsed an expanded role for Indigenous north Australians in taking up a "range of economic opportunities … to build on their comparative advantage in providing customary and commercial services on a vast Indigenous estate."

To summarise, there is a determination to engage in the mainstream economy and emerging "green" economy in ways that draws on the strengths of Indigenous culture. Other recurring themes are constraints on opportunity in livelihoods caused by (i) failure to recognise Indigenous rights in resources; (ii) where rights are recognised (in land), disempowering regulatory regimes; (iii) poorly designed and clumsily implemented, top down programs for supporting regional and Indigenous development; and (iv) recognition of the potential utility of land and sea management work, not only in its own right, but as entry to a wider range of opportunity. Reactions to policy weaknesses are uniform in demanding recognition of rights to use resources for wealth creation. But they vary in regard to the role of the state, from apparent concern about any significant supporting role through to interests in an active and substantial ongoing role for government in creating "markets" for labour and services to manage land and resources in remote areas.

5.2 Indigenous forums on natural resource management

A conspicuous development in land management in northern Australia over nearly three decades has been the growth of the Indigenous Caring for Country or Ranger movement (e.g. NLC 2006; Smyth 2011). In some cases these Ranger groups have had no formal government or other institutional support and have begun through the initiative of individuals or small groups determined to re-establish management influence over their lands (e.g. on Palm Island in 1983 and Kowanyama, both in Queensland, in the early 1990s; Smyth 2011)[4].

NAILSMA (2004) reports an early northern Australian forum of Ranger groups as putting priority on:

- protection of Indigenous knowledge at the local level;
- local enforcement powers;
- "real" funding to support action on country;
- protocols for working on country;
- women's involvement;
- networking amongst Indigenous people and alliances at the local level;
- supporting leadership at the local level (through regional exchanges); and
- relationships and partnerships with other land and sea management agencies, including government.

Local action and local empowerment, exercised in equitable partnerships with institutions with wider responsibilities, were dominant themes.

[4] in addition to Smyth 2011 see http://www.nailsma.org.au/projects/ranger_feature.html

Although not an exclusively Indigenous forum, the Kimberley Appropriate Economies Round Table (Hill et al. 2005) had strong Indigenous representation and made a number of statements and recommendations relevant to Indigenous livelihoods. It sought, among other things:

- legal recognition and protection of intellectual knowledge as the property of Traditional Owners;
- processes to protect and enhance cultural knowledge, and transmit it to future generations;
- systems and structures to promote, assist and support new and existing sustainable and appropriate enterprises;
- processes that promote and support culturally appropriate conservation areas under genuine co-management arrangements;
- 'quality and integrity' control systems for tourism activities;
- enterprises built on cultural knowledge and expertise; and
- processes to facilitate the teaching of Indigenous culture, knowledge and language.

Again the emphasis on maintaining and applying Indigenous knowledge is striking. The importance of genuine (equitable) partnerships recurs.

At the Garma Forum of 2008 held in east Arnhem Land on a theme of "Indigenous Knowledge: Caring for Country and Culture" (Fletcher 2009), a quite different group of participants called for:

- greater investment in recording and application of Indigenous knowledge and the languages through which that knowledge is communicated;
- greater Indigenous involvement in setting priorities and management of water through application of Indigenous knowledge;
- Indigenous Rangers on Indigenous land with the same powers as state Park Rangers;
- policy reform for Indigenous people to take control of resources through a community development approach;
- greater investment in people, resources and infrastructure in regional and remote communities;
- Indigenous people embedded in the policy discourse;
- successes like the Ranger programs to encourage local strategies in economic and social development;
- development of Indigenous leadership;
- government commitment to long term relationships and partnerships;
- programs tailored to the needs and strengths of communities, including flexibility to cope with country and family obligations; and
- greater awareness of the serious nature of the issues that confront people living in regional and remote Indigenous communities.

Emphasis on Indigenous knowledge was a key topic for the forum. In dealing with the partnerships issue, there is a more overt reference to an Indigenous role in policy-making.

The National Indigenous Land and Sea Management Conference of 2010 (Anon. 2010), highlighted issues including:

- recognition of Indigenous knowledge and practices in managing country;
- Indigenous communities to derive economic benefits from managing their country;
- connection between the ability to fulfil cultural obligations to country and the development of social and economic well-being in Indigenous communities;
- water management, especially gaining an allocation for cultural flows;

- communities to have a real ‘seat at the table’ in planning for natural resource management;
- erratically variable funding timeframes and reporting procedures that presently are too onerous, frequent and repetitive;
- flexibility to allow for differences in land management perspectives and processes;
- recognising differences in priorities for full and equal Indigenous participation: planning exclusively to "white fella" priorities causes disengagement and disempowerment;
- the dominant management focus is either exploitative commercial resource use, or strict resource protection, not on Indigenous values;
- successful planning will be driven by the aspirations and interests of the traditional owners;
- key role of partnerships, which may be slow to develop and rely on mutual respect and good communication;
- joint management can deliver benefits in improved social, economic and cultural wellbeing but remains an unequal partnership, in part because traditional knowledge remains under-valued;
- greater participation in sea country management, including marine based commercial and labour market activities;
- international engagement to support personal and professional development; and
- speaking with one voice guided by elders for strong governance and successful projects.

Unsurprisingly, the issues and aspirations coming from this wider cross-section of the Indigenous community echo many heard from north Australian Indigenous opinion leaders. The call for Indigenous voices to be heard in policy-making and for Indigenous values to be respected in partnerships is particularly strong. Failure to deal with Indigenous views on goals and targets for measuring progress is seen as a source of the clumsiness often evident in government programs.

A number of reports from Indigenous forums on issues connected with water management (e.g. Anon. 2008, 2009) also raise concerns about the weakness of rights in water and the inadequacy of existing planning processes to ensure that Indigenous voices are heard and interests protected.

Gorring et al. (2010), in reviewing forums and studies on cultural and natural resource management in the Kimberley, found consistency of statements and commitments from the region's Indigenous people over a period of 15 years. They note that governments have continued to offer poorly coordinated programs. Successful investments have involved development of Kimberley Rangers, fee for service work and genuinely collaborative projects with some environmental NGOs. Less successful projects offer one dimensional approaches that maintain existing power structures and fail to allow time to work with the "right people for the right country".

In addition to repeating the fundamentals about lack of control over resources, clumsy regulation and ill-fitting support programs identified by Indigenous leaders, all forums are consistent, over a considerable period, in also raising as important issues (i) better recognition of Indigenous knowledge; (ii) more equitable partnerships, especially with government; (iii) real Indigenous roles in framing policy and priorities; and (iv) the importance of developing Indigenous leadership.

5.3 Community statements

Obviously many groups have held private meetings about their interests and expectations in generating livelihoods. Here I consider a few recent reports, chiefly from north Australian regional Indigenous organisations.

In addition to custodial activities like management of IPAs, the Bawinanga Aboriginal Corporation (BAC 2010) emphasises commercial use of natural resources through trade in wildlife and fisheries. It is most interested in those industries that draw on wild stocks and hence depend on healthy country, rather than farming or forestry. The Maningrida region's communities have in the last decade rejected options for new forestry developments despite, or perhaps because of, past experience with forestry (see Cooke 2009, p. 79).

Aak Puul Ngantam, a community-based group established by the southern Wik people on Cape York Peninsula, reports (Martin et al. 2010) traditional owner goals as:

- getting people living back on country and supporting them;
- managing country through conservation activities;
- managing cultural sites;
- managing illegal hunting and fishing and visitors and tourists in general;
- fixing up roads and outstations; and
- creating jobs for people on country and opportunities for business.

In consultations for other aspects of the NAWFA studies, members of the group have indicated that pastoral and tourism ventures will be considered for providing work and generating incomes.

Other important statements include the words of the late Roy Dadayna Marika MBE, one of the founders of the Dhimurru Aboriginal Corporation, who argues that "… the only people who make decisions about the land are those who own the law, the people who own the creation stories, the people whose lives are governed by Yognu law and belief" (cited in DAC 2011, p3).

Individual landowners contributing to the Kimberley Appropriate Economies roundtable identified fire management and pastoral work (Lawford 2005) and cultural tourism (Andrews 2005; Lovell 2005; Shaw 2005) as appropriate activities.

Some individual groups have also made statements of regional expectations about rights in water and fostering meaningful participation in water allocation planning. Concerns have been expressed about apparent impacts of water use on billabongs and other key features of the biophysical and cultural landscape (e.g. Jackson and Robinson 2009; NAILSMA 2011a,b,c).

5.4 Positions put to the companion project

Although directed at identifying research needs, outcomes from the **Indigenous Livelihood Implementation Strategy and a Research and Development Agenda** provide some guidance for understanding Indigenous aspiration for livelihoods. They do so from the perspectives of land councils, whose obligations include assisting Indigenous groups to realise employment and enterprise opportunities drawing on land ownership. Those perspectives have been grouped under four themes which are briefly summarised here.

Theme 1: systematic evaluation of north Australia's natural, social cultural and human assets.

Informants are concerned that assets available to Indigenous people to drive livelihoods development are too poorly known to provide a secure base for a livelihoods strategy. The substantial work done under the Task Force process and TRaCK consortium do not appear to have answered all key questions. For example, there were calls for elucidation of cultural values attributable to water and for detailed studies of the hydro-ecology of the Kimberley. However, it

should be acknowledged that much of the TRaCK work has yet to appear in peer-reviewed publication, although most is available in various reports[5]. And arguably this sort of concern is inevitable given the probability that high quality research in complex biophysical and social systems and their interactions will raise as many new questions as it provides answers to old. The aspiration to be better informed is perpetual.

Theme 2: foster analysis and debate about directions for northern development.

Call for further debate, despite the extensive work of the Task Force and its collaborating researchers and natural resource managers, reflects significant regional variation in beliefs about the best way forward. In the Kimberley, for example, there appears to be a strong view that with additional facilitated interaction, Indigenous and non-Indigenous interests will be able to reach consensus about sustainable futures and the sorts of livelihoods they will support. There is support for creative thinking about options going well beyond the orthodox, and especially to avoid narrow views of the array of options Indigenous people may be able to access. This creative thinking would be informed by better understanding of Indigenous views of important contributions to well-being.

Theme 3: strategies for socially resilient and environmentally sustainable regional economies.

This theme covers several linked issues, built around developing a strategic land and water management framework. Connected ideas include review of the feasibility of "non-traditional" enterprises, such as in Information and Communications Technology.

All groups wish to see property rights in land and their resources clarified and resolved. In the meantime there are calls to step over property rights problems by acquiring lands by purchase; so that the property rights that come with them are equivalent to those held by other members of the community. There is particular interest in rights to water in terms of both cultural flows and access to commercial entitlements.

There is interest in quasi-commercial operations like market gardens and small scale cattle operations (killer herds) that provide meaningful employment but also contribute to resolution of diet-related health problems.

Theme 4: change in institutional frameworks to enhance regional Indigenous rights and role of local governance systems.

Aspirations here are built around change in state and territory water allocation processes to increase transparency and accountability, as part of a wider process to give Indigenous people real powers in resource management regimes. This would include devolution of powers in decision-making and enforcement of other laws presently exercised by state and territory governments. Indigenous Rangers, for example, would enjoy the same status and powers as non-Indigenous rangers. Wildlife species of particular interest to Indigenous people would be co-managed.

5.5 Summary of aspirations

Just as in any other sector of Australian society, Indigenous aspirations for livelihoods encompass many segments of the economy and individual contributions to it. No treatment of livelihoods issues should seek to circumscribe options: selection of favoured or favourable opportunities should be left

[5] Accessible through http://track.gov.au/publications

to those needing or seeking them. But that process may be constrained by knowledge of what is plausible, given existing and projected constraints in general, or in a particular local or regional situation. It is therefore unsurprising that many available statements tend to emphasise further exploration of the sorts of livelihoods in which community members have had past experience, like pastoralism and land management for conservation.

An important addition to this generalisation is concentrated attention on property rights in resources associated with ownership of lands and waters, as distinct from ownership of the land itself. This issue was not much discussed in northern Australia in the past, except in the somewhat esoteric area of wildlife law (Whitehead 2000). It was mostly ignored by federal, state and territory resource management and conservation authorities, despite parliamentary reports already mentioned and obligations in the *Environment Protection and Biodiversity Conservation Act* to "recognise the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and to promote the use of Indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge" (s3(1)(f) and (g)).

The centrality of resource rights has been brought into more acute focus through the provisions of the National Water Initiative (NWI), dealing as it does with commercially valuable rights. O'Donnell (2011) argues that the NWI requires state and territory legislation to protect Indigenous and cultural values in water management decisions. Further, he posits that the NWI requires recognition of Indigenous social **and commercial** interests in water plans.

The recent *Carbon Credits (Carbon Farming Initiative) Act* has added to interest by drawing attention to ambiguity of rights in carbon on, for example, pastoral land on which Indigenous people claim or have registered native title interests. With the commodification of carbon in plants and soils, commercial opportunities have begun to focus minds. Clearly it is important that such ambiguities be resolved as soon as possible. There is unanimous support from Indigenous groups to seek resolution of rights in all renewable resources as a key element of a meaningful livelihoods strategy.

Other issues that are seen to need attention as pre-requisites or concomitants of effective livelihoods development are:

- removing disempowering regulatory regimes;
- reframing presently poorly designed and clumsily implemented, top down programs for supporting regional and Indigenous development;
- exploiting the potential utility of land and sea management work not only in its own right but as entry to a wider range of opportunity;
- better pathways for entering and sustaining employment;
- proper recognition of Indigenous knowledge in decision-making and resource management more generally;
- more equitable partnerships, especially with government;
- real Indigenous roles in framing policy and priorities;
- creativity in identifying and assessing opportunities and a willingness to go beyond the commonplace; and
- developing Indigenous leadership.

It is notable that none of this material provides a sense of priorities for individual livelihood activities or types. The probability that such a statement of priority would be somewhat ephemeral and therefore potentially misleading is illustrated by the prospect of Australia's compliance carbon market being removed with a change of federal government.

Rather than attempting to assign priorities to the livelihood activities listed in Table 2, I instead consider how dependent they are on progress on these key issues identified by Indigenous individuals and organisations, and focus on the implications for processes for livelihoods development that will have application to many options.

6 A scan of livelihood activities

Using the system of categorisation described above and applying the statements of aspirations summarised in Section 5 above, Table 2 presents an initial scan of potential livelihood activities based on renewable resources. Candidate livelihood activities, as well as issues affecting them (Section 7) are drawn from the literature and personal knowledge.

Table 3 identifies potential livelihood activities that draw on nominated aspects of Indigenous culture and in particular Indigenous ecological knowledge (IEK).

Table 4 offers a crude ranking of the potential for growth in the various livelihood activities, involving no new quantitative analysis and, where quantitative estimates are offered, drawing on published figures. Reasons for particular rankings for growth are implicit in the analysis of individual livelihood activities in Section 7 *Individual livelihood activities*.

A few simple patterns emerge from these lists, which perhaps warrant some preliminary comment.

(1) With the emergence of carbon offset markets and development of other arrangements for payment for ecosystem services (PES) through broader government environmental offsets policies, the array of potentially rewarding custodial livelihoods is greatly expanded.
(2) These new opportunities increase potential incomes by up to an order of magnitude over existing payments that presently come mostly from government, and increase the range of potential purchasers. Looking after country is therefore emerging as a major source of economic opportunity.
(3) Many of these custodial livelihoods draw heavily on Indigenous knowledge and culture and so offer support to maintain and transfer knowledge and skills in the process of earning incomes.
(4) Most consumptive livelihoods drawing on naturally abundant living resources are modest in scale where formal markets do not already exist. Where there are established markets (e.g. fish), commercial access by Indigenous people is severely or entirely restricted by prior allocation, even on their own lands and seas.

These and other issues are dealt with in more detail in Sections 7 and 8 below.

Table 2: Categorisation of potential Indigenous livelihoods in northern Australia drawing on connections with land and seas and the renewable natural resources (natural capital) that they support. In seeking comprehensiveness activities that may overlap or be strongly interdependent have been included. Asset classes and ecosystem services listed against various activities are those most directly affected by that activity. Ecosystem services categories are taken from the Millennium Ecosystem Assessment (2005) and emphasise those most directly and explicitly addressed by the activity. Lands included overlying waters. Because the goal of all livelihoods is to add to financial, human and social assets, these are not repeated against **Asset class … fostered**.

Livelihood		Ecosystem service accessed or fostered by livelihood activity	Product type	Asset class		Sector(s)	Remarks
activity	category			deployed	fostered		
caring for country	custodial consumptive contingent	all	multiple	human social	native vegetation biodiversity surface and ground waters river and wetland systems landform and soils	all land and water using industries	catchall for many of the individual livelihoods set out below
catchment management	custodial	provisioning (multiple) regulating (water) regulating (erosion control) regulating (natural hazard)	increased water availability improved water quality	human social	landform and soils native vegetation river and wetland systems surface and ground waters	land and resource management mining farming	
riparian system management	custodial	regulating (water) regulating (erosion control) cultural (aesthetic)	stable landforms natural heritage	human social	landforms and soils river and wetland systems surface waters	land and resource management Indigenous customary use	
land rehabilitation	custodial	Provisioning (multiple) regulating (water purification) regulating (erosion control)	carbon sequestration restored production improved land condition	human social natural systems modified systems	native vegetation water landform and soils	carbon markets environmental offset markets mining	

Livelihood		Ecosystem service accessed or fostered by livelihood activity	Product type	Asset class		Sector(s)	Remarks
activity	category			deployed	fostered		
protected lands management	custodial	provisioning (fresh water) regulating (water) regulating (pollination) cultural (aesthetic) cultural (recreation) cultural (knowledge systems) cultural (spiritual) cultural (sense of place)	natural heritage cultural heritage	human social	native vegetation art, archaeological and sacred sites water landform and soils	land and resource management tourism recreation	
fire management	custodial	provisioning (fresh water) provisioning (food) regulating (erosion control) regulating (air quality) regulating (water) regulating (natural hazard) regulation (pollination)	natural heritage cultural heritage improved land condition GHG emissions offsets protection of property	human (knowledge and skills) social (collaborative governance)	native vegetation biodiversity art, archaeological and sacred sites landforms and soils	land and resource management environmental offsets public good services customary hunting and foraging	
feral animal control	custodial	regulating (erosion control) regulating (air quality) regulating (water) regulating (natural hazard) cultural (aesthetic) cultural (spiritual)	natural heritage cultural heritage improved land condition	human (knowledge and skills)	introduced organisms art, archaeological and sacred sites biodiversity physical assets	land and resource management environmental offset markets	
weed management	custodial	provisioning (food) provisioning (fuel) regulating (water)	natural heritage cultural heritage improved land	human	introduced organisms art and sacred sites	land and resource management environmental	potential as biofuels

Livelihood		Ecosystem service accessed or fostered by livelihood activity	Product type	Asset class		Sector(s)	Remarks
activity	category			deployed	fostered		
		regulating (natural hazard) cultural (aesthetic) cultural (spiritual)	condition		biodiversity landforms and soils (for production)	offset markets	
nuisance wildlife management (native species)	custodial	provisioning (food) cultural (recreation)	maintenance of production maintenance of recreational use	human (knowledge and skills) social (cultural obligations)	biodiversity	farming and ranching tourism	availability of skilled managers may avert private use of damaging control methods
visitor management tourism	contingent	cultural (recreation) cultural (aesthetic) cultural (sense of place)	visitor experiences visitor security	biodiversity waters art and archaeological sites human (knowledge)	landforms and soils art and archaeological sites biodiversity	tourism	management to avert impacts and increase understanding
visitor management recreation	contingent	cultural (recreation)	visitor experiences visitor security	biodiversity waters landforms human (knowledge)	landforms and soils art and archaeological sites biodiversity	recreation (including hunting)	management to avert impacts and increase understanding of more active forms of recreation
threatened species management	custodial	provisioning (genetic resources) cultural (aesthetics) cultural (knowledge systems)	environmental offsets public good benefits	human (knowledge and skills) lands (suitable habitats)	biodiversity	land and resource management environmental offset markets	may require supporting activities of many types, including making land available for re-introductions
carbon farming	custodial	regulating (climate)	environmental	human	biodiversity (if	land and resource	requiring skilled

Livelihood		Ecosystem service accessed or fostered by livelihood activity	Product type	Asset class		Sector(s)	Remarks
activity	category			deployed	fostered		
		regulating (air quality)	offsets pollution reduction avoided deforestation	(knowledge and skills) social (cultural obligations, governance systems)	managed appropriately) native vegetation land condition	management carbon markets	management to avoid adverse (biodiversity and customary use) outcomes
wildlife harvest management	custodial	provisioning (food) provisioning (fibre, leathers)	management services	human (knowledge and skills) biodiversity	biodiversity (if done well)	land and resource management Indigenous community	managing consumptive use of Indigenous and non-Indigenous people to limit impacts
commercial wildlife harvest (native animals)	consumptive	provisioning (food) cultural (recreation)	wildlife products fish products pets trophy hunting game fishing	biodiversity wildlife populations healthy wildlife habitats	wildlife habitats	bush-foods game foods clothing (leathers and furs) commercial fishing customary hunting subsistence fishing tourism recreation pet trade	taken directly from wild populations offers custodial benefits if managed for incentives to protect wildlife habitats where larger markets exist (fish) Indigenous access is constrained by prior allocation
commercial wildlife harvest (native plants)	consumptive	provisioning (food) provisioning (fibre) provisioning (fuel) cultural (aesthetics) cultural (knowledge	timber other plant products arts and crafts flowers, fruits and	biodiversity native vegetation	wildlife populations	native forestry agroforestry biofuels garden and landscaping	taken directly from wild populations

Livelihood		Ecosystem service accessed or fostered by livelihood activity	Product type	Asset class		Sector(s)	Remarks
activity	category			deployed	fostered		
		systems)	seeds			supply customary foraging bushfoods florists arts and crafts	
wildlife ranching (native animals)	consumptive	provisioning (food) provisioning (wild animal products)	wildlife products pet trade aquaculture	biodiversity wildlife populations	wildlife populations wildlife habitats	bushfoods game foods clothing (leathers and furs) pet trade	animals raised in controlled conditions ongoing dependence on wild stocks
wildlife ranching (native plants)	consumptive	provisioning (food) provisioning (wild plant products) provisioning (fuel)	timber aquaculture (algae) carbon farming	biodiversity	native vegetation	garden and landscaping supply biofuels	plants raised in controlled conditions but ongoing dependence on wild stocks
farming of wildlife (native animals)	consumptive	provisioning (food)	wildlife products pet trade aquaculture for fish, crustacea, molluscs etc	wildlife populations biodiversity	none	bushfoods game foods pet trade	closed systems once farm stock established
farming of wildlife (native plants)	consumptive	provisioning (food) provisioning (fibre) provisioning (fuel) regulating (climate)	timber other plant products combustible biomass convertible biomass aquaculture (algae)	wildlife populations biodiversity	none	plantation forestry biofuels horticulture cropping carbon farming domestic food production	closed systems once farm stock established

Livelihood		Ecosystem service accessed or fostered by livelihood activity	Product type	Asset class		Sector(s)	Remarks
activity	category			deployed	fostered		
wildlife exhibits	custodial	provisioning (genetic resources) cultural (recreation) cultural (knowledge systems)	recreational and educational experiences threatened species conservation	biodiversity wildlife populations	threatened species	recreation tourism education public goods	may provide stock for species recovery programs
bioprospecting	contingent	provisioning (genetic resources) provisioning (biochemicals and pharmaceuticals)	bushfoods alternative medicines pharmaceuticals	biodiversity	biodiversity	food production health	may support biodiversity if incomes returned to land management
invasive species harvest (exotic animals)	consumptive	provisioning (food) provisioning (genetic resources)	trophy hunting recreational hunting pet meat game meat	introduced organisms native vegetation landforms and soils	natural landscapes water resources production landscapes	recreation tourism game food	benefits for environments sensitive to details of design
invasive species harvest (exotic plants)	consumptive	provisioning (food) provisioning (fuel)	combustible biomass convertible biomass	introduced organisms native vegetation landforms and soils	natural landscapes water resources production landscapes	livestock production biofuels	exotic plants harvested for stockfeed or biofuels
farming (exotic animals)	consumptive	provisioning (food)	livestock production aquatic organisms	production landscapes soils	none	pastoralism aquaculture	invasive species risks with some options
farming (exotic plants)	consumptive	provisioning (food) provisioning (fibre)	timber fruits, flowers, seeds, oils, fibre	production landscapes soils	none	plantation forestry carbon farming cropping horticulture biofuels	invasive species risks with some options

Livelihood		Ecosystem service accessed or fostered by livelihood activity	Product type	Asset class		Sector(s)	Remarks
activity	category			deployed	fostered		
lease of land for long term occupation	consumptive	provisioning (various) cultural (chiefly recreation)	lease payments	landforms and soils associated waters native vegetation wildlife	various	plantation forestry horticulture cropping aquaculture	return to management of resource variable depending on use and lease arrangements
fees for temporary access to lands	consumptive	cultural (chiefly recreation)	entry fees	landforms and soils waters native vegetation wildlife	none	tourism	return to management of resource variable depending on use and lease arrangements
fees (royalties) for taking natural assets	consumptive	provisioning (various) cultural (various)	royalties	various, including wildlife	none	bushfoods gamefoods clothing (leather and furs) pet trade	mineral extraction is not considered
water entitlement trading (permanent)	consumptive	provisioning (fresh water) regulating (water)	water extraction rights	surface or ground-waters	none	water markets irrigated agriculture mining	return not guaranteed but could support other land management work
water entitlement trading (temporary)	consumptive	provisioning (fresh water) regulating (water)	water extraction rights	surface or ground-waters	none	water markets irrigated agriculture mining	return not guaranteed but could support other land management work
surveillance	custodial	provisioning (all) regulating (all) cultural (all)	risk management in natural and cultural heritage	human (knowledge and skills)	production systems customary harvest natural heritage	fisheries agriculture (inc animal and plant	basic requirement for effective resource

Livelihood		Ecosystem service accessed or fostered by livelihood activity	Product type	Asset class		Sector(s)	Remarks
activity	category			deployed	fostered		
					cultural heritage	health) biodiversity conservation human health	management
monitoring and evaluation	custodial	provisioning (all) regulating (all) cultural (all)	risk management	human (knowledge and skills) social (governance systems)	production systems natural heritage cultural heritage	fisheries agriculture (inc animal and plant health) biodiversity conservation human health	especially important for demonstration of returns on public or private investment
research	contingent	cultural (knowledge systems)	knowledge creation knowledge application	natural heritage cultural heritage land and associated waters (study sites)	various	research agencies government NGOs	benefits delivered to maintenance of assets dependent on nature and quality of research
education	contingent	cultural	cross-cultural training workforce training	human social cultural heritage natural heritage	various	various	opportunities for Indigenous groups to provide local training in livelihood activities and to equip others to work appropriately on Indigenous lands

Table 3: Extent to which of potential Indigenous livelihoods in northern Australia draw on and benefit from application of or connection with Indigenous culture and related interests and knowledge. Statements of applicability are based largely on Whitehead et al. 2000 and Yibarbuk et al. 2001.

Livelihood		**Applicability of cultural connections**	**Cultural attribute deployed**	**Livelihood description**	**Clients/purchasers**	**Remarks**
activity	category					
caring for country	custodial consumptive	direct highly relevant	acceptance of obligations to country obligations to neighbours ecological knowledge management techniques	ranger groups carbon and other ecosystem services trading enterprises	government conservation NGOs miners and other offsets purchasers	catchall for other livelihoods
catchment management	custodial	direct highly relevant	obligations to neighbours ecological knowledge application of fire management skills	partnerships with other landowners water management and trading	government conservation NGOs agriculturalists miners	
riparian system management	custodial	indirect highly relevant	ecological knowledge application of fire management skills	partnerships with other landowners species co-management programs	government conservation NGOs agriculturalists miners	riparian systems will often be excluded from availability for use and will require active management to retain integrity
land rehabilitation	custodial	indirect relevant	ecological knowledge application of fire management skills	contract services	government carbon markets mining and other resource extraction companies	
protected lands management	custodial	direct highly relevant	ecological knowledge knowledge of particular sites obligations to cultural sites	resource management under contract management of Indigenous Protected Areas joint management of declared reserves	government conservation NGOS business requiring offsets	
fire management	custodial	direct very highly	knowledge of fire behaviour	carbon farming biodiversity conservation	emerging and established carbon	in combination with formal science

Livelihood activity	Livelihood category	Applicability of cultural connections	Cultural attribute deployed	Livelihood description	Clients/purchasers	Remarks
		relevant	knowledge of fire effects on vegetation knowledge of other biological responses	pastoralism customary use (hunting and foraging)	markets orthodox markets	pastoral application based on experience
feral animal control	custodial	direct highly relevant	knowledge of animal behaviour hunting skills	contract services pet meat supply game meat supply customary use (hunting)	government conservation NGOs game meat industry pet meat industry	especially relevant to control at low densities
weed management	custodial	indirect relevant	knowledge of country knowledge of local flora	contract services	government conservation NGOs	refined ability to recognise "plants out of place"
nuisance wildlife management (native species)	custodial	indirect relevant	knowledge of country and native species behaviour	contracts services	government production interests tourism operators	
visitor management - tourism	contingent	indirect highly relevant	knowledge of country and nature various expressions of culture	guided tours planning for access controls protection and presentation of art sites	Indigenous tourism businesses other tourism operators	some forms of tourism may be highly intrusive
visitor management - recreation	contingent	indirect weakly relevant	knowledge of country	guided tours planning for access controls protection and presentation of art sites	Indigenous tourism businesses other tourism operators	some activities (e.g. catch and release fishing) of limited interest
threatened species management	custodial	direct highly relevant	ecological knowledge fire use	contract services Indigenous Protected Areas	governments conservation NGOs businesses requiring offsets	some rarer species will not be significant for Indigenous people but habitat management skills applicable to many species
carbon farming	custodial	direct highly relevant	fire use ecological knowledge	carbon markets	businesses requiring offsets	diverse array of options
wildlife harvest	custodial	direct	ecological knowledge	co-management	government	especially for species of major

Livelihood activity	Livelihood category	Applicability of cultural connections	Cultural attribute deployed	Livelihood description	Clients/purchasers	Remarks
management		highly relevant	customary management practices	contract services		significance to Indigenous people
commercial wildlife harvest (native animals)	consumptive	direct highly relevant	ecological knowledge harvest skills	trophy hunting game markets pet trade	safari companies pet suppliers	many regulatory barriers
commercial wildlife harvest (native plants)	consumptive	direct highly relevant	ecological knowledge harvest skills	timber production garden and landscaping (live plants) arts and crafts	timber and fibre producers specialist furniture and artefact producers art and craft centres and private galleries bushfood suppliers	
wildlife ranching (native animals)	consumptive	direct relevant	ecological knowledge harvest skills	wildlife products pet trade aquaculture	wildlife farms and aquaculturists	supplier to wildlife farms or operator of own farms
wildlife ranching (native plants)	consumptive	direct relevant	ecological knowledge harvest skills	timber aquaculture (algae) carbon farming combustible biomass convertible biomass	garden and landscaping suppliers land restoration operations aquaculturists	include harvest of seed or other propagules or adult plants for growing on in controlled conditions
farming of wildlife (native animals)	consumptive	indirect relevant (to marketing)	ecological knowledge spiritual associations	wildlife products pet trade aquaculture	retailers aquaculturists	closed systems once initial stock obtained branding and marketing may benefit from traditional associations
farming of wildlife (native plants)	consumptive	indirect relevant (to marketing)	ecological knowledge spiritual associations	timber other plant products combustible biomass convertible biomass aquaculture (algae)	garden and landscaping suppliers land restoration operations aquaculturists	closed systems once initial stock obtained use for energy supply (aside from customary) speculative

Livelihood		Applicability of cultural connections	Cultural attribute deployed	Livelihood description	Clients/purchasers	Remarks
activity	category					
wildlife exhibits	custodial	indirect relevant (to marketing)	ecological knowledge spiritual associations	threatened species conservation recreational and educational experiences	government public generally	branding based on stories of relationships to individual species
bioprospecting	contingent	direct highly relevant	ecological knowledge traditional uses (including medicinal)	bushfoods alternative medicines pharmaceuticals	biomedical researchers bushfood purveyors	difficulties in protecting intellectual property
invasive species harvest (exotic animals)	consumptive	direct relevant	ecological knowledge knowledge of country hunting skills	trophy hunting recreational hunting pet meat game meat	safari companies game and pet meat suppliers recreational hunters and their organisations	
invasive species harvest (exotic plants)	consumptive	indirect not relevant	no particular associations	combustible biomass convertible biomass	alternative power generators alternative fuel suppliers	some invasive species may be usable as fuels or convertible to liquid or gas
farming (exotic animals)	consumptive	indirect relevant	more recent tradition of working in pastoral industry	livestock production aquatic organisms	orthodox markets	some groups have generations of experience in pastoral industry
farming (exotic plants)	consumptive	none not relevant	none	timber fruits, flowers, seeds, oils, fibre	orthodox markets	traditional methods of farming some plants not applicable to most introduced crops
lease of land for long term occupation	consumptive	limited (choice of appropriate sites)	knowledge of ecological and cultural values of country	"royalty"	plantation foresters horticulturalists crop growers aquaculturalists retailers and other service providers	
fees for temporary access to lands	consumptive	entry fees	knowledge of ecological and cultural values of country	"royalty"	tourism operators recreationists	

Livelihood activity	Livelihood category	Applicability of cultural connections	Cultural attribute deployed	Livelihood description	Clients/purchasers	Remarks
fees (royalties) for taking natural assets	consumptive	royalties	knowledge of ecological and cultural values of country	"royalty"	bushfoods gamefoods clothing (leather and furs) pet trade	
water entitlement trading (permanent)	consumptive	indirect limited relevance	knowledge of ecological and cultural values of water may influence management of trades	sale of water extraction rights	water markets	
water entitlement trading (temporary)	consumptive	indirect limited relevance	knowledge of ecological and cultural values of water may influence management of trades	sale of water extraction rights	water markets	
surveillance	custodial	direct highly relevant	ecological knowledge situational knowledge (of specific country)	risk management in natural and cultural heritage	government	refined ability to recognise plants and animals" out of place" and changes in behaviour
monitoring and evaluation	custodial	direct highly relevant	ecological knowledge situational knowledge (of specific country)	risk management	government conservation NGOs carbon markets	customary skills supplemented by sophisticated recording systems
research	contingent	highly relevant	ecological knowledge situational knowledge	knowledge creation	government universities other research organisations	research as an activity generating employment in a range of ways
education	contingent	direct highly relevant	cultural heritage natural heritage	various cross-cultural training workforce training	local people seeking support to access livelihoods lessees or other resources users seeking access to	opportunities for Indigenous groups to provide local training in livelihood activities and to equip others to work appropriately on Indigenous lands

Livelihood		Applicability of cultural connections	Cultural attribute deployed	Livelihood description	Clients/purchasers	Remarks
activity	category					
					Indigenous lands	

Table 4: Crude assignment of scale and potential for growth in Indigenous livelihoods activities based on natural resource use in northern Australia. Income estimates are provided only where some relevant information is readily available. Significant=potential to provide at least some local incomes or employment. Substantial=incomes and employment at least comparable to existing options. Large=greater potential than many existing options.

Livelihood activity	Present scale	Potential for increase	Source of growth	Examples of market/ purchaser	Source/Remarks
caring for country	substantial (>$ 15 m pa in wages in WoC, $12 m pa CforC)	significant	offset policies see increase in PES schemes increased proportion of CforC funding to align with land holdings maintenance of Working on Country program	government developers	Allen Consulting 2011 Hill and Williams 2009 estimate cover many of activities below
catchment management	subsumed in CforC above	significant	proper recognition of contribution to water resource	various	assumes allocation of water for commercial use - value presently unknown
riparian system management	subsumed in CforC above	significant	proper recognition of contribution to water resource	various	assumes allocation of water for commercial use - value presently unknown
land rehabilitation	small	significant	mining developments on and around Indigenous land	mining industry other developers	existing mining proposals (e.g. South of Embley, Limmen River, Canning Basin)
protected lands management	large (> $20 m pa)	significant	IPA scheme various corridor projects increased joint management	government conservation NGOs	estimate mostly made up of IPA funding and portion (<20%) of expenditure on jointly managed parks
fire management	small (1 project)	large (>$100 m pa)	Carbon Farming Initiative	carbon markets (voluntary and compliance)	NAILSMA (unpublished) - based on projects already in development
feral animal control	small	significant	Carbon Farming Initiative	carbon markets (voluntary and compliance) conservation NGOs government	

Livelihood activity	Present scale	Potential for increase	Source of growth	Examples of market/ purchaser	Source/Remarks
weed management	large (within CforC, WoC programs)	significant	Land Sector package, particularly Biodiversity Fund	government minor private interest	need for control will continue to grow rapidly
nuisance wildlife management (native species)	small	minor	problem crocodiles increased urbanisation	government limited private	minor activity except for crocodiles
visitor management tourism	useful	substantial	increased land holdings increased access to Indigenous land	private tourism interests	
visitor management recreation	useful	substantial	increased land holdings increased access to Indigenous land trend to managed access to Indigenous lands and coasts	private tourism and recreational interests	
threatened species management	minor	minor	weakly funded activity	government conservation NGOs offset obligations	may receive greater priority in linkage with carbon through Biodiversity Fund
carbon farming	small	large (>$150 m pa with fire and improved land management)	Carbon Farming Initiative Biodiversity Fund Indigenous Carbon Farming Fund	government conservation NGOs offset obligations voluntary and compliance carbon markets	NAILSMA unpublished estimates
wildlife harvest management	large but informal (customary)	substantial (with recognition)	co-management arrangements with government	government	co-management of species of particular significance to Indigenous people
commercial wildlife harvest (native animals)	limited (chiefly crocodile eggs)	significant (additional species, greater volumes)	greater range of niche products as Indigenous enterprises develop capability	wildlife farmers	Gorman et al. 2008 subject to development of cooperatives or other mechanisms to provide continuity of supply
commercial wildlife harvest (native plants)	substantial (mostly as medium for arts, crafts)	significant (additional species, greater volumes)	greater range of niche products as Indigenous enterprises develop capability	arts centres food processors plant nursery trade	Whitehead et al. 2006 Gorman et al. 2006

Livelihood activity	Present scale	Potential for increase	Source of growth	Examples of market/ purchaser	Source/Remarks
wildlife ranching (native animals)	see commercial wildlife harvest above				Gorman et al. 2008
wildlife ranching (native plants)	see commercial wildlife harvest above				Whitehead et al. 2006 Gorman et al. 2006
farming of wildlife (native animals)	limited	significant	crocodile farming	leather industry	subject to linkage to other ventures (e.g. feral animal control, fishing to provide food)
farming of wildlife (native plants)	limited	significant	rehabilitation of mine sites minor garden plant business	mining companies	subject to sufficient scale to warrant establishment of nursery
wildlife exhibits	small	limited	subject to substantial increase in tourist numbers	tourism interests government (threatened species)	
bioprospecting	negligible	limited	unlikely	independent bio-prospectors pharmaceutical companies	low probability of significant benefits
invasive species harvest (exotic animals)	significant	significant	new areas for harvest increased intensity of harvest	game meat suppliers pastoral industry	low return compared with risk of environmental damage
invasive species harvest (exotic plants)	negligible	limited	biofuels	energy producers	subject to development of related technologies
farming (exotic animals)	substantial	substantial	increase in pastoral lands held new integrated management models	meat suppliers cattle exporters	largely dependent on ILC activity
farming (exotic plants)	limited	substantial	improved access to water	fruit and vegetable markets grain markets	on areas of good land with access to irrigation water
lease of land for long term occupation	significant	significant	sites for irrigated agriculture, including horticulture and intensified pastoral use tourism ventures dependent on major infrastructure	local, interstate or international agricultural and tourism interests	distinct from Indigenous-initiated and managed intensification of use

Livelihood activity	Present scale	Potential for increase	Source of growth	Examples of market/ purchaser	Source/Remarks
fees for temporary access to lands	significant	substantial	tourism and other uses not requiring major modification or infrastructure	ecotourism and cultural tourism interests game fishing and trophy hunting interests	dependent on readily relocated accommodation etc
fees (royalties) for taking natural assets	significant	significant	natural products markets	bushfoods, cosmetic use of plants native species forestry (selective harvest) pet trade	often relatively short term "fads"
water entitlement trading (permanent)	none	substantial	increase in irrigated agriculture increased mining use and obligations to purchase water	regional water users	requires recognition of rights in consumptive pool for commercial use
water entitlement trading (temporary)	none	substantial	increase in irrigated agriculture increased mining use and obligations to purchase water	regional water users	and obligations of miners to purchase water
surveillance	significant	substantial	devolution of some regulatory roles and powers	government	assumes cost-effectiveness can be demonstrated
monitoring and evaluation	limited	significant	continued development of capability and supporting tools	government offset purchasers mining companies	often linked to offset commitments or other obligations flowing from environmental assessment process
research	limited	significant	greater commitment to participation of local people	government universities private researchers	dependent on continued development of capability
education	limited	significant	cross cultural training training in Indigenous NRM practices re-design of school curricula	government NRM managers educators	

7 Individual livelihood activities

The livelihood options drawing on natural assets and their management summarised in Tables 2-4 are now considered individually, with attention to features that may influence their suitability for serious consideration by Indigenous people, and the demands they place on people, environments and other resources, particularly water.

This preliminary review draws principally on local studies and fewer pertinent international studies. The discussion seeks to provide some background and context as well as draw attention to major issues and related research and development questions.

7.1 Caring for country

The term "caring for country" was originally used as a generic, seeking to capture relationships of Indigenous people to their lands, which encompass much more of significance to Indigenous well-being than the narrower conventional understanding of natural resource management. Caring for country defines many aspects of Indigenous culture, including meeting obligations to ancestors, to clan and to family (Morrison 2007). In discharging these obligations, participants increase their well-being in many ways (Burgess et al. 2005) and deliver benefits to the broader Australian community in reduced demands on public funds and improved environments (Garnett et al. 2009). Caring for country also delivers benefits in customary livelihoods such as increased abundance of favoured animal and plant foods (Russell-Smith et al. 1997; Yibarbuk et al. 2001; Whitehead et al. 2003; Altman 2009).

More recently the term has become associated with particular government programs of support for Indigenous ranger groups (Weir et al. 2011) through programs like Caring for Our Country[6] and Working on Country[7]. A recent review of the Working on Country program found that the true cost was 23% lower than the apparent (budget) cost because it reduced welfare payments and increased taxes paid (Allen Consulting Group 2011). This study made no attempt to value other benefits such as improved health (and consequently reduced public costs; Campbell et al. 2011), reduced crime, or the environmental benefits that are principal objectives of the program, and so presents a gross understatement of benefits. Experience gained in broader Caring for Country work is also likely to be transferrable to other, more tightly focused livelihoods dealing with specific resource management tasks, like commercial carbon farming or other payment for environmental services (PES) arrangements. These and related programs (e.g. Indigenous Protected Areas; Section 7.6 *Protected lands management*) have, in addition to their inherent conservation value, done much to help Indigenous people to restore management of their lands and to gain the skills and confidence to engage with other opportunity. To disparage them as green welfare (see Section 5.15.1 above) because they use public funds to generate public environmental benefits is to misrepresent grossly the obligations they create and the significance of their contribution to Indigenous well-being (e.g. Burgess et al. 2005). On any reasonable analysis the Working on Country programs have been important successes in both conservation management and Indigenous economic development; and they have a continuing important role.

[6] see http://www.nrm.gov.au/
[7] see http://www.environment.gov.au/indigenous/workingoncountry/index.html

Given the centrality of water and wetlands to customary use of country and associated major contributions to customary livelihoods (Russell-Smith et al. 1997; AJ Griffiths, unpublished data; Altman and Branchut 2008), developments that alter water availability or quality and access to water-dependent features, and the possible tradeoffs from water use must be well understood and properly weighted in decisions. The quality of management of both Indigenous and non-Indigenous livelihoods in any significant part of a catchment will be felt in the condition of its waterways and wetlands (Harris 2001). The full array of potential impacts should be among the tradeoffs considered explicitly in developing and implementing livelihood strategies.

Both the Indigenous caring for country ethos and its formal expressions in government programs that seek environmental and conservation outcomes need to be considered carefully when examining livelihood options. Livelihoods that require major change in landscape structure (e.g. land clearing, water impoundments) or restrict access to country needed to meet ceremonial and management obligations can create obvious conflicts.

On the other hand, exclusively conservation-oriented options should not be treated as the default for Indigenous landholders. Proposals should be examined carefully on merit, including social and economic benefits. Open-ended or otherwise under-specified agreements with public or private funders carry the risk of excluding landowners and communities from commercial arrangements in payment for specific environmental services like carbon management (see Section 7.5). Whilst broad conservation agreements have played and will continue to play critical roles in livelihood strategies, Indigenous landowners need to resist being seen and used as cheap sources of conservation benefits, whether patronised as "natural" conservationists or treated as mendicants hemmed in by regulatory anomalies who have no viable alternatives.

7.2 Catchment management

North Australian rivers are generally free-flowing (unregulated) and in good ecological condition compared with waterways and wetlands in other regions (Kennard et al 2011). Their catchments are less intensively used and hence less modified (Woinarski et al. 2009). However, keeping them in good condition requires active management (Whitehead et al. 2002). Pervasive threats include invasive plants (Adair and Groves 1998; Grice 2005) and animals (Norris and Low 2005), wildfire and poor fire management (Russell-Smith et al. 2007) and, in places, poorly managed agricultural and other development and use (e.g. Franklin et al. 2005; Hughes et al. 2008; Rustomji et al 2010). Overdevelopment of catchments leads inexorably to impacts on water availability and quality (Harris 2001). Quality of management of terrestrial environments can also affect estuarine and other near coastal marine environments (Brodie and Mitchell 2005; Manson et al. 2005; Ryan et al 2007).

Even though some Indigenous groups have articulated their commitment to manage wetlands with an integrated, whole-of-catchment approach (Storrs et al. 2001; Sinnamon 2011), the role of Indigenous people in catchment management is not presently recognised directly through government or non-government funding for provision of ecosystem services. Related work is mostly supported through broader programs including Indigenous Protected Areas (IPAs)[8] and Working on Country (WoC)[9]. Various forms of state and territory government support also contribute to capacity

[8] http://www.environment.gov.au/indigenous/ipa/index.html
[9] http://www.nrm.gov.au/funding/woc/index.html

to manage often substantial areas that foster better management and protection of significant portions of catchments (see Putnis et al 2007).

Contributions that Indigenous people have made and continue to make to management of catchments for sustained access to abundant high quality water and highly productive water-dependent ecosystems may not be recognised as discrete livelihood activities, but underpin many of the livelihood options available to them and to others (e.g. commercial fishing and tourism). Indigenous owners of substantial areas in particular catchments should consider taking active roles in existing and new catchment management institutions and processes to help manage potential impacts from other livelihoods, protect the water-related values important to them, and promote claims to allocations of water warranted by their roles in maintaining the quantity and quality of water available for allocation. Positive Indigenous roles in catchment management and the significance of Indigenous lands in producing the water that governments seek to allocate and distribute through markets should underpin claims for rights in water that go well beyond local native title interests (see Section 7.27 *Obtaining and using water entitlements* below).

At present, law and policy, including provisions of the National Water Initiative (NWI)[10], disenfranchises suppliers of water. Because water rights are uncoupled from land, there is no incentive for landholders outside the site of extraction to maintain conditions favourable to water capture and protection of water quality. Rights are assumed by governments and potentially transferred to cashed-up users rather than directing benefits to "providers". Treating water as literally falling from the sky ignores the role of lands under management to capture and purify it. Payments for Environmental Services (PES) provide one option to correct that policy failure (Section 8.5 below).

7.3 Riparian system management

The condition of riparian systems strongly influences the ecological function and habitat quality not only of the streams they are associated with (Bunn et al. 1999; Pusey and Arthington 2003) but also of the wider landscape (e.g. Woinarski et al. 2000). They are therefore treated as important indicators of the health of northern landscapes (Whitehead et al. 2000).

Condition of riparian systems is threatened in the north by unmanaged fire (Townsend and Douglas 2004), feral animals (Ens et al 2010) and weeds (e.g. Anon 1996). Domestic stock watering may cause significant damage (Jansen and Robertson 2001). Mining activities may affect both the morphology of streams and their fringing vegetation, as well as in-stream water quality (e.g. EES 2011).

Indigenous people actively manage riparian habitats through use of fire (e.g. Russell-Smith et al. 1997; Yibarbuk et al 2001) and are concerned to protect water quality and condition of in-stream habitat (Finn and Jackson 2011). The delivery of services (see Section 8.5 below) through such activities is not presently recognised directly. However, in common with other specific management tasks, management of riparian systems is supported indirectly through IPA, WoC or other (e.g. Caring for Our Country) funding. As noted above, formal recognition of Indigenous rights in water going beyond protection of native title rights (NAILSMA 2009), which might permit trade or commercial

[10] http://www.nwc.gov.au/__data/assets/pdf_file/0019/18208/Intergovernmental-Agreement-on-a-national-water-initiative2.pdf

use in water-dependent enterprise, could provide additional incentives to undertake work that optimises water availability and quality.

7.4 Land rehabilitation

Relatively small proportions of Indigenous-owned or managed land have been severely modified by land clearing or replacement of native vegetation. Exceptions include significant areas on the Tiwi Islands converted (in the past) for plantations of native Cypress *Callitris intratropica* and introduced *Pinus caribaea*¸ and (presently) introduced *Acacia mangium*. Commercial interest in these enterprises has now collapsed.

Some decades ago, Commonwealth government-supported forestry was also attempted in the Maningrida area, but support was withdrawn after a Senate Inquiry exposed misunderstanding or misrepresentation of the economic potential (Lacey 1979). Territory government support for forestry at Murgenella at the base of the Cobourg Peninsula was withdrawn in the early 1990s. The mainland sites have recovered native vegetation cover over several decades. On the Tiwi Islands, the plantation operator, Great Southern Plantations, failed in May 2009 in circumstances that contributed to a decision to hold another Senate Inquiry (SECARC 2009). The future of the site remains uncertain, although the Tiwi Land Council appears committed to continuing the operation if it can find ongoing financial support.

Substantial areas of Aboriginal land support mining, including sites within national parks like Ranger in Kakadu. Pre-mining harvest of commercially valuable plants and post-mining rehabilitation may create enterprise opportunities (Klimenko and Evans 2009), especially at the more extensive mining operations such as bauxite extraction occurring on a large scale in both Queensland and the Northern Territory that require removal of large areas of native vegetation and other surface disturbance.

Providing rehabilitation services may also be plausible at other severely disturbed sites (e.g. on land previously cleared for pastoralism) where, for example, skilled fire management will almost always be important irrespective of what other steps are taken to promote re-establishment of native vegetation (e.g. Craig et al 2010, Brady and Noske 2010). Depending on the timing of clearing and details of the rehabilitation strategy, such work may also qualify for carbon farming credits (*Section* 7.5 *Carbon management (carbon farming)* below).

Large areas of land also require rehabilitation following decades of adverse fire regimes (Russell-Smith et al. 1998; 2010). In contrast to the lack of incentives for good water management (Sections 7.2 and 7.3 above), the Carbon Farming Initiative provides powerful incentives to correct long-standing fire management failures.

Rehabilitation of landscapes can in general be expected to have a positive effect on water management, but in sites where water is fully allocated or over-allocated the re-establishment of woody vegetation can intercept surface water and reduce infiltration to ground-waters (e.g. Cannell 1999; Silveira and Alonso 2009). In some situations, it will be necessary to consider carefully implications of revegetation of substantial areas for water management. This will rarely be an important factor in north Australia, except perhaps at more developed sites like the Daly River (NT) where forestry operations have been established in areas previously used for cropping or mixed farming.

Regulations under the *Carbon Credits (Carbon Farming Initiative) Act* presently prohibit or deal ambiguously with some land rehabilitation arrangements of interest to Indigenous people, such as areas of Aboriginal land incorporated into national parks. Such anomalies and ambiguities should be corrected (Section 7.5 *Carbon management (carbon farming)* below).

7.5 Carbon management (carbon farming)

The national Carbon Farming Initiative (CFI) establishes a framework for tradeable carbon offsets generated through changes in land management practice. Eligible projects may deliver abatement of emissions of greenhouse gases or increased storage of carbon in vegetation and soils (DCCEE 2011a). The Australian Government has taken a number of measures to support Indigenous engagement in the CFI, including working with NAILSMA to prepare the formal methodology for savanna fire credits (DCCEE 2011b). The savanna burning methodology describes how to reduce emissions of the potent greenhouse gases methane (CH_4) and nitrous oxide (N_2O) through better use of fire as a management tool. It is based on restoring Indigenous methods that due to displacement of people from their traditional lands, and laws inhibiting skilled use of fire, have not been consistently applied in many northern landscapes for many decades (Ritchie 2009). Their restoration therefore represents a departure from common practice, the key test of additionality (eligibility) under the *Carbon Credits (Carbon Farming Initiative) Act 2011*.

Northern Australia, including large areas of Indigenous land, supports native vegetation sequestering much carbon (Law and Garnett 2011). Soils are also significant carbon stores. Grace et al. (2006) argue that "there is considerable scope for using many of the savannas as sites for carbon sequestration, by simply protecting them from burning and grazing, and permitting them to increase in stature and carbon content over periods of several decades". Total exclusion of disturbance from Australian savannas is unlikely and probably undesirable, but carbon storage can certainly be increased by better management of fire (Murphy et al. 2009; 2010). Whilst increased carbon stores in standing vegetation following exclusion of grazing is predicted by many models in different biomes (e.g. Mekuria et al. 2011; Grace et al. 2006) the extent to which soil carbon increases under reduced or no grazing is equivocal, with some studies indicating positive responses to reduced grazing (e.g. Shreshtha and Stahl 2008; Bagchi and Ritchie 2010; Carerra et al. 2007) but others finding no net change (e.g. Pringle et al. 2012) or positive associations between grazing intensity and soil carbon in modified pastures (summarised in Jones and Donnelly 2004).

In addition to recovery of degraded or modified systems by natural processes of seeding or suckering, carbon farming may involve plantings of native or exotic species in single species plantations or more diverse plantings among otherwise natural vegetation. The degree of intervention needed to establish additional plants may be highly variable and include supplementary water and nutrients (fertiliser). The woody biomass and carbon storage gained in such modified systems may be substantially greater than in natural systems.

Eligibility conditions for such supplemented operations are set out in regulations (*Carbon Credits (Carbon Farming Initiative) Regulations 2011*) and in methodologies approved by the Minister for Climate Change and Energy Efficiency. Those project types most relevant to Indigenous livelihoods include:

- managed regeneration, on or after 1 July 2007, of native vegetation by:

- exclusion of livestock; or
- changing the timing and the extent of grazing; or
- removal of feral animals; or
- management of non-native plants; or
- ceasing suppression of regrowth;

- restoration of natural wetlands that had been drained;
- savanna burning projects;
- establishment of permanent plantings on or after 1 July 2007;
- reduction of methane emissions through removal of feral goats, deer, pigs or camels;
- reforestation of previously cleared sites; and
- protecting native forests from deforestation (deforestation avoided).

Those methods involving plantings cannot use known weeds, and must not interfere with water availability. Omission of buffalo and feral cattle from the initial list of feral species for which reductions in methane emissions can be recognised appears to have been in error, and will presumably be corrected.

The putative ownership of carbon stores generated in these ways is variable across jurisdictions, particularly on public lands leased for pastoralism, which constitute a large proportion of the northern landscape and in which Indigenous people retain native title and related interests. Federal law (the *Carbon Credits (Carbon Farming Initiative) Act 2011*) provides for negotiation rights for recognised native title interests in carbon sequestration projects. But given the apparent determination of some jurisdictions to allocate carbon rights under state law, the effectiveness of these provisions is unclear. In some jurisdictions, park management services may seek to claim benefits from carbon sequestration on reserved lands to defray management costs, even where those lands are not owned by government but jointly-managed with Indigenous land owners (PJWhitehead, pers. observation).

The federal government has raised the possibility of further consultation on Indigenous rights in carbon; presumably with a view to amendment of federal law should this prove necessary or desirable. NAILSMA has proposed that native title applicants, whether the claims are presently recognised or not, should retain a right of negotiation for all carbon farming projects on public lands, with a view to an equitable share of benefits from such opportunities (NAILSMA, unpublished).

In some areas of northern Australia, restoration of cleared land may provide opportunities to earn carbon incomes (Fensham and Guymer 2009), but because native title or other rights in land previously cleared is more likely to have been extinguished, relatively little Indigenous land will provide such opportunities. Some opportunities require development of additional methodologies, which can be slow and expensive. The federal government proposes to fund some of this sort of work through the Indigenous Carbon Farming Fund[11].

Whilst many issues of detail remain to be resolved, the legal and policy environment generally favours substantial Indigenous access to opportunity in carbon farming. Some of these opportunities, particularly in savanna fire, are unusually attractive because they are favoured by ownership of large areas of land with few directly competing commercial uses, lesser complexity of

[11] http://www.environment.gov.au/cleanenergyfuture/icff/index.html

formal tenure and cadastral boundaries in remote regions, compatibility with caring for country obligations, dependence on traditional skills and collaborative decision-making processes, relatively rapid return on investment, and limited requirement for capital (Whitehead et al. 2009).

There are also some issues surrounding sequestration that require careful consideration. The present law requires permanence of stores, defined as 99 years. This means that while projects may generate incomes over periods measured in decades as standing carbon accrues, once carbon stores reach an equilibrium, whether imposed by the manager or "natural", then landowners will be required to maintain that carbon store for many more decades, with no additional income. If the carbon stores are lost through decisions made by landowners, then credits may need to be repaid.

There are many ways to deal with this issue, including arrangements to keep some credits in reserve, perhaps in conjunction with other landowners. A great benefit of the carbon farming opportunity and particularly savanna fire abatement is that it can provide useful incomes over an extended period, enabling owners to protect important values and develop human and physical capital, while gaining the time needed to work through their long-term livelihood options.

Carbon farming interacts with water resource management principally through the potential for local or wider increases in vegetation density, especially of woody species, to change surface flows and infiltration to aquifers and to take up sufficient water to influence quantities of water available to other users or other parts of the environment. Positive effects are also likely through landscapes being better managed that would otherwise be the case. The CFI legislation sets out approaches to dealing with such issues.

7.6 Protected lands management

Northern Australia has a long history of Indigenous involvement in management of formally declared reserves, with Kakadu National Park having been under joint management for more than 30 years. Garig Gunak Barlu (Cobourg Peninsula) and Nitmiluk National Parks are jointly managed under their own Territory laws. Recovery of land was dependent on leaseback as national park and this approach to formal recognition of land rights continues in other locations.

In the Northern Territory, most other reserves declared under Territory law were made available for joint management under the *Parks and Reserves (Framework for the Future) Act* enacted in 2004. This was done in response to a High Court judgment (*Western Australia* vs *Ward* 2002) that called into question the validity of declarations of Territory parks and so opened them to claim under the *Aboriginal Land Rights (Northern Territory) Act*. Rather than contest this interpretation, government determined to resolve ambiguity by ceding grant of title, subject to lease back to the Territory as jointly-managed parks.

In both Western Australia (Haberkern 2009) and Queensland (Haberkern et al. 2009), the use of joint management arrangements is also growing, with WA arguably lagging in its efforts to secure equitable joint management arrangements.

Commitment to joint management has grown despite evidence that it can prove problematic. In exchange for fixing the use of their lands for extended periods (often 99 years), Indigenous landowners and their communities gain access to rental and (sometimes) entry fee income, opportunity for employment and enterprise, and mechanisms for influencing the way the reserve is managed. In practice, though, Indigenous owners often experience difficulty in asserting their

priorities in park management, and issues where their views do prevail may be subject to political reversal (Lawrence 2000). Majority representation on boards does not translate directly to strong influence on decisions, because capacity to act is limited by dependence on budgets and related information controlled by government partners. Nonetheless, important benefits are available through employment on parks and opportunities to develop and operate enterprise, especially in tourism (e.g. Kakadu National Park Board of Management 2007, p 85).

The federal Indigenous Protected Areas (IPA) program has been an important innovation in use of Indigenous lands to meet conservation objectives (Gilligan 2006). Here Indigenous owners receive modest but recurring funding to support employment of Indigenous Rangers and other operating costs, and agree to specific management objectives for sites. Agreements may permit other forms of development on parts of the area, provided conservation goals are still delivered. This option has been taken up enthusiastically, with several major IPAs in northern Australia and others in development[12], including sites that actively link land and sea management. With about 24% of Australia's national reserve system comprising IPAs, they have become an indispensible part of the nation's protected lands network.

Notwithstanding their role in protecting the national estate and hence legitimacy of demands on the public purse, some IPA managers have sought to diversify their funding base (Nauman and Smyth 2007) to reduce dependence on government (e.g. Dhimurru and Eastern Arnhem Land and Warddeken in western Arnhem Land). The status accorded by formal government recognition - effectively accreditation - is probably useful in attracting, for example, philanthropic funding.

Given trends for government to promote public goals through market-based instruments[13], continued increase appears likely in use of more targeted agreements and associated payments to secure specific biodiversity conservation and other environmental benefits. Because IPAs are not formally declared as reserves under relevant law, regulatory constraints are less intrusive than in the formally declared joint management estate. IPA funding is now approaching its limits arguably well short of meeting potential demand to achieve Australia's national conservation goals or exhaustion of Indigenous interest in participation. Arrangements for continuation of the program should be settled promptly.

As well as being used to protect special areas from specific threats, protected areas can play a broader role in management of catchments to maintain water availability and quality and to maintain biodiversity in all parts of the aquatic system (Nel et al. 2009; Hopkins and Whiles 2011). The large Indigenous-owned areas of land in IPAs and other protected lands will do much to maintain water availability and quality but these contributions are not presently recognised in water allocation and payment regimes.

7.7 Fire management

The centrality of fire to the lives and resource management goals of Indigenous people is well understood (Yibarbuk 1998; Yibarbuk and Cooke 2001; Gammage 2011). Sophisticated understanding of the behaviour of fire and its influence on landscapes is an enduring feature of north Australian Indigenous culture (Garde et al 2009). However, displacement from traditional

[12] see http://www.environment.gov.au/indigenous/ipa/map.html
[13] see http://www.marketbasedinstruments.gov.au/

lands and suppression of traditional activity through imposition of formal regulatory regimes often designed for other environments threatens the security and inter-generational transfer of that knowledge.

Indigenous and non-Indigenous students of contemporary fire management agree that there is too much fire in much of northern Australia: fires are too big and occur too frequently (Yates et al 2008; Garde et al 2009). There is less consensus about the role and design of prescribed burning to control wildfire, but evidence from Arnhem Land indicates that early burning in the cooler dry season can prevent later hotter fire by simple substitution and creation of fire breaks that isolate unburned areas from sources of ignition (Price et al 2012). Reduction of late dry season fires reduces emissions of greenhouse gases (Russell-Smith et al 2009) and improves the condition of vegetation (Edwards and Russell-Smith 2008) - including listed threatened plant communities[14] and probably of fauna (Woinarksi et al. 2009).

Fire management is one of the few areas of natural resource management where Indigenous ecological knowledge has been accorded quasi-statutory recognition: in prescriptions for savanna burning for greenhouse gas abatement. The methodology for generating recognised marketable credits under the Carbon Farming Initiative is explicitly recognised as being based on Indigenous practice[15] (see Russell-Smith et al. 2009). It has been endorsed by the Domestic Offsets Integrity Committee established under the federal *Carbon Credits (Carbon Farming Initiative) Act*, and was recently approved (February 2012) by the relevant Minister[16]. Other commitments to apply Indigenous fire management skills for management of landscapes and protection of biodiversity have been incorporated in plans of management for jointly-managed parks like Kakadu and Uluru (Kakadu Kakadu National Park Board of Management 2007, p. 63; Uluru-Kata Tjuta Board of Management 2010, p. 79).

In contrast much of southern Australia; none of these prescriptions seek total exclusion of fire (Russell-Smith et al 2009) because that would be both difficult and undesirable. Savannas depend on regular disturbance by fire for their present structure and function (Staver et al 2011). Fire is a tool to be deployed with skill to achieve well-specified objectives (Whitehead et al 2003). Herein lies a particular risk for skilled Indigenous fire managers: that others will take up formulaic application of broad fire management options - like more early burning - in place of a nuanced ability and acceptance of obligations to adapt methods to local circumstances. This may deprive Indigenous people of opportunity to use their skills commercially or to be otherwise supported in their application and, perhaps more critically, crude imitation may end up discrediting genuine practice and perhaps also damage other opportunities. Haynes (2010) describes the fire program in Kakadu National Park as "dominated by whites in the name of 'authentic Aboriginal culture' (and Western science too) and only sporadic frustrated resistance by traditional owners and their countrymen and women".

No attempt has been made to protect Indigenous knowledge in fire management in law (e.g. through patent). Arguably too much is in the public domain already to permit such action. Indeed, it

[14] http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=111

[15] http://www.climatechange.gov.au/government/initiatives/carbon-farming-initiative/methodology-development/approved-methodologies/~/media/government/initiatives/cfi/methodology-development/methodologies-approved/savanna-burning-methodology-approved.pdf

[16] see http://www.climatechange.gov.au/minister/mark-dreyfus/2012/media-releases/February/mr20120222.aspx

may be counter-productive to attempt formal legal protection. A recent patent attempt by an Australian company working in carbon management illustrates the point. That company tried to patent a method for generating carbon credits through regionally-coordinated fire management, based largely on the premise that aggregating contributions from individual actions over large scales was a novel approach. A successful patent would have positioned the company to demand payment from any party (including Indigenous people) seeking to deploy similar methods for commercial gain. However, detailed publications from interests in the West Arnhem Land Fire Abatement project (WALFA) on Indigenous practice to achieve regional scale outcomes was recognised as "prior art" that had entered the public domain. The particular patent application has now lapsed[17].

Arguably, benefits from knowledge and skills that are widely shared in the Indigenous community are best achieved by developing capacity through new enterprises to apply that knowledge skilfully. Competitive advantage can then be gained and maintained through performance and the reputation of Indigenous businesses rather than through legal protection that is expensive to obtain and of questionable efficacy (Drahos 2011).

Attempts to regulate for particular fire regimes or to over-specify them in plans of management and other quasi-regulatory instruments could also be damaging. This would not only disable the incipient savanna fire markets which require regulatory additionality, but would entrench inflexible and hence sub-optimal practice.

There are additional opportunities to deploy improved fire management knowledge and practice to greatly increase carbon benefits and enjoy carbon incomes. Biodiversity and social "co-benefits" will also be generated. These warrant support, not just for their commercial potential, but because they provide useful pathways to prepare for a wider array of occupations. And dependence on a mix of traditional and IT-deployed scientific knowledge provides and important platform for attractive school curricula (*Section 7.31 Education* below).

As noted above, fire management around rivers and streams affects riparian vegetation and in-stream water quality very directly. Poor fire management more distant from riparian systems can also have important impacts on water quality by accelerating erosion (Russell-Smith et al. 2006). Skilled use of fire in and around wetlands is important to maintain vegetation patterns favouring characteristic wildlife (Whitehead and McGuffog 1997; Whitehead 1998).

7.8 Feral animal control

Persistently large population of feral animals in northern Australia cause substantial environmental damage, reduce production and create other risks: like acting as reservoirs and vectors for spread of animal or human disease and threats to physical safety (Letts et al. 1979; Bayliss and Yeomans 1989; van den Hurk et al 2001). Use of landscapes for customary purposes and tourism can be disrupted by the presence of large and potentially dangerous feral animals like water buffalo *Bubalus bubalis* (Robinson et al. 2005).

Approaches to control of exotic animals, especially feral domestic stock, are often highly contested (Symanski 1994). Animal welfare and animal rights interests may argue that killing is unnecessary or unethical and may be unpersuaded by arguments about intervening to prevent the slower but no

[17] Supplement to the Official Journal of Patents 1 March 2012. IP Australia, Canberra.

less certain destruction of the native organisms dying on loss of the habitat that sustains them. Control is always expensive, especially when sterilisation, other chemical fertility control or capture and relocation are promoted as alternatives to killing (e.g. English 2002). Per capita costs of control escalate when densities are low, so eradication is rarely considered: programs need to continue indefinitely as populations recover. Governments are reluctant to meet such costs from public funds or to impose them on landholders, in part because the costs of failing to act are rarely known in any currency, let alone in dollar terms. For example, neither the densities below which environmental or social costs fall to acceptable levels nor the financial costs of keeping them below that level are known for any feral animal common in northern Australia in any environment.

The net result of these social, economic and environmental uncertainties is that policies and programs for control of invasive animals lurch from neglect to large scale interventions when problems become too obvious to ignore; and then back to neglect again when a measure of control is asserted and immediate problems abate (Robinson and Whitehead 2003).

In the Indigenous domain, there has been a tendency to treat Indigenous attitudes to feral animals (Rose 1995) as qualitatively different from non-Indigenous views. This has had the unfortunate result of stalling control programs in some settings (PJWhitehead, personal observation). The reality is, however, that the mix of reasons for resisting weakly constructed control programs is no more or less diverse than in non-Indigenous settings. Objections include loss of economic or utilitarian value (e.g. use of animals like buffalo and pigs for food), ethical concerns about killing large numbers of animals (more than necessary to meet immediate needs for food), family or other associations with particular populations, incorporation in local heritage, and associated beliefs that some exotic animals have a legitimate place and play valuable roles in the landscape (Robinson et al 2005). Perhaps most significantly, the reasons for asserting vigorous control may be unconvincing because good information on impacts is lacking. Too often conservation authorities fall back to abstract arguments about animals not belonging in the relevant environment, a position that is unlikely to influence people with a strong local association with the species and particular populations extending over several human generations.

Reaching agreement can be achieved in the same way as in any other setting: by exposure to information on impacts, and involving affected people in debate and decision-making, including design of control programs (Robinson et al 2006). A few exotic species, like Banteng Cattle *Bos javanicus* raise particularly difficult questions because they are threatened in their native habitats. But even in such cases it is possible to design control regimes that protect both their international conservation value, generate incomes and protect environments (Brook et al. 2006).

The quality of information needed to determine precise target densities and hence the scale of control operations and their cost is rarely available. Once decisions are taken that damage or other risks are at levels that warrant control, then programs will necessarily be adaptive in design and execution. Arguably the most efficient approach will be to keep good records of animals removed and their locations and monitor sites supporting the values that were considered to warrant protection. In this way a relationship between control effort and reduction in damage or risk can be established and used to refine programs as experience is gained. Ens et al (2010) and Ens (2012) illustrate how such monitoring can be done using accessible and reliable technology. Decision-making about mitigation of some risks (safety or disease) is more complex but may be supported by modelling using data on encounter rates or similar that are relatively straightforward to gather.

Exotic fish have not caused the same level of problems in north Australian waters as in southern Australia (Pusey et al. 2011), although small numbers of exotic aquarium fish have become established at a couple of sites in the Northern Territory and a number of populations of *Tilapia* (herbivorous fish commonly used in aquaculture) are causing concern in the Gulf of Carpentaria. There is clearly ongoing need for both surveillance and control. Cane toads are the only amphibian to have caused widespread problems: futile attempts to intercept toads across wide fronts have mostly been abandoned. But there may be situations where intensive local control is warranted by threats to especially important sites or vulnerable wildlife populations, especially on islands, many of which are owned by Indigenous people.

Exotic invertebrates also present considerable risks. Although most attention and expenditure goes to control of exotic insect vectors of disease (e.g. Williams et al. 2006), exotic ants also cause conservation problems (Lach and Thomas 2008) and inconvenience people, sometimes severely.

Effectiveness of control of many species will depend on, so far as possible, preventing introductions, and then detecting infestations and acting early. Indigenous people are well placed to carry out both control and monitoring programs on their own lands to protect values important to themselves and other interests, and to work under contract in other areas. The cost effectiveness of improved surveillance (Section 7.29 below) and associated monitoring and evaluation systems (Section 7.30 below) to deal with invasive plants and animals should be investigated (Hulme 2006; Leung et al. 2005).

Large feral herbivores can have many impacts on water resources. Feral buffalo directly degrade and pollute water-bodies through wallowing, and accelerate drainage of wetlands through "swim" channels. Pigs cause extensive physical disturbance. They contribute to catchment-wide effects on hydrological and sedimentation processes and so can have large cumulative impacts on water availability and quality (Fogarty 1982; Letts et al. 1979; Skeat 1996). Protection of water-dependent ecosystems and their associated fauna by maintenance of environmental flows may be ineffective unless accompanied by control of feral animals. The disturbance created by large animals and their roles as vectors of seeds and other propagules can exacerbate weed problems.

Controlling feral animals to reduce their impacts on production and natural resources will remain an ongoing challenge in northern Australia. The opportunity to deploy Indigenous skills and commitment to protect country is yet to be seriously addressed in northern Australia.

7.9 Weed management

Some remote Indigenous lands remain relatively free of weeds (Yibarbuk et al 2001), while areas with an agricultural or pastoral history have sometime large infestations (Letts 1960). And even the remotest sites are under threat from the thorny shrub *Mimosa pigra* and exotic grasses that are capable of rapid dispersal (SEWPAC 2011a, b). There would now be few sites that do not face significant weed problems. The risks posed by major weeds are arguably better understood than feral animal damage. *Mimosa* and para grass *Urochloa mutica* cause extreme modification of floodplain habitats, excluding other plants and denying fauna and humans access to resources (Braithwaite et al. 1989; Ferdinands et al. 2005). The grassy weeds change fire regimes through their large fuel loads and put at risk the persistence of woody vegetation in affected sites (SEWPAC 2011b; SA Setterfield, pers. comm.). Nutrient depletion from soils may follow (Rossiter et al 2004; Rossiter-Rachor et al 2008).

As with control of other pests, eradication is rarely plausible, in part because costs of control escalate so much when densities are low that efforts are lifted or slowed prematurely, permitting rapid population recovery after these bouts of control (Walden and Bayliss 2003). Once such organisms are well-established and dispersed, control effort must be maintained to avoid squandering earlier investments. Strategic control of isolated or "pioneer" outbreaks can help maintain clean areas at lower cost than delaying interventions until population increase and problems become obvious (Taylor and Hastings 2004).

The Australian Weed Committee has recently (April 2012) added new species to the list of Australia's worst weeds, including the exotic pasture *Andropogon guyanus*. This may increase funds available for control, but unfortunately well after the threat was recognised and control had become a complex and expensive challenge. Whilst some of the most pressing problems currently occur with species introduced as pastures, there are risks with ornamental and other garden plants (e.g. Miller and Walduck 2011) which will probably increase over time as more varieties are brought to the Australian tropics and are moved around towns and settlements.

The stakes in weed control are high for Indigenous land owners and managers. Not only do the worst weeds threaten to change the character and productivity of their lands, but also put at threat many livelihoods, including tourism, carbon farming and other environmental services, as well as commercial and customary use of wildlife. Weed control to serve national and regional conservational goals, protect Indigenous and non-Indigenous production and commercial interests is likely to remain a significant component of the NRM-based livelihoods landscape indefinitely. Although killing plants, often through use of poisons, is itself unlikely to attract the enthusiastic voluntary engagement of some industries, weed management will be an essential component of other publicly and privately-funded projects to maintain environmental services.

The effects of weeds on water management are felt directly through their use of water (Rossiter et al. 2004) and impacts on management of impoundments, as well as indirectly through effects on riparian vegetation. Efforts to control weeds like rubber vine through fire can damage the structure and function of riparian systems (Valentine et al. 2008; 2012). Risks of herbicides entering waters are obviously increased if weed types and densities demand increased use of less rapidly degraded herbicides over significant areas of a catchment.

7.10 Nuisance wildlife management

Native animals may also cause nuisance (fruit bats in urban backyards), financial loss (magpie geese, lorikeets, cockatoos in fruit and nut crops), threaten human safety directly (e.g. dingos or saltwater crocodiles), or act as vectors for zoonotic disease (bats carrying lyssavirus; native rodents and scrub typhus). Indigenous groups do some crocodile management in the Northern Territory (removal and relocation of problem animals: DAC 2011), but have had little involvement in other forms of control of native pests.

Nuisance wildlife may very directly impact other livelihoods based on tourism and horticulture, but rarely directly affect water resources. Large saltwater crocodiles may deny recreational access to water bodies. Some Ranger groups are involved in crocodile management with government; further engagement may be possible as a component of expended wildlife management roles, especially in remote areas (Sections 7.13 and 7.14 below).

7.11 Visitor management

As owners of large areas of land which support substantial settlements, national parks and reserves used for tourism and recreation, and attract various users of resources on land and waters, Indigenous people have important reasons to involve themselves in managing access and the activities and safety of visitors.

Incomes can be derived from passive forms of access management like fees for entry, royalties for taking resources, or leases to establish exclusive rights to access and use a site (see Section 7.26 *Income-generating land use agreements* below). Other, more engaged options include joint ventures where providing access to tourism or other businesses entitles Indigenous partners to guarantees of employment or a share of business incomes or profits. Individuals or groups may also establish their own businesses in visitor management, such as guided tours. A mix of these options might be pursued on jointly-managed parks or Indigenous protected areas.

7.11.1 Tourism

Indigenous tourism has been valued nationally at $7.2 billion or 12% of visitor expenditures (Tourism Research Australia 2010). Much of that value is captured in major centres even though over half of all Indigenous tourism businesses are located in remote or very remote areas, where much of the Indigenous population lives. In 2008 the industry was seen as "fragile and tenuous" (Buultjens and White 2009) and there is no indication of significant improvement in that status since.

Wray et al. (2010) argue that successful regional tourism depends on strong state and local government support for planning and implementation. All north Australian political jurisdictions and the federal government have developed Indigenous tourism strategies (NTCC 2004; Tourism Queensland 2010; Tourism WA 2005; Indigenous Tourism Australia 2007), although objectives are sometimes vague and activity appears intermittent. Rhetoric is not always matched by rigour of analysis or the vigour of approach to Indigenous development through tourism (Whitford and Ruhanen 2010). Brereton et al. (2007) found little enthusiasm among park managers for engaging Indigenous people in tourism ventures on parks. In remote areas, private supporters of Indigenous economic development like mining companies may find it difficult to adopt practice that optimises outcomes (Buultjens et al. 2010a).

Tourism Australia ranks both ecotourism and Indigenous tourism among the nation's key visitor attractions. Ownership of large areas of ecologically important lands could position Indigenous people well to offer compelling experiences satisfying both demands. However, complex ecotourism accreditation processes based on exclusively non-Indigenous views of nature inhibit participation. The Indigenous tourism sector in remote and regional Australia remains immature (Fuller et al. 2005; Buultjens et al. 2010b). Connections to mainstream tourism through inclusion in "packages" and participation in networks is often weak (Nielsen et al. 2008).

Assessments of demand for tourism experiences that include exposure to Indigenous people and culture are equivocal, with some indicating that a small minority of tourists seek such experiences (Ryan and Huyton 2002). Impacts on participating communities may be positive or negative (Dyer et al. 2003; Simpson 2007). Some visitors with an interest in direct contact with Indigenous culture may be concerned at the potential for intrusiveness (Moscardo and Pearce 1999). It has been argued that poor naming practices for Indigenous rock art sites contribute to vandalism (Clark 2009). In

some cases Indigenous lands or sites are accessed by tourists without approval from traditional owners or custodians (e.g. Scherrer et al. 2010). Loss of control over what access and experiences can be appropriately shared is a common Indigenous concern (Nielsen et al. 2008).

Palmer (2004) summarises conflicts between Indigenous views of appropriate behaviour on country and the expectations of visitors (bushwalkers) in Kakadu National Park. Formal acceptance of visitor use of traditional lands may be accompanied by continuing discomfort about risks created for country and people, including visitor safety. Traditional use of country may be curtailed by the presence of visitors. A number of strategies and management plans for parks and reserves (e.g. Kakadu Board of Management 2007) promote the notion of joint ventures where Indigenous owners retain a large measure of control over the tourism enterprise, and some of these have enjoyed success (Haynes 2010).

The quality of visitor experience may itself be directly impacted by the density of visitors (Friemund and Cole 2001). As land owners, Indigenous people engaged in tourism have the option to "calibrate" visitor densities in ways that are more difficult for publicly-funded experiences, so that the quality and hence commercial value of experience is maintained. One of the attractions of the IPA model is that it permits greater influence over tourism activity than is generally applied to declared reserves. Nonetheless, levels of Indigenous interest in tourism as a source of employment or enterprise is variable, with some expressing enthusiasm (Andrews 2005; Lovell 2005) but take up of opportunities sometimes being less enthusiastic.

In northern environments characterised by year-round high temperatures it is unsurprising that much tourist activity focuses on water bodies and their associated vegetation, which present as oases of dense shade, as well as more interesting scenery, in a superficially unvarying and sometimes harsh savanna matrix (Hadwen et al. 2006). Intense use in some sites can lead to deterioration of surrounding environments, of riparian vegetation and in-stream water quality (Manning 1979; Hadwen et al. 2003; Phillip et al. 2009). Even such apparently benign activities as swimming may have significant impacts on biophysical character (Butler et al. 1996). The impacts of tourists are greatly influenced by the ways in which they gain access and move through sites (Cole 1993). For examples, walkers have much lower impact on vegetation and soils, but because they may spend more time on site, may cause more (refuse and excretory waste) pollution.

7.11.2 Recreation

Some visitors seek access to areas for particular forms of recreation. Obviously this category of work with visitors overlaps with tourism more generally, but creates additional opportunities and demands associated with more active forms of recreation. These include hunting and fishing, diving, boating, cycling, motor-cycle or quad-cycle use, or 4 wheel-driving. Such activities differ from more packaged and passive tourism in potentially greater impacts on biophysical values, risks of intrusion to cultural sites, and incompatibilities (e.g. safety) with other uses including traditional (subsistence and ceremonial) use of country and resources. Often such active uses may need to be exclusive, with other visitors or even land owners unable to enter sites in such use. In negotiating such arrangements, financial or other benefits probably need to be greater to compensate for more intrusive requirements and provide the funds to manage impacts.

Poorly-managed use of recreational vehicles may impact water resources through alteration of drainage patterns and increased erosion. Large powered boats in rivers may erode banks (Bauer et

al. 2002), leading to slumping, increased turbidity and damage to in-stream vegetation, and altered wetland drainage patterns. Controls over boat speeds may be desirable in some situations (Maynord 2005).

Tourism undoubtedly offers additional opportunities but rapid development under current economic conditions appears unlikely. Incremental growth is more probable as landholders firmly re-establish their presence on country and gain the interest, means and confidence to offer greater visitor access. Opening up lands also used for other purposes will require planning (Section 8.18) and active management.

7.12 Threatened species management

A number of Indigenous groups and especially Rangers have become involved in management of threatened species. Management may be highly targeted through interventions to protect particular populations of a single species or, more commonly, to protect or foster attributes of habitat that favour one or more threatened species or assemblages. Examples of the former include transfer of northern quolls *Dasyurus hallucatus* to predator and cane toad-free islands owned by Indigenous people (Hill and Ward 2010) and of the latter, better management of fire to protect fire sensitive plants over a large area (e.g. TSSC 2011).

Direct financial support for such work set out in recovery plans is often highly constrained (see examples in Palmer et al. 2003; Dorricott and Garnett 2007; Hill and Ward 2010) but the presence of threatened species or assemblages may also influence support to create and maintain local Indigenous Ranger groups or establish IPAs with modest but important ongoing funding. Threatened species will not always be those of greatest interest to Indigenous people (whether through utilitarian value or cultural significance). Livelihoods based substantially on threatened species are most likely to be seen as useful for larger culturally-important animals like dugong and marine turtle, which are important components of the customary economy, especially if genuine co-management arrangements are available (see Turtle and Dugong Taskforce 2011; Section 7.13 *Wildlife harvest management* below).

Threatened species management intersects with water resource management when habitats of such species are affected by extraction or impacts of other livelihood activities on water quality.

7.13 Wildlife harvest management

Many species of wild plants and animals have economic value in markets (Whitehead et al 2006, Gorman et al. 2008) or subsistence economies (Altman 1987, 2003). Commercial use of native species automatically triggers much regulation, especially if products are exported interstate or internationally. Regulatory responses may sometimes be weakly justified in conservation terms (Whitehead and Storrs 2003, 2004). Subsistence use by Indigenous people is less regulated, although pressures to assert tighter government control recur, particularly for "charismatic megafauna" like dugong (e.g. Heinsohn et al. 2004) and marine turtles. Such calls often have a weak base in science and take too little account of potential impacts on local people (e.g. Campbell 1998). Influences on policy for wildlife use and conservation are many and various (see below and Section 8.4) and it is easy for Indigenous perspectives to be overlooked or discounted.

Indigenous people have a critical stake in the future of many animals that characterise northern Australia, including iconic species like estuarine and freshwater crocodiles, magpie geese, dugong, marine turtles and freshwater turtles. Such species are economically and culturally important and their most favoured habitats often occur on Indigenous-owned and controlled lands and waters. Greater engagement of Indigenous people in their management appears desirable on the grounds of efficiency and equity.

But perhaps more importantly, Indigenous understanding of the ecology of such species is a valuable asset that should be deployed in their management (e.g. Russell-Smith et al. 2009; McGregor et al. 2010; Turtle and Dugong Taskforce 2011). Working as managers of wildlife to meet local needs and national conservation goals could provide important livelihoods directly and help maintain other livelihoods for Indigenous people. Re-examination of regulatory regimes in combination with formal recognition of Indigenous knowledge and management practice for equitable co-management partnerships is likely to be particularly productive.

It is important to note that many of these species depend on habitats that are directly affected by the standards of management of wetlands and catchments and their associated water resources. For example, near shore marine habitats like seagrasses - on which marine turtles and dugong depend - can be damaged by sediment or other pollutants transported from poorly-managed catchments and shifts in salinity associated with change in freshwater flows (Livingston et al. 1998; Gillanders and Kingsford 2002).

7.14 Commercial wildlife harvest (native animals)

Markets for products from native animals in Australia are most developed for fish. Obvious exceptions to this general rule are the kangaroo harvests concentrated in sheep and cattle farms in southern Australia, which are justified at least in part as pest control programs. Kangaroo products include leathers and meat for pets and human consumption. Crocodile programs mostly involve ranched animals rather than harvest directly from the wild (e.g. PWS 2009a).

For most taxa, conservation laws often prevent taking from the wild for sale, irrespective of conservation status. Australia does not permit the export of live animals as pets or for any other reason except limited exchanges with zoos or other wildlife exhibits (see Simpson and Chudleigh 2007), so international markets for Australian parrots and the like are filled by animals bred in other places.

A wide range of fish and benthic organisms (corals, sponges) are taken live for the national aquarium trade from both freshwater and marine environments (e.g. DPIFM 2008), but Indigenous people have been relatively little involved in this trade. A number of freshwater fish species occur only on Indigenous lands (Pusey et al. 2011), but any commercial advantage offered by restricted access can be lost as soon as captive breeding begins. There has been at least one instance of limited royalties being paid to traditional owners for continued access to breeding stock (PJWhitehead, personal observation).

Outside fisheries, the national and state Parliaments have recognised commercial returns, livelihood opportunities and conservation benefits of well-managed wildlife use (Senate Rural Affairs and Transport References Committee 1998; Environment and Natural Resources Committee 2000) but this has not led to serious change in laws or policies. This situation seems likely to persist and any

proposal for commercial use of native animals for food is likely to attract close scrutiny and criticism, irrespective of its origin. Modest proposals for entering the pet trade may be less challenged (see Fordham et al. 2010). But whatever the reaction from raucous lobby groups, it is unreasonable for Indigenous people to acquiesce in deprivation of opportunities for sustainable commercial use (like hunting of crocodiles) and these pressures should resisted. Freese (1998, 1999) thoroughly examines the competing arguments for commercial use of wildlife as a conservation tool.

Axiomatically, availability of wildlife for commercial harvest directly from the wild depends on maintenance of habitats of the targeted species. Given that many animals already in trade or proposed for trade are aquatic or semi-aquatic, the connection of sustainable wildlife harvests to good management of water resources and water dependent ecosystems is self-evident. Processing of harvested wildlife may require access to reliable water supplies, but usually relatively small volumes would be required. Perversely, tight restrictions over sustainable use of native species from unmodified habitats may direct Indigenous landholders towards more orthodox forms of production that require greater modification of land or irrigation, both of which put greater pressures on water resources.

In addition to regulatory difficulties and community disquiet about some forms of use, there are many practical obstacles. For example, in all but the most specialised markets, providing timely supplies of products in predictable quantities are basic obligations. Guaranteeing supply of products dependent on wild harvest and all the factors that influence it is extraordinarily difficult at small (community-level) scales (Whitehead et al. 2006; Cunningham et al. 2009). Supply may be threatened by events in the community that affect people's availability for work or natural variation in abundance and distribution of the product. Building inventory by storing reserves locally to "smooth" peaks and troughs in supply is impractical for many products. Finding ways to ensure continuity of supply is a major issue for all wildlife (animal and plant) products sourced from wild populations.

Despite the difficulties, commercial use of wildlife may offer some livelihood options where few others exist, and warrant further Investigation.

7.15 Commercial wildlife harvest (native plants)

Commercial use of native plants is well established throughout the country in harvests of wildflowers in Western Australia, forestry of various types, and some harvests of live plants.

7.15.1 Native species forestry

Small-scale forestry based on native timbers growing naturally has a comparatively long history in north Australia (e.g. Venn 2004; 2006; Lacey 1979). Products were processed by small (including mobile) mills and used primarily in local construction rather than for commercial sale. Most of these operations ceased several decades ago on closing of missions. Renewed interest in timber harvest has been stimulated by the clearing to waste of potentially valuable timbers in areas of bauxite mining. In addition to the established mine at Weipa (Anon. 2005), there have been proposals for additional major developments on other parts of Cape York, including close to Aurukun. Similar opportunities may arise at mining developments on forested sites s in other parts of northern Australia.

Venn (2004) considered that an optimal strategy for exploiting such opportunities would involve portable sawmills brought close to harvest sites rather than larger "permanent" mills which would require logs to be transported over considerable distances. Obviously, dependence on the schedules of mining companies whose patterns of development are dictated by factors unrelated to Indigenous employment will create fragile enterprises, unless timber can be sourced elsewhere during mining lulls. Over the longer term, establishment of plantations on rehabilitated mined land may provide for continuity of supply, but regeneration may be compromised on mining spoil and forest composition influenced long term by initial treatments and responses (Norman et al. 2006). There could be no guarantee that methods promoting rapid stabilisation of land under repair would also produce assemblages favouring commercial harvest.

Like all other direct use of plants in commerce, sales of timber whether raw or processed will require approval from state or territory governments and perhaps the payment of royalties to the state. Both Queensland and Western Australia have elaborate legal frameworks for managing forestry. The Northern Territory has no forestry law but under its wildlife law (*Territory Parks and Wildlife Conservation Act*) may regulate taking of native timbers and payment of royalties. In all jurisdictions harvest and transport of stems will require management to keep disturbance within acceptable bounds and so protect landscape stability and water quality.

Options for livelihoods based on plantations forests of native species are considered in Sections 7.17 *Wildlife ranching (native plants)* and 7.19 *Farming of wildlife (native plants)* below.

7.15.2 Non-timber forest products

Indigenous people harvest native plants for many customary purposes, including food, fibre, dyes, implements, art works, and ceremony. A number of these uses also have commercial application, with small-scale enterprise offering bushfoods, visual art, crafts, didjeridus, spears and other implements (Koenig et al. 2005; Whitehead et al. 2006). Products with a cultural association often involve a good deal of value-adding which improves returns to participants. Many works on materials harvested from the bush enter markets in fine arts[18]. These and other non-timber forest products (NTFP) are important in many communities in north Australia (see DAFF 2008).

Fruits like bush tomato and Kakadu plum are increasingly in demand as additives (less commonly on their own) in foods (Cherikoff 2000) or even cosmetics. Cycad leaves and flowers or other parts of other plants may be harvested for use by florists as parts of larger floral arrangements, and whole plants taken from the wild may enter the live plant trade (Griffiths et al. 2004; 2005).

As a general rule, vegetation (plants) on an area of land belongs to the owner of that land, and can be used as the owner chooses, provided land clearing and soil conservation laws are not breached. This means that plants can be used on site to support a business such as grazing. However, direct sales of plants or parts of plants most often require permits and also require payment of royalties to the state. In theory all artefacts containing parts of a plant also require individual approval, even though the commercial transaction may be based mostly on the value added by the artist or craftsperson. In practice these formal (and probably unworkable) requirements are rarely enforced.

[18] e.g. http://www.maningrida.com/home

In other circumstances, onerous regulatory regimes have been imposed at considerable cost but no conservation gain (Whitehead et al. 2006), and such regulatory excesses should be avoided (see Section 8.4 below).

Some species of regularly harvested plants (e.g. *Bombax ceiba* for carving) grow in wetter, water dependent ecosystem types. Harvest of native plants for commercial sale in an unprocessed form will rarely require significant additional water use. However, some options, especially those involving sale of live harvested plants, depend on functioning plant nurseries that will obviously require a reliable water supply.

7.16 Wildlife ranching (native animals)

Wildlife ranching involves taking animals from the wild and rearing them in captivity for at least a part of their life cycle, prior to utilisation. Life cycle stages particularly vulnerable to natural mortality and easily harvested and handled are usually chosen, such as eggs of reptiles or birds. Ranching works commercially because no provisions need be made for holding breeding adults and maintaining the sometimes specialised conditions needed for successful reproduction. And the survival and growth of harvested animals can be optimised. Ranching can also be designed to minimise ecological impacts, because effects on harvested populations are minimised by focusing on life cycle stages and subsets of the population with the lowest probability of going on to reach reproductive age in the wild.

The Northern Territory and Western Australian governments permit ranching of crocodiles (*Crocodylus porosus*); with the Territory harvest of crocodile eggs being by far the largest. Wild populations have continued to grow despite the substantial egg harvest (Fukuda et al. 2011). A number of Indigenous communities participate in the harvest, with most eggs coming from Indigenous-owned lands. All jurisdictions including Queensland also allow problem crocodiles to be transferred to farms to be used for breeding (QEPA 2007; DEC 2009; PWS 2009a; PWS 2010). In the Territory most eggs and hatchlings go to farms run by and employing chiefly non-Indigenous people. The Pormpuraaw crocodile farm (Cape York) is owned and managed by the local Council and employs mostly Indigenous people, but runs on captive breeding. Local people have sought approval to take eggs from the wild. Whilst applications have previously been rejected by the Queensland Government, an experimental harvest is presently underway[19]. Other farms in remote areas on Indigenous land have closed, perhaps due to the high costs and erratic supply of food adequate for captive animals.

The Territory's program for management of the Magpie Goose *Anseranas semipalmata* allows limited experimental egg harvest for ranching (PWS 2009b). Small scale trials were unable to establish whether commercially viable arrangements were possible. Preliminary estimates of the cost of rearing birds from eggs hatched in captivity were substantially higher than domestic species. The tight seasonality of laying means that rearing facilities generate returns over a small part of each year (Whitehead and Tschirner 1989; GJW Webb, unpublished). Further studies are warranted.

Another small ranching program is operated by the Maningrida community. Gravid long-necked turtles *Chelidona rugosa* captured in the wild raising are induced to lay by hormone injection and

[19] http://www.cdu.edu.au/enews/versions/020412/Stories/croc-egg_7.html

then released at the site of capture. Their eggs are incubated locally and the hatchlings sold into the pet trade (Fordham et al 2007; 2010).

There is probably scope to increase the range of animals ranched, but the scale of businesses and employment created from any one species is likely to be relatively small and address niche markets. Whilst enterprises based on a single species (aside from those using unusually high value species like crocodiles) will struggle for financial viability, integrated operations taking a number of species and so making greater use of equipment and staffing may be possible. Aquaculture options summarised under wildlife farming (Section 7.18 below) perhaps warrant additional consideration.

Most wildlife operations involving keeping of significant numbers of animals will require a reliable water supply for husbandry and related cleaning of facilities. Aquatic species will be particularly dependent on high quality water supplies, sometimes in substantial volumes.

7.17 Wildlife ranching (native plants)

Harvesting seed or cuttings from wild plants and propagation under controlled conditions is similar in concept to ranching of animals. Such products may be used for land rehabilitation, plantation forestry, the flower trade, or live-plant nursery trade.

Some Indigenous Ranger groups have become involved in taking seeds from rare or endemic plants from their lands and growing out in nurseries for conservation and perhaps ultimately for sale (Liddle and Gibbons 2006). Small scale seed harvesting ventures for growing plants for sale has been done by a number of Indigenous groups, often to supply stock for mine-site rehabilitation (e.g. in Kakadu National Park[20]). Such activities provide an important complement to land rehabilitation services (Section 7.4 above) because sourcing stock of local provenance is otherwise difficult.

Some now defunct plantation forestry endeavours (e.g. Cypress Pine *Callitris intratropica* in the Northern Territory) have used seed from wild plants to generate stock. Sandalwood plantations based on the Australian native *Santalum spicatum* (Clarke 2006) appear to rely on seed from wild populations.

All such activities depend on a reliable water supply (for germination and grow out facilities) and if successful may contribute to efforts to maintain water quality from rehabilitated land. Aquaculture options include growth of algae and phytoplankton for biofuels or feed for farmed or ranched animals (below). These obviously require a substantial and reliable water supply.

7.18 Farming of wildlife (native animals)

Wildlife is said to be farmed when an operation can generate its product without depending on continued harvest of the species from the wild. Farms operate as "closed" systems. Crocodile farms in Queensland operate mostly in this way, with the young they produce coming exclusively from on-site breeding, although they may use problem animals taken from the wild as breeding stock. Crocodile enterprises in other jurisdictions use both farmed and ranched stock. Organisations like the Bawinanga Aboriginal Corporation are seeking to breed other reptiles in captivity for sale to the pet trade[21]. For example, in the Northern Territory proposals have been made to establish captive

[20] http://www.digedi.com.au/northern-territory/business-details.php?business=Kakadu%20Native%20Plants
[21] see http://www.bawinanga.com/bac-enterprises/djelk-wildlife-enterprises

breeding populations of Oenpelli Pythons *Morelia oenpelliensis* through arrangements with traditional owners of the only lands on which they occur naturally (NRETAS n.d.).

Husbandry of native bees in artificial hives for commercial production of their honey (sugarbag) and wax is being examined in a number of settings (e.g. Anon n.d.; NLC 2010).

There may be other opportunities to breed threatened species for wildlife recovery programs but these will often require specialised facilities. Other needs, including veterinary expertise and specific foods, may be difficult to satisfy in remote locations. Unless a group can develop and hold a unique product which others are unable to access and incomes are supplemented by arrangements to trade some specimens with wildlife exhibits nationally or overseas, returns will often be low, because recovery plan funds are often sparse.

Aquaculture in north Australia occurs in all three jurisdictions and is presently built around the native species barramundi, mud crabs, prawns, pearl oysters, and trepang (Clark et al. 2009). Opportunities exist for production of ornamental (aquarium) fish. Present technology allows most to be farmed in completely closed systems without ongoing dependence on wild stock (e.g. Schipp 2007), although the option remains to use wild animals to source spawn. Grow out facilities may range from completely artificial systems, through large earthen ponds, to enclosed portions of otherwise unmodified natural systems with or without supplemental feeding. Oysters are grown on racks suspended in natural marine environments with reliable current flow.

Much aquaculture is technically demanding and management and infrastructure intensive. Reliable water and power are required for many options. Sites close to major centres are often preferred for systems producing food (e.g. see Schipp 2007 in regard to barramundi) to minimise transport costs and delays. Some operations (e.g. pearl aquaculture) are highly specialised and offer little employment to local people and make little or no use of local skills. At the other extreme, some aquaculture like that of the sea cucumber (trepang) can occur in areas of seabed leased, enclosed and stocked with juveniles with little day-to-day management being required.

These contrasts point to a basic difficulty with many orthodox aquaculture ventures as sources of Indigenous livelihoods. Those operations requiring intensive management inputs also require significant infrastructure and equipment and specialised skills. Those like trepang that make use of healthy natural waters generate little employment, except at harvest.

Wildlife farming activities of all sorts will require reliable access to water and if they involve aquatic animals may require a substantial supply and systems for managing risk of environmental pollution from waste water. Management of disease can be a critical issue for captive stock and some diseases may affect wild populations of susceptible organisms (Marine Aquaculture Task Force 2007).

In general it would be expected that ranching of secure wildlife species designed to draw sustainably on healthy wild populations and/or high quality habitat management on Indigenous land would present more readily exploited options than closed farming systems and their attendant greater costs in (breeding) facilities and year-round maintenance of breeding animals. Options for "low technology" aquaculture involving various forms of ranching or farming warrant more comprehensive investigation than has occurred to date (see, for example: Bannister et al. 2007; Bell and Jervis 1999; Duckworth and Woolf 2007; Knuckey 1995).

7.19 Farming of wildlife (native plants)

A number of attempts have been made to introduce native plants into horticultural undertakings of various sorts on Indigenous land. These may include supplemental plantings of species like Kakadu Plum (*Terminalia ferdinandiana*) in areas where they occur naturally, with little further intervention. More intensive endeavours may include establishment of orchards or farms on land cleared specifically for this purpose and supported by irrigation and active pest control.

Like so many other opportunities, Indigenous benefits from work to increase availability of native fruits and other plant products are compromised by difficulties in protecting ideas and products from lower cost competition nearer major centres and with better access to capital, expertise and markets (Whitehead et al. 2006). Cunningham et al. (2009) illustrate the difficulties with reference to Kakadu Plum. Such cost-based challenges might be addressed through "branding" of Indigenous products and the equivalent of fair trade arrangements to secure premium prices (Spencer and Hardie 2010; Section 8.14 below) although some dispute that association with Indigenous producers is a significant advantage in relevant markets (Cherikoff 2000).

As noted earlier, some forestry plantations of native species have drawn on seed from trees in the wild, but seed could also be sourced from existing, "domestic" populations that are now unharvestable due to inadequate maintenance (such as Cypress Pine *Callitris intratropica* on the Tiwi Islands). Most intensive plantation operations in north Australia draw on exotic rather than native species.

Some decorative native plants, including some of restricted distribution on Aboriginal land, may be suitable for "domestication" but once fertile material is sold, suppliers will emerge where raising and sales can be managed at lowest cost.

7.20 Wildlife exhibits

The Bawinanga Aboriginal Corporation (BAC) has established a Wildlife Centre for captive breeding of native species for trade (Fordham et al. 2010). BAC also proposes to examine the potential to open that centre to the public, as a complement to other tourism ventures. Crocodile farms have sometimes included tourism elements. Wildlife exhibits are expensive to operate and are unlikely to run profitably as stand-alone enterprises unless tourist numbers are exceptionally high.

Maintaining captive animals in healthy wildlife exhibits requires access to reliable water supplies.

7.21 Bioprospecting

Bioprospecting is the search for economically valuable genetic resources and bio-chemicals in nature. A number of important treatments for disease have been identified by determining the active constituent of traditional remedies and treatments.

Australia, as a signatory to the Convention on Biological Diversity, has asserted rights to regulate access to genetic resources and to protect the interests of Indigenous people to benefit from traditional knowledge and practice. Regulations made under the federal *Environmental Protection and Biodiversity Conservation Act* require those accessing biological resources in a Commonwealth area to enter into benefit sharing agreements. Those agreements must specify sources of knowledge

that led to a particular organism being targeted and, if Indigenous people's knowledge is involved, to specify agreements for using that knowledge.

Outside Commonwealth areas (most of Australia's land area and coastal waters), state and territory laws apply. All jurisdictions have enacted more or less complementary law[22] but the extent to which these legal frameworks genuinely protect Indigenous interests is questionable (e.g. Sampath 2005; Cunningham et al. 2009). I am aware of no Indigenous benefit-sharing agreement having resulted in a substantial flow of benefits to Indigenous groups under any of the related laws. Perhaps one of the reasons for this is that most organisms have distributions that extend outside Indigenous lands, offering opportunities to avoid benefit sharing. Agreements are more likely if marketing of a product can draw on an Indigenous connection or, in the case of food ingredients, necessary regulatory approvals are facilitated by recognition of safe long term use by Indigenous people[23].

As noted in regard to fire management above, using stronger formal legal mechanisms to protect knowledge will always be problematic, especially if elements of that knowledge have already entered the public domain. Indeed, published reports of such knowledge may be necessary to help secure benefit-sharing when "discoveries" are exploited commercially by others. Indigenous communities will rarely be placed to pursue commercialisation of a pharmaceutical or botanical medicine except in partnerships.

Bioprospecting places no particular pressures on water resources but may draw on the biodiversity supported by water-dependent ecosystems.

7.22 Wild harvesting of exotic (feral) animals

Large populations of feral animals exist in many parts of north Australia, and they continue to grow and expand into previously unoccupied areas. Populations of some species are large enough to support commercial use in a number of different ways. Buffalo are mustered for live export and slaughter for meat in parts of the Northern Territory. Field-shot or trapped pigs may be taken to supply markets for game meats, which fluctuate erratically in scale and value. Recreational (safari) hunting operations taking pigs, buffalo, deer or banteng work in all northern jurisdictions.

Feral species offer access to markets, like safari hunting and game meats, less encumbered by the substantial regulatory burden associated with native species (Whitehead 2000; Whitehead and Storrs 2003). Formal studies (e.g. Bradshaw and Brook 2007; Collier et al. 2011) indicate that some operations generating reasonable returns per animal can be profitable; and a few have operated over the long term to generate both employment and royalties to landowners.

Feral species have also entered the customary economy and are now an important source of food in many Indigenous communities (e.g. Altman 1982; Robinson et al. 2005). The extent to which commercial or subsistence use of feral animals contributes to controls to limit the risks they pose to environments, human health and animal health will vary with context and especially the commercial returns available from their exploitation (Choquenot et al. 1995). Recognition of commercial value can sometimes inhibit control for environmental or other reasons and encourage tolerance of large populations while awaiting the next opportunity (Robinson and Whitehead 2003).

[22] see http://www.environment.gov.au/biodiversity/science/access/states/index.html
[23] http://www.fda.gov/Food/FoodIngredientsPackaging/GenerallyRecognizedasSafeGRAS/default.htm

Prospects of using commercial harvests to reduce populations to levels at which significant environmental benefits are achieved could be enhanced by opportunities emerging through the Carbon Farming Initiative (Section 7.5 above). The CFI establishes mechanisms to recognise carbon credits from reductions in methane emissions through culling (federal *Carbon Credits (Carbon Farming Initiative) Regulations*). Connected benefits in carbon sequestration following recovery of vegetation suppressed by high feral animal densities might also contribute, although "permanence" (Section 7.5 above) will be threatened by the sort of recovery of populations that has characterised the stop-start feral animal control programs often mounted in northern Australia (see Choquenot 1991).

Assessing the financial viability of such integrated projects will require quite complex analysis incorporating the dynamics of carbon markets, feral animal populations, patterns of vegetation recovery at different feral animal densities, other environmental impacts, and the durability of institutions for maintaining control over very long periods. Estimates of all of these parameters will involve high levels of uncertainty and so increase risk of financial or other failure.

Despite these complexities, the imperative to explore all plausible incentives for control, and hence the potential to contribute to Indigenous livelihoods, remains. Feral animal impacts on Indigenous lands appear to be increasing in many locations (Ens et al 2010). Because the animals are unconstrained and may change habitats and locations seasonally, those costs may be felt by people who are not benefiting directly from the commercial harvest.

Minor usage of cane toads for souvenirs or novelties[24] offers no particular opportunities for Indigenous people.

Many feral species have particular impacts on water resources and water-dependent ecosystems, perhaps most obviously in the case of water buffalo and pigs. Potential to protect or enhance water availability and quality should be considered when determining targets for reductions by commercial or customary harvest.

7.23 Wild harvesting exotic plants

Most exotic plants that occur in the wild as unmanaged populations dense enough to permit harvest for any purpose are highly invasive and weedy in the sense that they spread readily and damage natural or production systems. Maintaining or tolerating such species at densities sufficient for economic harvest is therefore likely to conflict with the interests of other land and resource users.

Nonetheless proposals to use weeds such as *Mimosa pigra* or high biomass grasses as feedstock for power plants (e.g. Presnell 2004) or second generation biofuels (Section 7.25.5 below) or for other purposes (hay or seed for "improved" pastures) arise from time to time. Such species cannot be used in carbon farming (see Section 7.5).

Some Indigenous lands in northern Australia support large weed populations or are at risk of future invasion if present controls are not improved (Gardener 2005). Whilst it is likely that proposals for use of weeds will continue to arise, commercially compelling cases may prove elusive (Grice et al. 2011), particularly when account is taken of the risks to other users and the constraints that the presence of large populations of invasive plants place on other land uses.

[24] e.g. http://www.univenter.com/cane-toad.html

Harvesting of weeds raises no unique issues for water management although risks to aquatic systems may be increased if harvest methods involve high levels of disturbance or tolerance of species likely to invade wetlands or riparian systems.

7.24 Farming of exotic animals

Cattle-raising is a major industry in northern Australia, generating gross incomes in the order of $1 billion pa and providing up to 5% of employment. Its viability over much of the north depends on access to large areas of relatively cheap land with comparatively modest capital investment in infrastructure. A trend towards larger corporate holdings with the capital to make more intensive use of the most favourable sites appears likely to continue.

Indigenous people own large parts of the north Australian land mass and are likely to recover more as various land rights and native title applications are settled (Altman et al. 2007). Many areas are unsuitable for conventional agriculture, although some areas in the Daly River area of the Northern Territory, for example, are at least as favourable as areas already under development (PJWhitehead, unpublished analyses). With proposed improvements in access to remote areas and new approaches to land use, such as irrigation mosaics, serious proposals for development can be expected, although Indigenous opinion regarding the desirability or acceptability of land clearing for agriculture is divided (PJWhitehead, personal observation), just as it is in other segments of Australian society. Exposure drafts of proposed Northern Territory laws for land clearing seek to protect Indigenous access to land development opportunity by "reserving" a portion of allowable clearing for catchments for Indigenous landowners, equivalent to the proportion of Indigenous land in the catchment[25]. Studies presently being done with the support of the federal government include development of a framework to support Indigenous groups to develop pastoral holdings into commercially viable enterprises[26], probably through intensification of use.

Indigenous people seeking approvals to clear land for more intensive pastoralism or other animal husbandry in Queensland will need to navigate laws for native vegetation management (land clearing) (the *Vegetation Management Act*) and for protection of the important values of rivers (*Wild Rivers Act*). Likelihood of obtaining approval varies with the status of the vegetation type to be cleared. It is argued that the *Wild Rivers Act* may unreasonably restrict development (Pearson 2010) although the Queensland Government notes that no development application in relevant areas has been rejected since the law was introduced in 2007 (DERM 2011).

In Western Australia, the *Environmental Protection Act* prohibits clearing where the biodiversity values, land conservation and water protection roles of native vegetation would be significantly affected. In general this means that land clearing may be approved where the vegetation type is not rare and clearing is unlikely to cause degradation of land or water resources, or put at risk vulnerable species of plants or animals.

Many older Indigenous people in northern Australia have had long experience with extensive pastoralism. Despite exploitative employment conditions in the past, many also have positive memories of the work and the opportunities it provided to be on country and to meet related obligations (Gill 2005; PJWhitehead, personal observation). They are eager to see younger people

[25] http://www.nretas.nt.gov.au/natural-resource-management/natveg/legislationreview
[26] http://www.regional.gov.au/regional/ona/nabis.aspx

take up pastoral work. The reasons given for favouring pastoral work are at least superficially similar to those cited for seeking other forms of work that depend on presence on country (Garde et al. 2009).

Lands recovered through state or federal land rights laws and native title claims, or through purchase by the Indigenous Land Corporation (ILC) and mining companies as a component of land access settlements often includes pastoral leases. Some of these retain elements of pastoral infrastructure. Through schemes like the Indigenous Pastoral Program in the Northern Territory and the Kimberley Indigenous Management Support Service (KIMSS) in Western Australia, Indigenous landowners are supported to restore properties to production and to secure employment through training (ILC 2011).

Groups recovering pastoral sites, especially in marginal country like much of Cape York and the Top End, confront difficult questions about approaches to development. Extensive pastoralism is well matched to the sort of livelihoods sought by many Indigenous people seeking return to country, but is in most cases unlikely to provide the financial returns necessary to support all those with an interest in the land. Options for intensification of use and higher incomes may be constrained by land capability and by difficulties in accessing and servicing debt finance, and also conflict with cultural norms, including meeting obligations to country.

Alternatives to significant intensification, while maintaining pastoral activity, include diversification of income sources such as contract delivery of fire and other land management services to neighbours, carbon farming on parts of the property unsuitable for orthodox production, tourism and arts and crafts, or small-scale horticulture. In these sorts of models, well-equipped and managed pastoral properties could act as nodes for accessing off-site employment and conducting small enterprise. The pastoral training properties managed by the ILC (e.g. Merepah on Cape York) are placed to take up broader roles in a range of land management activities. Laws governing pastoral leases may inhibit other uses, but all northern jurisdictions have recognised the desirability of permitting greater flexibility in the array of activities permitted on pastoral leases. Working out ways of handling additional compatible uses of pastoral land should be given priority by north Australian governments.

Quality of management of pastoral or other animal husbandry can have profound effects on environmental integrity, including quality of surface waters and in-stream and riparian habitats. Intensification will increase water use and risks of compromising quality of surface waters, especially on sites that are acknowledged to be marginal for production. Owners with limited capital may find it difficult to access the funds needed for infrastructure (e.g. fencing) to protect sensitive parts of the environment.

Various forms of pastoralism are likely to remain an important source of Indigenous livelihoods for the foreseeable future, particularly when combined with other compatible land uses including carbon farming on less productive parts of estates. Delivery of various services (including fire management) to other members of the pastoral industry will provide additional opportunities.

7.25 Farming of exotic plants

A wide array of options for using exotic plants commercially are available in forestry, horticulture, cropping, improved pastures, and biofuels. Many of these mainstream uses have potential to

interact strongly with other livelihood options and raise difficult issues in water management. It is desirable that they be subject to careful "whole of property" or "whole of community" planning before major steps are taken (see Section 8.18 below).

7.25.1 Forestry

Despite recurring failures in plantation forestry ventures in northern Australia (Lacey 1979), the Australian Government remains committed to fostering Indigenous engagement in forestry, apparently including large scale operations in northern Australia. The National Indigenous Forestry Strategy (Anon. 2005) calls for "participation by Australian Indigenous communities and peoples (at) levels at which they enjoy demonstrably greater economic and social independence and standing in the wider community, while staying connected to their cultural values".

In an annex to the strategy, a number of predictions are made regarding production from a large plantation forestry project (30,000 ha cleared and planted to *Acacia mangium*) on the Tiwi Islands, none of which have eventuated. The company involved, operating as a managed investment scheme, has failed. Prior to entering administration, the company was found to have breached environmental conditions by clearing into buffers around sensitive areas, and had agreed to rehabilitate such areas. This project has been the subject of a Senate inquiry (SECARC 2009), as were previous Northern Territory forestry programs on the Tiwi Islands and mainland Northern Territory (Lacey 1979).

Some Indigenous communities in northern Australia have had relatively long-term involvement with forestry through selective logging and saw-milling of native timbers, mostly for local infrastructure rather than commercial supply (Venn 2004; Anon. 2005; Fear 2008). These skills could obviously be transferred to harvest and processing of logs of exotic timbers.

Despite the poor record of larger scale forestry operations for timber production, in part due to the high incidence of termite and storm (cyclone) damage in northern forests and woodlands, less ambitious approaches may be plausible. These could involve plantings of exotic trees in association with other agricultural or pastoral use (agroforestry) or among native vegetation. Examples include growth of exotic (Indian) sandalwood *Santalum album* in plantations using Australian native plants (*Acacias*) as hosts.

Growing plantation forests for carbon storage may also be plausible, provided plantings do not require the removal or displacement of native vegetation, because this would be inconsistent with requirements of the *Carbon Credits (Carbon Farming Initiative) Regulations*. However, exotic trees selected for their suitability for plantation forestry or agroforestry may prove to be invasive (Richardson and Remanet 2011).

Forestry operations will often require irrigation to establish young plants. Established plantations may intercept and transpire water that would otherwise reach aquifers or surface flows (Silveira and Alonso 2009), reducing availability for the environment and other users. This may be important in areas where water is already substantially allocated. In the Northern Territory, land approved for clearing for pasture in landscapes considered likely to be stable under that use proved highly unstable when converted to forestry use that failed to take account of limiting factors of soil characteristics and rainfall intensity typical of the region (I. Fox, pers. comm.).

Despite a poor history, proposals for large-scale forestry will undoubtedly continue to arise, but carbon management frameworks will provide strong incentives to restrict operations to already cleared sites.

7.25.2 Horticulture

A number of Indigenous settlements have developed or are considering commercial-scale horticulture. Mangoes and a number of other tropical fruits are candidate commercial crops together with vegetables and fruits that can also meet local community needs.

Costs, freshness and security of food supplies for remote settlements are often unsatisfactory (NHRA 2006). Some groups have resumed the practice, common during the Mission period up to the early 1970s, of growing their own vegetables and fruits, often in association with the operation of a plant nursery (e.g. RIG Network 2011). The Napranum Community Farm on Cape York produces an array of fruits and vegetables that are sold at its own store. The enterprise employs up to 10 people seasonally. Such efforts often receive technical support from government[27]. It is not known whether these small-scale enterprises are profitable, but given the level of staffing, it appears unlikely. Proposals have been developed in other communities for local supply (CYBD 2010) as well as processes to encourage greater consumption of fruit and vegetables (Smith 2009). Feasibility (including costs) will vary substantially from site to site due to differences in soils and climate and costs of providing necessary infrastructure. The revitalised Ord River scheme (Section 7.25.3 below) will be an important larger-scale source of horticultural products.

Horticulture at a commercial scale requires accessible and reliable water supply of high quality. Demands are relatively well understood and advice is available from relevant government agencies. Providing the infrastructure for water sourcing (which in large parts of the savannas will be groundwater) and efficient delivery may present a significant cost. Impacts on water resources are possible especially at large scales through direct use and pollution from biocides (particularly insecticides) and fertilisers entering ground or surface waters. Vertebrate pests (fruit bats and frugivorous birds) often cause significant damage and are difficult to control.

7.25.3 Cropping

Cropping ventures have proved particularly problematic in north Australia (Woinarski and Dawson 2002), influenced by poor soils, erratic variation in timing of rainfalls, plant and animal pests, plant disease, constrained infrastructure and distance from markets. Extended periods of relative dryness and associated impacts on water availability for irrigation and on environments have reduced enthusiasm for some irrigated crops[28]. Regulatory constraints on broad scale land clearing have reduced options in north Australia, where relatively little previously-cleared land is available.

A major exception to this general trend is the Ord River development in north Western Australia, where cropping of various sorts including sugar cane is expanding on a conjunction of favourable soils and ample irrigation water from Lake Argyle. Indigenous people have negotiated a number of native title agreements in connection with further development. The terms included compensation for the 1960s dispossession by construction of the Ord River dam which provides the water.

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[27] e.g. http://www.nt.gov.au/d/Primary_Industry/index.cfm?Header=Indigenous%20Horticulture

[28] see http://www.nretas.nt.gov.au/natural-resource-management/water/water_allocation/committees/drmac/crggroup

The Agreement for Stage 2 of the development provides community benefits of $24 million over 10 years to establish the Miriuwung Gajerrong Corporation with access to an Investment Trust. Funds will also be provided to establish jointly-managed conservation areas. Traditional owners will have ownership of freehold land for leasing to prospective farmers. Arrangements to increase employment of local Indigenous people are part of the agreement. In exchange native title interests have surrendered claims on substantial areas of land on which native title will be extinguished. These areas will then be made available for agricultural use[29].

Thus the development has created a number of livelihood opportunities in agriculture, land management more generally and, potentially, in various service industries. As noted elsewhere (Section 8.1 below) Indigenous people have to date benefited little from agricultural development in other situations.

Cropping may require large quantities of water, varying with the crop and nature of soils. Pesticides and fertiliser use is common and may contribute to pollution of ground and surface waters. Cropping can place many demands on landscapes and natural resources but returns to land owners and their communities may be relatively small except on the best sites. For example, much of the production from sites like the Daly River is from low values crops like hay[30].

7.25.4 Improved pastures

Much of the land cleared of woody vegetation in northern Australia has been modified to increase production of exotic pasture species used in grazing or for harvest of hay. Many introduced pasture species are highly invasive and have spread far from points of introduction to create severe management problems (Grice et al. 2006; SEWPAC 2011a). Growing recognition of the problems caused by such species is indicated by the recent addition of Gamba Grass *Andropogon guyanus*, a species introduced and promoted by government to the list of weeds of national significance. A number of other species place wetlands and their fauna at risk (e.g. Ferdinands et al. 2005) and may cause difficulties in the management of water impoundments and other water management infrastructure.

Other proposals for irrigated agriculture presently under investigation (Section 7.24 above) are likely to involve intensification of pastoral production in particularly favourable parts of the landscape. If, as is likely, such intensification involves introductions of exotic pastures, increased risks of invasion of other sites are inevitable. In affected regions, weed management costs and demand for weed control services are likely to be substantially increased.

State and territory regulators may need to consider tightening guidelines for use of exotic pastures if mosaic developments proceed.

7.25.5 Biofuels

Feedstock for biofuels may be extracted from plants usually grown for food, non-food plants that nonetheless produce sugars, oils or other energy-dense compounds that are readily converted to fuels, or from less energy-dense biomass in residues from food crops or produced specifically for

[29] see http://www.atns.net.au/agreement.asp?EntityID=2654
[30] see http://www.dhlgrs.nt.gov.au/__data/assets/pdf_file/0009/88461/Kath_Investment_Profile_complete.pdf

direct use or conversion. Because, unlike fossil fuels, they are renewed through photosynthesis taking up atmospheric carbon, their use has the potential to reduce net greenhouse gas emissions.

However, first generation biofuels like ethanol derived from sugars in food crops redirect the most productive combinations of land and water away from food towards potentially more profitable biofuel feedstocks (Bryan et al. 2010) which may reduce food availability and push up food prices. Second generation biofuels are derived from a wider range of feedstocks. They are considered less likely to impact land use because they convert the cellulose from food crop residues or non-food plants grown on more marginal land. But if land is cleared of existing native vegetation to plant biofuel feedstocks of any sort, then GHG benefits may be lost (Fargione et al. 2008; Searchinger et al. 2008).

Other second generation options depend on organisms like algae for biodiesel production (e.g. Greenwell et al. 2010) that do not require extensive land clearing or take up high quality agricultural land. Many options for second generation biofuels require additional research and technological advance, with progress being made on a number of fronts (e.g. Bokinsky et al. 2011; Case et al. 2012; Teixeira 2012; Wilson 2012).

Trials of biofuel production using the tree *Milettia pinnata* on pastoral properties have begun in the Northern Territory and Queensland and expansion onto ILC properties has been proposed[31]. Given that the trees are not harvested (seed is the source of oils) projects of this sort may also qualify for carbon farming credits if established on sites legally cleared of native vegetation in the past.

A particular issue with many biofuels is the potential for candidate plants to also be highly invasive (Raghu et al. 2006). If grown in large numbers at high densities the potential for escape into adjoining sites is high, especially if the feedstock is sought in profuse seeding (Buddenhagen et al. 2009). Highly invasive species could threaten many other livelihoods. The IUCN (2009) has issued guidelines to cover selection and use of biofuel species, but their efficacy is untested. Given the challenges faced by Indigenous land managers in dealing with the large suite of invasive species already present (see above), proposals for deliberate introduction of additional invasive species need to be carefully vetted (e.g. Cousens 2008).

Some biofuel projects, especially first generation feed-stocks, will place substantial ongoing demands on water. Many will require irrigation for establishment. Pesticide use may be required and the disturbance associated with regular harvest will add to erosion risks, which may compromise water quality.

It is likely that Indigenous landowners will be asked to consider or may themselves initiate proposals for biofuel production, particularly if technological progress permits use of lower quality feedstock that can be produced on lands marginal for other production.

7.26 Income-generating land use agreements

Indigenous land is often held under inalienable communal title, usually administered by Land Trusts (*Aboriginal Land Rights (Northern Territory) Act*) or Prescribed Bodies Corporate (PBCs) constituted under the *Native Title Act*. Communal title is sometimes identified as a barrier to enterprise development because it may inhibit individual initiative, complicate agreement on land use, prevent

[31] see http://www.rmwilliamsag.com.au/index.php?option=com_content&view=article&id=12&Itemid=8

individuals raising loans secured by their interest in land, or prevent sale of land to raise capital to fund enterprise development or acquisition of other assets (Hughes and Warin 2005).

In fact, facilitating agreements for commercial operations of many sorts on Indigenous communal lands on behalf of their land trust clients is a routine activity of Land Councils. Options are available to lease lands long-term and in other settings such long-run leases (e.g. pastoral leases) are treated as valuable assets and as providing proper security. Arguably, the strength of Indigenous title supports delivery of long term and sustainable benefits through the collective negotiating power it offers to Indigenous owners for securing favourable terms in making their principal asset available for use by others.

Commercial land use agreements may underpin many of the Indigenous livelihoods considered here, involving joint ventures or other forms of partnership with external interests. As well as implementing decisions about specific commercial activities that create employment or other livelihood opportunities directly, payments for leases or other guarantees of access to land and resources may also provide the funds to support different Indigenous enterprise or reinvestment in management of land. Examples of the sorts of payments that may be involved include:

- leases of land for government facilities or private constructions sufficiently long term to permit economically-viable investment in buildings or other infrastructure;
- leases of land and existing infrastructure for service delivery;
- establishing forestry plantations with decadal plus harvest rotations (e.g. Tiwi Islands);
- guarantees of non-exclusive access to nominated areas of land or coast for specified purposes (e.g. package tourism) not requiring significant infrastructure;
- guarantees of exclusive access to nominated areas of land or coast for higher-end tourism or other activities (e.g. sport fishing, safari hunting) that are incompatible with presence of significant numbers of other visitors;
- taking resources (e.g. fishes, crocodile eggs, trophy animals) from nominated areas to specified limits at agreed prices;
- harvesting timber from nominated areas;
- fee-based short term access to waters (e.g. "licences" for recreational fishers); and
- fee-based camping permits.

Use of land resources to gain income in this way could also be criticised as promoting an Indigenous rentier economy, deploying the principal asset not to generate new wealth through production but having a minority (traditional owners) capture benefit passively. The relevance of such characterisations will depend on whether incomes are reinvested to maintain the asset, put into other enterprise, or used for engagement (e.g. employment) of community members in the commercial activity for which the land or resource is made available by its owner(s). The planning processes emphasised elsewhere in this report (Sections 8.1 and 8.18 below) can provide context for decision-making on leases and, if leases proceed, how landowners acting in concert can maximise community benefit.

Arrangements for use of lands by others with no cultural obligations and no or limited understanding of Indigenous views of appropriate practice arguably increase risks of environmental damage or compromised cultural values. For example, vehicles may introduce weeds or other pests, agreed land uses may be inherently damaging (e.g. land clearing for plantation forestry) or resource use (e.g. commercial fishing) may compromise availability for community and customary purposes.

Keeping feral animal numbers at levels that optimise a trophy hunter's experience may compromise environmental condition and customary use. Managing such impacts should influence terms of any agreement, including meeting environmental and cultural management costs in setting financial arrangements. In particular, implications of agreed land use for the status of sites' water resources and water dependent ecosystems should be an important focus.

7.27 Obtaining and using water entitlements

A strongly recurring theme in much of the literature on Indigenous economic development is the disconnect between rights in land and control over the resources associated with those lands. States claim ownership of water and allocate it without overt consideration of where it originated and how the actions of different landholders influence its quantity or quality. Indeed, those most likely to receive large and often free allocations of water are those who intend to use it in ways and quantities (like irrigated agriculture and mining) that may reduce availability and compromise quality for other (downstream) users. Miners, often with relatively short term commitment to a region but substantial water demands, are able to take water outside water allocation plans. But landowners who have no immediate plans to modify their lands for agriculture or take up other activities that require substantial water use will usually be ineligible for water allocations.

Altman and Arthur (2009) identified no Indigenous organisation holding a substantial water entitlement in north Australia. North Australia's Indigenous people have no presence and hence no influence in emerging water markets.

O'Donnell (2011) argues that state and territory jurisdictions should legislate to specify Indigenous water allocations in what have been called Strategic Indigenous Reserves (SIRs). The Mary River Indigenous Experts Water Futures Forum made formal statements calling for the establishment of such reserves. Many of the potential livelihoods outlined here would benefit from such allocations being available. Whilst setting aside of SIRs in water allocation plans may be relatively straightforward for systems that are not close to fully allocated, additional arrangements will be required in fully allocated systems where all entitlements are in trade. In such situations, purchase of existing entitlements by governments or supported by public funding may be necessary to recover Indigenous allocations (O'Donnell 2011).

In addition to providing for Indigenous people to make direct use of water in various water-dependent enterprises, entitlements might be used to obtain funds for other commercial activity by providing security for loans, or sale (permanent trade) or lease (temporary trade) of entitlements. Whether water entitlements should be communal and "inalienable" in the same sense as Indigenous land title remains in debate.

Indigenous people have also emphasised the need to bring an Indigenous perspective to decisions on water allocations and hence the timing and extent of extractions (NAILSMA 2010b). Variation in flow regimes can affect many values on and off-site including the utilitarian, cultural and spiritual (Chan et al. 2010; Finn and Jackson 2011). These effects should be reflected in determinations of sustainable extraction (the size of the consumptive pool).

Risks of this kind might also influence community decisions about use of Indigenous water entitlements. For example, sale or lease of water entitlements to upstream users may cause changed flows that have impacts on culturally or ecologically important in-stream or connected

assets. If the water allocation process is imperfect, Indigenous holders of hard-won water entitlements may feel pressure to forgo use of those entitlements to protect the integrity of the water system. Avoiding such perverse situations is best achieved by active and well-informed participation in the water planning process to ensure that no important values are compromised by poor decisions about total allowed extraction.

A study[32] funded by the federal government to examine the potential for irrigated agriculture in the Gulf region of Queensland, including an examination of impoundments on the Flinders and Gilbert Rivers, is particularly relevant here. Other investigations for development of irrigation mosaics in various parts of northern Australia[33] raise issues for management of ground-waters and their dependent ecosystems, which have proved challenging in other parts of northern Australia because of the linkages between ground-waters and important dry season flows in some river systems (e.g. Harrington et al. 2011).

Impacts of flow regimes on less tangible values can also affect commercial opportunities, for example in tourism, where the appearance of river systems as free flowing and wetlands as healthy can be important to visitors (e.g. Brown and Daniel 1991).

Incomes that might be available from trade in water entitlements are difficult to predict because operating water markets have not been established in any north Australian catchment (Nikolakis and Grafton 2009). It is therefore difficult to compare potential benefits and costs of choosing to trade. Such uncertainty is best managed by strong and continuing involvement in water allocation processes

7.28 Arts and crafts

In this scan of livelihoods, arts and crafts have been have been identified among consumptive uses. Most products use materials taken from the bush as media for visuals arts and objects with at least nominal utilitarian use - like baskets, nets, musical instruments, and spears. However, markets value nearly all of these products most highly for their aesthetic attributes and/or status as creative expressions of culture. Many Indigenous artists produce their works with modern materials and many creations, irrespective of media, enter fine art markets. Even though the dependence of arts and crafts on particular natural resources may be regarded as somewhat tenuous, the role of arts and crafts in north Australia's Indigenous economies and its implications for other economic activity are arguably significant enough to warrant separate consideration.

The industry has a long history, summarised not long ago by a Senate Committee (SCECITA 2007) looking at options to better secure Indigenous incomes against "inauthentic" products and other risks. The Committee described the arts story as one "of economic growth and prosperity amidst poverty and economic disadvantage", and quoted an estimated total value of up to $500 million pa. The proportion of Indigenous people participating in arts production in remote areas considerably exceeds the proportion in other, paid mainstream employment.

In contrast to many other remote enterprises, this sector is rated by most observers as an enduring success. Like other durable enterprise in these settings, Indigenous arts and crafts continue to draw strength from connections to place and the capacity to build production around cultural obligations,

[32] http://www.regional.gov.au/regional/ona/nqis.aspx
[33] http://www.regional.gov.au/regional/ona/nabis.aspx

rather than coming into conflict with them. Just as with the more recently developed caring for country movement (Section 7.1 above); large numbers of Indigenous participants have demonstrated a willingness and capacity to engage with the mainstream economy. These activities deliver products sought and valued by the wider Australian and international communities, through payments that do not require them to abandon or weaken their obligations to local society.

The achievements of the arts and crafts industry continue to depend on some government support accessed through art centres acting as not for profit organisations, often reinvesting funds in community facilities. For some, the arts centres provide places of daily refuge from strife in sometimes difficult settlement environments. But the centres retain a capitalist core in that increased effort and improved skills result in greater individual rewards. The arts centres arguably provide models for the sorts of "hybrid" organisations that should be considered for other emerging Indigenous enterprises. However, this view may be rejected by some (e.g. Arthur 1999; IBR 2003) on the grounds that confounding community goals with business goals (like greater numbers of employees than strictly necessary or preferring health services over distribution of profit to individuals), reduces incentives to development economically sustainable enterprises. The Australian Bureau of Statistics surveys of Indigenous businesses will exclude most community organisations, which may include some arts centres, on the grounds that are "not part of the market sector" (ABS 2012).

Arts and crafts enterprises often use natural resources drawn from water-dependent ecosystems. Images and inspiration also draw on representations of water-bodies and the beings associated with them. There is a risk that damage to water systems or denial of access to country that might be associated with other livelihoods (e.g. trophy hunting or other arrangements for exclusive visitor use) will weaken these connections.

7.29 Surveillance

Australia's long, sparsely-populated northern coastline is exposed to risks of illegal human entry and associated or independent incursions of human and zoonotic disease, invasive plants and animals, and illegal fishing and other wildlife poaching. Indigenous Ranger groups along this coast already undertake modestly-funded surveillance activities for Australian Customs and the Australian Quarantine and Inspection Service (e.g. BAC 2010; DAC 2011). Additionally, inland work is done on testing feral animals for the presence of bovine tuberculosis and other stock disease.

Improved potential to detect intrusions, and pick up evidence of animal or human disease before extensive spread, is likely to increase in importance over time. However, relevant federal agencies appear to project a continuing modest role for communities along the northern coast, with funding from Customs apparently decreasing.

Nonetheless, there would appear to be scope to take work of this sort beyond surveillance to include investigation and enforcement. An expanded role will generate requirements for training and better equipment, but should be planned in the interests of continuing improvement in performance through greater local involvement and responsibility. Subsequent to the Blue Mud Bay decision of the High Court about Indigenous control over access to waters over Aboriginal land, the Northern Territory Government has indicated willingness to consider devolution of some powers related to fisheries management. Nonetheless the recently released Indigenous Fisheries

Development Strategy for the Northern Territory makes no specific commitments on the nature or pace of devolution.

Systematic examination of options for transfer of some responsibilities for active local surveillance and enforcement should be included in any regional development planning.

7.30 Monitoring and evaluation

Payments for ecosystem services (PES) will require systems of evaluation to demonstrate delivery of products (Wunder 2005). In many cases Indigenous people will be providers and will need to establish systems for their own use in association with offset or other programs in which they are involved. In addition, better planning and target setting systems for all forms of resource management in northern Australia will necessarily add performance criteria incorporating Indigenous perspectives on values to be protected and limits of acceptable change. An Indigenous role in design and implementation may create employment and enterprise opportunities.

As noted in regard to feral animals impacts, Indigenous groups have already been involved in the design and delivery of monitoring systems using simple but effective technology that promise better performance over the long term through more eyes, reporting more often, in more places and on more relevant issues than competing orthodox "expert" systems (Noss et al. 2005; Gearheard et al. 2011).

There may be important advantages for Indigenous providers of environmental services in seeking measures of performance based on agreed environmental outcomes rather than indices of activity which others may regard as relevant. Basing payments on product rather than inputs, however measured, will free Indigenous providers to structure work arrangements to achieve the goals in ways that suit them rather than being dictated by the need to meet arbitrarily determined government or other measures of effort of apparently-relevant types of activity.

A number of Indigenous groups have experience with monitoring water quality and condition of some high value water-dependent ecosystems (Ens et al. 2010; Sinnamon 2011). There would appear to be considerable scope to expand such work systematically to increase knowledge of tropical river systems and the impacts of regional management; as well as inform PES arrangements. Well designed, executed and maintained long-term datasets can themselves be extraordinarily powerful research tools (Lindenmayer et al. 2011).

7.31 Education

Land and sea management activities enjoy considerable prestige within Indigenous communities for reasons that go well beyond their status as an important source of paid employment (Putnis et al. 2007; DAC 2011; BAC 2010; WLM 2011). Some Indigenous Ranger groups have developed relationships with community schools and engage young people in their work, sometimes through formally constituted Junior Ranger groups (e.g. BAC 2010). Other communities are proposing similar arrangements. Anecdotal reports suggest that attendance at schools is higher on days when Rangers are present.

Land and sea management work invokes a mix of traditional and formal skills. Literacy and numeracy training are part of all Ranger training programs (J. Yanner, personal communication). Methods used

for fire work, for example, combine customary knowledge of fire behaviour and its ecological effects, biological understanding of mechanisms of fire impacts, physics and chemistry of fire and the associated technology of mapping tools, computer use for mapping and tracking of fires, interfacing GPS and Cybertracker systems with mapping facilities, and completion of written reports including quantitative analysis. Land and sea management work could be matched with many aspects of a formal school curriculum to increase relevance to Indigenous lives and opportunity (Fogarty and Schwab 2012) and, consequently, attractiveness to students and their parents.

Issues in the management of water, the place of water in Indigenous culture and their significance for maintaining the health of land and sea country and well-being of people could form a key component of improved education programs designed for their relevance, accessibility and rigour. Indigenous livelihoods will benefit indirectly because community members will be better equipped and motivated to take up paid land management employment. In addition, skilled participants in often seasonal employment on particular land and resource management tasks may be able to take up formal and information teaching and training roles.

7.32 Research

The biophysical attributes of Indigenous lands and the way these shape and are shaped by contemporary Indigenous culture are attractive subjects for research in a number of disciplines. Participation in conduct of research could itself generate significant livelihoods. The Aboriginal Research Practitioners Network at Charles Darwin University provides training to its members in participatory and action research methods (Sithole et al. 2008). Balkanu Cape York Development Corporation also provides mentoring for this sort of work (B. Martin, personal communication). These arrangements could be built on to develop greater participation in biophysical and social research as useful livelihood options, as well as driving a research focus on questions of particular relevance to communities.

In some locations there may be scope to formalise arrangements in association with development of knowledge centres in ways that maximise the relevance of research conducted on Indigenous peoples' lands and seas through active, paid participation of community members in such research.

With serious support, building capability could make a significant contribution to incorporating Indigenous perspectives in measures of success of all government and non-government programs in areas as diverse as biophysical health of land and seas, human health and other progress in closing the gap. An improved evidence base is essential to guide policy development and application. Research to establish sound water management systems, including ways to determine the effectiveness of cultural and environmental flows should be a particular focus and will be especially valuable if connected to strong, community-based monitoring systems (Section 7.30 above) and connected educational initiatives (Section 7.31 above).

7.33 Other options, including within-community services

Livelihoods based on direct use of natural resources are the longest-standing and arguably, most thoroughly explored of humanity's repertoire. The potential to come up with entirely novel ideas is accordingly low. But additional livelihoods that connect in one way or another with use of natural resources open up other options. Examples include translators, cultural liaison experts, research

facilitators, and a variety of "fixers" who make it possible for individuals or organisations to work productively in settings with which they are unfamiliar.

In addition, there are a number of within-community services that may be considered. Some of these have already been identified (e.g. coastal licences for supplying some fish species to local markets). Other local markets in some wild-harvested plant and animal foods may be considered. A recurring theme in discussion of livelihood activities is the desire to return to traditional country. Until local economies are established that are capable of sustaining residence on country, local entrepreneurs may wish to offer commercial services in transport and simple accommodation services to those who themselves lack the means to get back to country.

8 Key issues for livelihoods development

Each of the livelihoods considered here raises its own unique set of opportunities and constraints, but many members of those sets are shared with other livelihoods. Here I examine recurring issues and ways of addressing them.

8.1 Livelihoods and regional development

The north Australian economy is dominated by mining, tourism, pastoralism and public sector activity. Stoeckl and others (2011) report low economic multipliers for mining and agriculture (including pastoralism) in northern Australia, and limited local employment benefits. And such local economic activity as is generated from these sectors reaches relatively fewer Indigenous people than their representation in the local population. The Indigenous and non-Indigenous economies operate relatively independently, with the strongest links being the large proportion of Indigenous welfare incomes flowing to local retailers. There are few avenues for monies to flow in the other direction: from the mainstream non-Indigenous economy to the Indigenous economy (Altman et al 2007; Stoeckl 2010).

This situation needs to change if more and more diverse livelihoods are to be created, but improvement will require more than increasing the quantity of goods and services produced in north Australia: the way in which goods and services are produced must also change. Stoeckl and Stanley (2009) make the obvious suggestion that an essential step will be to position local Indigenous people to supply services that that are presently sought outside the region. Because there are few substantial private businesses in most locations, this will often involve provision of services to government in health and education or, where assets of conservation or tourism value require management, to conservation and natural resource management agencies.

Although policies for local and Indigenous preference are in place, political will and agency commitment to make the greater effort necessary to source more inputs to public sector activities from regional Indigenous people appear relatively weak. When combined with problems of work-readiness, limited progress is perhaps inevitable until decisive action is taken. Given the demonstration of acute need and the extreme social consequences of failing to act, it appears reasonable to expect government agencies to (i) regionalise all relevant parts of their operations; (ii) increasingly employ local people to deliver services, even if at the cost of some (temporary) reduction in efficiency; and (iii) link these steps to coherent employment and workforce development processes. For example, it is surely remarkable that after decades of joint management, Kakadu National Park should still have most positions occupied by non-Indigenous staff and presently be showing little change in levels of employment of local Indigenous people (DNP 2011).

Other government policies in regional economic development in Australia are also weak. Systematic action resourced well enough to address needs and pursue opportunities strongly and directly, is rare (Beer et al. 2005). Most private enterprises have few incentives to invest in the regions, with the notable exception of resource extraction (mining) industries that come and go with the development of individual mines. But as shown by Stoeckl et al. (2011), those often very large investments in development of mine sites and then the longer-term extractive operations fail to reach Indigenous residents: proximity to major mines has made no difference to the socioeconomic

status of Indigenous people over periods of up to several decades (Taylor 1999; Taylor and Scambary 2005). Most goods, services and expertise and even relatively unskilled labour are imported. Poor education and health and limited formal employment experience work against significant Indigenous employment.

Failure of industry operational investments to reach local people or of governments to reinvest incomes gained from mining royalties or taxes in the regions have been ameliorated to some extent by adoption of corporate social responsibility policies, through which companies invest more directly in local communities. The way in which such investments are deployed can determine whether an industry presence leaves a positive or negative legacy. The quality of agreements between mining industries and Indigenous communities is improving (Langton and Mazel 2008). Prior planning by communities about the most productive areas of investment to support sustainable regional development will help industry to optimise the level and durability of community benefit.

A promising avenue for structural change in purchase of local inputs by both governments and the private sector arises from systems for payment for environmental services (PES). The Carbon Farming Initiative is the most prominent among a larger number of state and federal examples of related schemes. A current study funded by the federal Department of Regional Australia, Local Government, Arts and Sport titled *Building Markets in Environmental and Land Management Services* (see below) may help bring serious attention to the opportunity. And help is certainly needed in regional development planning.

Various regional development plans, roadmaps and/or strategies have been developed during 2011 for many regions of Australia, including (for example) the Kimberley, Far North Queensland and Torres Strait Islands and the Northern Territory (RDAK 2011, RDAFNQ 2011, RDANT 2011). Unfortunately, the Territory plan (RDANT 2011) has no mention of such PES opportunities. Others show limited apparent awareness or, if the issue is recognised (e.g. RDAFNG 2011), fail to promote actions to realise potential. Yet there are simple options available to government to direct greater resources to regional and remote northern Australia: for example, through environmental offsets policies[34,35,36] amended to favour or at least encourage Indigenous suppliers of environmental offsets. Weak development planning processes are exacerbated by conservation and resource allocation planning being conducted independently, often by quite different groups.

Communities of remote and regional northern Australia are presently challenged to act as more than disengaged observers, occasionally distracted by formulaic plan-making of the sort exemplified by the RDA regional statements. Taking up more active roles will require support and, importantly, assurance that governments' apparent commitments to regional development are real, backed by return of some of the (particularly mineral) wealth generated from the regions, and deployed to build on rather than discount the interests, skills and commitment of those communities.

And Indigenous organisations will also need to play their part in regional development, especially in developing processes for timely take up of opportunities offered through planning processes, or more serendipitously. Investments in individual capacity-building and, particularly, stronger and more effective regional and local Indigenous organisations may be repaid relatively quickly through

[34] Northern Territory http://www.greeningnt.nt.gov.au/pdf/draft_environmental_offsets_policy_october_FINAL%202010.pdf
[35] Queensland http://www.derm.qld.gov.au/register/p02501aa.pdf
[36] Western Australia http://www.epa.wa.gov.au/docs/1863_PS9.pdf

improved effectiveness[37]. Groups that take a strong role in local (country-based) planning (Smyth 2012) will be much better positioned to take advantage of funding programs for local development, whether organised under a northern regional development framework or more idiosyncratically. The significance of a coherent regional development commitment from government will be to provide the confidence to invest in local initiatives.

Governments and Indigenous organisations should support processes for serious regional development planning backed by commitments to invest in plausible proposals for Indigenous enterprise and/or employment. Regional development plans should be designed to provide context for water allocation processes and link to regional conservation plans.

Local and regional Indigenous organisations should position themselves to take advantage of improved support for regional development through "country-based planning".

All jurisdictions should review and adjust as necessary their environmental offsets policies and law to foster provision by Indigenous enterprises and encourage industry to source its offset obligations with Indigenous people.

8.2 Communal title and place-based obligations

Grant of inalienable communal title is a fundamental feature of Indigenous land rights law. Transfers of rights in land are determined by traditional processes rather than exchange of title by sale or other means. Clan and family associations with, and obligations to, specific areas of land and their features mean that one area of land is not substitutable for another: the option to realise the capital value of land through sale cannot arise. Unlike holders of other marginal (pastoral) lands in northern Australia, large areas of which are not commercially viable on their orthodox productive potential alone (Holmes 1990), Indigenous landowners cannot realise capital gains from increasing land valuations.

For these and other reasons, communal ownership has been criticised as inhibiting economic development. However, objections appear to be at least in part ideologically based. Invocations of Marxism or "primitive socialism" to describe communal land ownership illustrate the strongly ideological flavour of some commentary (see Bradfield 2005 for a discussion). Pearson (cited in Bradfield 2005) describes communalism as "the very basis of Aboriginal culture". To attack this form of tenure is therefore to attack land rights and the determination of many Indigenous people to follow their religious beliefs, including defining, place-based obligations. It requires unusually flexible thinking to, on the one hand, support laws blocking sites from land rights claims when a continuing attachment to the place cannot be shown, and on the other to propose that successful claimants sell or otherwise alienate land recovered, actions that would clearly deny the significance of attachment. If the form of land rights law is thought to require improvement, rather than the principle of communal title warranting special attention, attention might be more productively directed at more fundamental questions about denial of options for earning incomes from lands, because the resources they support are unavailable for commercial use (Section 8.3 below).

[37] see http://www.aiatsis.gov.au/research/success.html

Notwithstanding, processes for gaining approval for enterprises on Indigenous lands or drawing on their resources can be slow and expensive, and some adjustment may be desirable to facilitate quick responses to opportunity, particularly where restriction on other use is minor and/or scale of environmental change is modest. Prior participation of relevant Indigenous people in good local (country-based) and regional development planning processes should facilitate examination and processing of individual development proposals.

Land Councils and other relevant Indigenous organisations should participate fully in regional and, where appropriate, local development planning and review processes for analysis and approval of commercial land use agreements to reduce unnecessary complexity, costs and delays.

8.3 Rights in (renewable) resources

Rights to land and to control access to land and waters are essential features of north Australia's Indigenous economies. The economic value of land assets is, however, compromised by the way in which Indigenous attachments to land have been viewed by the courts and interpreted in legislation. From the earliest considerations of land rights, emphasis has been placed on the spiritual aspects of the Indigenous relationship with land (see the High Court decision in *Western Australia vs. Ward*) rather than the utilitarian and economic. To a lay observer, this emphasis and related discounting of material interests is hard to understand: it is as though spiritual sustenance was all that Indigenous people asked of their lands. Langton (2011) identifies the failure of advocates of self-determination to take up related economic inequalities - that could never be resolved solely by a numerical minority deploying its political rights - as a significant factor in perpetuation of disadvantage.

The notion that the land provided for Indigenous peoples' needs in abundance, without investment of physical or intellectual effort and systems for recognising rights in resources has been debunked (e.g. Jones 1969; Gammage 2011). But this peculiar view is perpetuated in laws that deny Indigenous property rights in resources. Water is a key asset over which Indigenous rights remain ambiguous (O'Donnell 2011). The conceptual and practical difficulties created by this situation have been highlighted by the emphasis of the National Water Initiative (NWI) (COAG 2004) on separation of rights in water from ownership of land, as a precursor to free markets in water. Rights to use water for customary and community purposes are protected, albeit ambiguously, under native title law (O'Donnell 2011). But with water allocation arrangements that set caps on total water use and then trade entitlements within that cap, separated entirely from ownership or other interests in land, Indigenous landowners may struggle to gain access to the water entitlements needed to realise economic benefits from their land, robbing the recovery of lands of much of its potential social value.

NAILSMA (2009a) and other Indigenous organisations and individuals (e.g. Anon. 2008; NAILSMA 2009b; MLDRIN 2010) take the position that rights in land must be accompanied by property rights in resources associated with the land, including water. And those rights should include use for commercial purposes. Queensland has provided limited recognition of such rights through the *Cape York Peninsula Heritage Act*, which provides that water plans and wild river declarations in the region must provide a reserve of water for the benefit of Indigenous communities for economic as well as social purposes. In its Katherine water allocation plan, the Northern Territory had made provision for an Indigenous reserve based on the area of Indigenous land within a relevant catchment. Up to 2% of licensed extraction was allocated for future Indigenous economic

development (NRETAS 2009). In the draft plans for the Ooloo and Tindale aquifers, 24% and 25% respectively of the maximum water extraction limit have been tentatively allocated to an Indigenous reserve (NRETAS 2011; 2012). There appear to have been no formal moves by the Western Australian state government to recognise Indigenous rights in water for economic development.

Despite growing acceptance of the desirability of protecting Indigenous economic interests through access to water allocations, Queensland law makes an essentially arbitrary allocation of 1% of flows. In the Territory, recognition is at the discretion of the Minister for Natural Resources and Environment. The first plan-based allocation was calculated solely on the likely area of land overlying the aquifer for Indigenous people may be granted exclusive access under the *Native Title Act.* Whilst welcome, such a "concession" makes no contribution to the livelihoods of the region's substantial Indigenous population with non-exclusive native title interests.

Indeed, as noted earlier, the logic of allocations based purely on relative area of Indigenous land can be seriously questioned, given especially that there are no area-based constraints for other licence holders. Irrigators have received and will continue to receive allocations greatly in excess of the relative area of land under their ownership and so have a disproportionate impact on availability to others. The quality of water originating on such intensively-used lands is also more likely to be compromised. Clearly, more work is required on providing a more logical and equitable base for estimation of water allocations to Indigenous interests (Section 8.20 below).

Water resources are highlighted in analysis and advocacy of resource rights, because they have had the most sustained and best-supported attention from federal, state and territory policy-makers and regulators, and Indigenous advocates for change (above). But similar inequities exist in regard to living resources such as fish and wildlife. Allocation of access is done through processes that take no account of contributions to the condition of the resource and its habitats, conflicts with customary livelihoods, or to socio-economic disadvantage. Licences to take fish commercially, for example, are often issued at the scale of whole jurisdictions so that local people have no capacity to protect customary use or manage conflict with other commercial livelihoods like game fishing enterprises (Whitehead and Storrs 2003). The Blue Mud Bay decision of the High Court[38] recognised Indigenous rights to control access to waters overlying land granted under the *Aboriginal Land Rights (Northern Territory) Act*. Land Councils in the Northern Territory have indicated that they see this recognition as an important opportunity to achieve better management of commercial and recreational fisheries for broader benefit, and to increase Indigenous engagement in commercial fishing.

Resolution to date has focused on dealing with recreational fishing issues[39], and the extent to which change in rights to access resources for commercial use will be sought or achieved is not publicly known. Clearly a more consistent and equitable approach to Indigenous rights in living resources, especially dropping the discrimination against commercial use, is desirable. But as with all similar high level policy initiatives, realising benefits will also require that local and regional Indigenous organisations position themselves, through high quality local, "country-based" planning (see also Section 8.18 below), to identify and access pathways for taking up opportunity.

[38] http://www.hcourt.gov.au/assets/publications/judgment-summaries/2008/hca29-2008-07-30.pdf
[39] see http://chiefminister.nt.gov.au/News/Chief_Minister_Seals_Historic_Daly_River_Fishing_D/

Laws governing access to renewable resources associated with land should be reviewed to ensure that recovery of Indigenous land, irrespective of tenure, is accompanied by rights to use associated resources commercially.

Indigenous groups with interests in Indigenous fisheries should develop, through local planning processes, propositions to be put to governments to realise the goal of greater Indigenous involvement in commercial fisheries that are common to all jurisdictions.

8.4 Living resources - approach to regulation of commercial use

Approaches to rights in resources derive mostly from the common law as modified for application to Indigenous people through statutes like the federal *Native Title Act*. Case law and statutes for implementing common law principles to manage living resources vary across jurisdictions. Commercial rights in vegetation are usually held by landowners, although royalties may be payable to the state or territory (e.g. for timber or other forest products). Pastoral lessees have rights to use vegetation for pastoral purposes but not for other commerce.

Outside the orthodox, longstanding arrangements for fisheries, most laws relating to commercial exploitation of native animals treat use as inherently undesirable. Onerous conditions and various outright prohibitions (e.g. of international trade in live animals) create conditions where it is much easier to displace wildlife and their habitats from the land and replace them with exotic animals than to use populations of native animals commercially, even if they are able to sustain that use (see Section 8.4 below). Freese (1997, 1998) sets out the "use it or lose it" debate.

Cooney (2008) summarises the confused and confusing state of Australia's laws governing wildlife use. Despite generally negative policy and legal settings, the Northern Territory has promoted commercial use of wildlife as a way of contributing to conservation outcomes by encouraging protection of wildlife habitat as a commercially valuable asset (PWS n.d.). Other north Australian jurisdictions appear less enthusiastic about wildlife use, as evidenced by Queensland's continuing prohibition on harvest of estuarine crocodile eggs from the wild, despite evidence of recovery and substantial crocodile populations in the regions seeking approval (Read et al. 2004).

Animal welfare and animal rights perspectives increasingly influence wildlife policy internationally (Hutton et al. 1995) and nationally. Differences between those whose livelihoods, whether subsistence or market-based, depend on wildlife and those who have a more abstract or philosophical interest can be difficult to resolve because participants in the debate build arguments on value positions that are fundamentally at odds (Webb and Rafaelli 2008). Some groups regard commodification of wildlife as inherently unacceptable, even if conservation goals are advanced (Mills 2006). Many animal welfare or rights groups seek to impose their views of acceptable practice on others through demands for changes in law or by influencing retailers to drop products they find offensive[40]. The Australian Government has blocked opportunities for Indigenous livelihoods based on crocodile hunting[41] largely on animal welfare grounds that the Territory government regards as spurious.

[40] http://www.savethekangaroo.com/background/campaign-history.shtml
[41] See http://www.environment.gov.au/minister/archive/env/2005/mr06oct05.html

Food handling laws also limit options for marketing wildlife taken from the field, and Australian markets for game meats - aside from kangaroos and some feral animals - are not well developed.

Processes for handling fish and other sea-foods are less cumbersome, and there would appear to be scope for much greater Indigenous involvement in fisheries of various sorts. Present laws in the Northern Territory (Part 11, Division 2 of the *Fisheries Regulations*) provide for Aboriginal Coastal Licences which allow for local capture (using amateur fishing gear) and sale but not entry to full commercial fisheries. And while being denied options to take and sell the most valuable species locally or to sell any fish in open markets, the holders of such licences have no rights to exclude full commercial licence holders from the areas in which they have a traditional interest and may seek to earn an income.

An Indigenous Fisheries Development Strategy 2012-2014 has been released in the Territory (DoR 2012), and a similar Indigenous Fisheries Strategy 2011-2015 has been made in Queensland (DEEDI 2011). Although both strategies envisage greater involvement of Indigenous people in fisheries management and more employment in the fishing industry, they avoid any language that might suggest greater Indigenous control over fisheries or change in licensing arrangements to promote Indigenous entry to commercial fisheries. Western Australia has prepared a draft Aboriginal Fishing Strategy which has not been implemented in full but is similar in coverage to the others. Indigenous groups should grasp the opportunity to put specific proposals to governments about taking up increased opportunity in fisheries.

Achieving more consistent processes and easing potential burdens on Indigenous enterprises seeking to use wild plants and animals commercially are desirable, but realistically appear likely to be difficult to achieve. Commonwealth government proposals for increased cost recovery for management plans and associated applications[42] are likely to increase the burden. Proposals to review environmental law under the COAG reform process appear only to cover environmental assessment processes (BRCWG 2011).

Uniform enforcement of wildlife law has never been seriously attempted across the huge expanses of northern Australia. Costs of control from the centre are prohibitive and nature of threats to the conservation or economic status of most species does not warrant uniform, centrally-controlled effort across such large areas. Risks of local illegal harvest or legal but poorly-managed over-harvest (Whitehead et al. 2006) are best dealt with locally by people with good local knowledge of the harvested species and persons active in customary use or trade. Arguably, costs can be reduced and effectiveness increased by appropriate devolution of legal powers, preferably matched to customary authority for a region or species. Options are considered in more detail later in this paper (Section 8.7).

A process for simplification of rules for commercial use of renewable resources, better matched to conservation needs, should be initiated in all jurisdictions.

Indigenous groups with interest in commercial fisheries should develop, through local planning processes, propositions to be put to government to realise the goals of greater Indigenous involvement in commercial fisheries common to all jurisdictions.

[42] http://www.environment.gov.au/epbc/publications/pubs/consultation-draft-cost-recovery.pdf

8.5 Payment for environmental services (PES)

PES is a response to the failure of markets to maintain a public good: quality of biophysical environments. Because the services from natural systems and good natural resource management, like clean air and water, are available to all free of charge, non-one has an individual (private) incentive to maintain them (Luckert and Whitehead 2007). Wunder (2005) provides a widely accepted definition of PES. Briefly, his definition posits a voluntary purchaser of a well-defined service that the provider is obliged to secure. Payment is conditional on demonstration of delivery. However, there are many variants, which often differ in the rigour with which outcomes from provision of the service are demonstrated, as distinct from evidence of levels of relevant activity (e.g. Gibbons et al. 2011).

The federal and, to a lesser extent, state and territory governments are already operating in the PES space. The federal Working on Country program funds Indigenous ranger groups who contract to undertake specified kinds of work in nominated locations. The Indigenous Protected Area (IPA) program supports traditional owners of lands of conservation value to deliver on objectives set out in an agreed management plan for a defined site. The IPA arrangements are regarded as sufficiently robust to warrant recognition in Australia's national reserve system. State and territory governments as well as some commercial entities, conservation NGOs and research agencies support Indigenous Ranger groups to undertake specified tasks. The Northern Territory Government has permanently relocated an ecologist to support a Ranger group working in the Djelk IPA from Maningrida. State support for Indigenous Rangers outside declared national parks are arguably most formalised under the Queensland *Wild Rivers Act*[43].

The national Carbon Farming Initiative (CFI) to commence in July 2012 is a more rigorous system creating markets for carbon credits that must be reliably quantifiable and meet other standards (Section 7.5 above). Particular efforts have been made to engage Indigenous people in carbon farming opportunities through specific funding arrangements[44]. All jurisdictions also have environmental offsets policies backed, in the states and federally, by laws that require residual detriment from major developments to be compensated. This may be done by payments to funds established to acquire or manage conservation areas or by direct relationships with offset providers capable of delivering other forms of environmental improvement. Some environmental services like fire management might also be delivered by Indigenous people working on a fee for service basis on non-Indigenous land.

The available and emerging mixes of policy measures as well as NGO investments in environmental management provide many opportunities for Indigenous land owners to enter PES markets of one sort or another. As noted above in discussion of regional development strategies, governments can encourage Indigenous engagement in such markets by design of their environmental offsets policies to favour or at least not to discriminate against Indigenous providers in remote regions.

Concerns about the way such opportunities might be lost or constrained, expressed particularly by the Cape York Institute and NAILSMA, have their roots in forms of conditionality. If, as is the case with the federal CFI, only actions that go beyond compliance with existing law are recognised, then options are determined by the particulars of state or territory legislation. Tight laws on land clearing

[43] see http://www.derm.qld.gov.au/wildrivers/pdf/rangers_flyer.pdf
[44] http://www.climatechange.gov.au/government/initiatives/indigenous-carbon-farming-fund.aspx

are the most obvious example: Indigenous groups in Queensland may be unable to claim credits for avoiding deforestation of their land because broad-scale land clearing has been effectively halted (Winer et al. 2011).

Risks also arise in agreements reached about how land or resources will be managed in return for payment or other support. Some argue that ecosystem services come bundled from intact natural systems. It follows that an efficient PES system will match rewards to those services delivered at lowest cost and receive the other, "correlated" benefits free of charge. The notion of bundled services may have some validity in circumstances where the benefits are delivered by low cost interventions, like withdrawing management for other productive purposes and allowing recovery to occur at its own pace, or where a single action demonstrably delivers multiple benefits without adding to costs or suppressing other benefits.

But this utopian situation is likely to be realised but rarely (e.g. Gren et al 2010). For example, savanna fire management to abate emissions of methane and nitrous oxide can deliver biodiversity benefits while systems recover from long periods of over-burning. But a point will be reached when further reduction of fire will compromise biodiversity because the mix of wooded and grassed areas to which the local fauna is adapted is lost. It will be necessary to impose some burning to achieve the optimal biodiversity (and cultural) value of landscapes even though this reduces potential fire abatement incomes (Whitehead et al. 2009). Delivering multiple benefits will nearly always require compromise on the quality of some of them and hence on incomes, and generate additional costs. And Indigenous landowners cannot reasonably be expected to subsidise some benefits sought by the wider public.

It will be particularly important for Indigenous groups considering conservation or other land management arrangements with government or NGOs to ensure that they do not inadvertently close off income-generating options by over-committing or using vague language that may be construed to cover multiple assets or products. Providers of environmental services must recognise the compromises that may be necessary and avoid implying that multiple benefits can be delivered at no additional cost. Potential impacts on other livelihoods also need to be considered, notwithstanding Turner and others' (2012) demonstration at the global scale that the value of ecosystems services available from priority areas for biodiversity conservation are several times opportunity costs (of production forgone).

Attempts to create crude co-benefit standards risk promoting this notion of additional "free" or very low cost (a small premium on carbon prices) benefits at the expense of Indigenous providers who could reasonably seek separate recognition of such products (e.g. see discussions of water resources in Section 8.19 below). If poorly handled, PES markets may create "power asymmetries (that) contribute to reproducing rather than addressing existing inequalities in the access to natural resources and services" (Kosoy and Corbera 2010).

Savanna fire abatement (above) is a particularly valuable PES option because quickly realised abatement incomes can support projects during the long process of accruing, demonstrating and working out how to reward the larger carbon bio-sequestration and other benefits. These early incomes can help overcome an important barrier to implementation of more comprehensive schemes (see for example, Goldstein et al 2006) that accrue and validate benefits more slowly.

The PES literature also presents debates about the risk of crowding out other motivations for positive action (Redford and Adams 2009) to protect or promote environmental services, and/or rewarding behaviour that would have occurred anyway (van Hecken and Bastiaensen 2010a,b). In the case of many Indigenous groups, PES complements other motivations by providing additional means to get back onto country. Incomes are presently used primarily to fund access to traditional lands of a consistency and duration that could not otherwise be achieved: the scale of finances available appears sufficient to encourage alignment of the objectives of purchasers of ES with customary goals (Whitehead et al. 2008; 2009). In the north Australian situation, PES appears unlikely to displace other motivations but instead promote complementarity of targeted paid work and compatible customary activity (Luckert and Whitehead 2007).

The requirement for such services is likely to go on growing as existing problems like invasive species continue to expand their range and land use is intensified at some sites. Options presently under examination for "mosaic" agriculture[45] have the benefit of reducing risks of localised over-use of water, pollution and biodiversity loss associated with broad scale agriculture, but generates a different set of interactions that will require management. For example, mosaics of land use intensification for pastoralism will exacerbate weed problems from exotic pastures, by taking them into more parts of the landscape; native and exotic pest problems affecting exotic pastures and other crops will be exacerbated by embedding smaller areas of farmland in a less intensively managed matrix. Projections of the benefits of such proposals should take account of the costs of managing their impacts in other parts of the landscape used for entirely different purposes.

As noted earlier, the federal Department of Regional Australia, Local Government, Arts and Sport (DRALGAS) proposes a proof of concept study[46] for establishing an economic market in environmental and land management services in northern Australia, which will seek to identify barriers to participation for Indigenous communities in managing Australia's environment and cultural heritage. In this context, however, it is important to note the risks inherent in promoting a single best approach to delivery of environmental services, whether publicly or privately purchased. Despite objections to government involvement in PES and the forms of conditionality this entrains, as raised by organisations like the Cape York Institute (Winer et al. 2011), in some situations government co-investment in delivery may be a better, more equitable option than entirely market-based approaches (van Noordwijk and Leimona 2010).

Indigenous organisations at regional and jurisdictional scales should examine their ability to engage with markets for environmental services, including capacity to negotiate favourable terms and guarantee delivery, and where necessary seek partnerships or collaborations with other groups.

Indigenous organisations and state/territory jurisdictions should seek input to the DRAAS study of market-based handling of environmental and land management services: to ensure that implications for Indigenous people are fully understood; and resist any tendency to regress to a simplistic single "best" model that does not meet the needs of northern Australia.

[45] http://www.regional.gov.au/regional/ona/nabis.aspx
[46] http://www.regional.gov.au/regional/ona/bmelms.aspx

8.6 Efficiency and equity in payment for environmental services (PES)

A naïve and archaic, but surprisingly resilient, prescription of good conservation and land management practice for generating ecosystem services is to do nothing. But the notion of disturbance-free savannas is nonsensical (Whitehead et al. 2002). Types, degrees and frequency of interventions need to be determined according to the outcomes sought and then systematically applied. Specified environmental services will require design and delivery of managed disturbance (e.g. Garde et al. 2009). Delivery of ecosystem services (ES) in northern Australia is therefore an active process requiring considerable intellectual and physical effort and skill.

PES systems recognise that it is unfair to place the burden of conservation mostly on rural landowners by demanding that they meet additional uncompensated costs or removing elements of their property rights. Purchasers pay for effort, for constraints on the way use rights are exercised and losses in other livelihood options. Alleviating socioeconomic disadvantage is not a primary goal of PES and related schemes, although if payments significantly exceed the opportunity costs of the constraints on existing livelihoods that accompany the purchased service, they may deliver important benefits to the rural poor.

However, there have been criticisms that efficiency criteria inherent in strictly market-based schemes may overwhelm equity considerations and result in unfair distributions of benefits. For example, in some settings, buyers may avoid the transaction costs of dealing with many smallholders in preference to dealing with larger, better-off landowners (Corbera et al. 2007a). Poorer landowners may lack the capital needed to change practice in the ways needed to enter a PES market. Organisational and political affiliations may influence who enjoys access and hence benefits, rather than capacity to contribute or need being decisive (Corbera et al. 2007b). Bundling may be sought when multiple benefits can be generated only with additional efforts and costs (Section 8.5 above).

Statements and actions from the federal government promoting Indigenous engagement with the Carbon Farming Initiative[47] indicate that such market-based arrangements are seen as having potential to create economic opportunity and reduce socioeconomic disadvantage in some settings[48]. But who will be able to take up the opportunities and get the benefits, and what form will those benefits take?

Land trusts and prescribed bodies corporate (under the *Native Title Act*) made up of a representative group of owners provide the entities through which Indigenous interests interact with the wider legal and economic systems (Memmot and Blackwood 2008). Their approval is usually required for any commercial land use and they may set conditions for that use. These bodies influence the manner in which benefits are generated, the scale of benefits received, and the groups and individuals eligible to receive those benefits.

Rewards for the effort to deliver ES can be delivered through paid employment, but landowners who are not actively involved in work may also seek payment through the equivalent of royalties, perhaps as a proportion of the incomes earned on their land. Clearly at a given (market) price and demand for a service, amounts paid in royalties will reduce funds available for employment. There are risks that royalty payments to land owners may reduce funds available for employment to

[47] http://www.environment.gov.au/cleanenergyfuture/icff/
[48] http://www.markdreyfus.com/portfolio/media-releases.do?newsId=4879

compromise both the quantum of services deliverable and the social benefits (Section 7.5 above). Tradeoffs will require careful management to optimise community benefit.

Resolution of such tradeoffs are best left to Indigenous interests using mechanisms accepted as appropriate (and hence as equitable) by their communities (Whitehead et al. 2009). But such mechanisms will need to be backed by strong formal governance systems to guarantee socially-acceptable handling of equity in access, participation in decision-making, and in distribution of economic and other benefits. Considerable effort and support will be needed to build such systems in groups that have never had to deal with business and the obligations associated with managing significant enterprises.

Government policy-makers must recognise risks like those identified above and avoid complicating already challenging processes. Formal systems of accreditation must permit recognition of variation in social benefits rather than look for simplistic, box-ticking co-benefit standards. Purchasers of ES should be properly informed about the level of social benefits derived in delivery of environmental offsets.

Indigenous organisations should work with communities to develop equitable approaches to distribution of benefits from PES schemes that recognise the social value of maximising employment on country.

Policy-makers should recognise that delivery of multiple benefits will always generate additional costs and avoid propositions that require or imply no-cost bundling or other cross-subsidy.

Accreditation and other standards in PES schemes promoted or recognised by government should avoid confounding various classes of benefit and ensure that buyers have information on variation in different benefit types.

8.7 Devolution of statutory powers

Community-based natural resource management (CBNRM) occurs when communities have the legal rights, the local institutions and the economic incentives to ensure that use of natural resources is sustainable. Internationally, the demand for new approaches, including CBNRM, arose from concerns about the capacity of central governments to manage shared resources. In northern Australia, Indigenous CBNRM emerged as an early expression of self-determination and reassertion of rights to manage country, rather than external influences (Smyth 2012).

A guiding principle for CBNRM (subsidiarity) is that decisions should be taken as close as possible to the citizens affected by them (McKay and Jencroft 1996). The approach boasts some important successes, as well as some failures (Murphree 2009; Berkes 2010). CBNRM successes are most likely when objectives of governments, other (NGO) interests and the local community are clear and compatibilities and incompatibilities well-understood and acknowledged (Arambiza and Painter 2006). Agrawal and Gibson (1999) caution that a nuanced understanding of community is required that does not assume homogeneity of interests and capabilities and instead draws on understanding of local institutions.

Devolution of rights and obligations from the centre, including some presently statutory powers and obligations, is particularly relevant to north Australia. In the large states, the centre is too distant both physically and in priorities and pre-occupations from the northern periphery to have the understanding needed for good decisions. And in all jurisdictions, the government resources to implement decisions effectively over large areas with diffusely spread populations are lacking (Whitehead and Storrs 2003; Whitehead et al. 2006). Chartres and Agrawal (2009) found that carbon storage was optimised in forest management when forests were under local ownership and rule-making for management was localised.

From time to time, various governments have raised options for devolution of powers in some areas of natural resource management, but have rarely gone beyond rhetoric. The Far North Queensland and Torres Strait regional plan (e.g. RDAFNQ 2011) call for a reconceptualised regionalism that strengthens local decision-making. With governments continuing to seek reductions in costs, opportunities for devolution of functions need to be examined more systematically and with genuine attention to resourcing implications, risks and benefits for regional communities. Such arrangements need to go well beyond the more or less tokenistic consultative mechanisms that operate in areas like commercial fisheries. When benefits are sought not only in incomes and resource condition but are linked to authority and responsibility "large increments in social capital can result" (Murphree 2009).

Governments and Indigenous organisations should work together to identify opportunities to devolve regulatory and associated surveillance and monitoring and evaluation roles to Indigenous groups working on country. Particular attention should be paid to options for genuine co-management of species of particular cultural and economic significance to Indigenous people.

8.8 Livelihoods research and livelihoods development

In a review of work done on Indigenous livelihoods research, Smyth and Whitehead (2012) identified the need for greater clarity in the intent of such work. Different stakeholders will have quite different views of the key objectives of livelihoods research and the obligations of different participants to help deliver across the spectrum of expectations. Unsurprisingly, research agencies emphasise high quality, tested (peer reviewed) additions to knowledge that can be deployed in situations other than the specific sites and circumstance of enquiry; and Indigenous organisations seek practical on-site improvements in livelihood opportunities for the participating individuals and communities.

Smyth and Whitehead (2012) proposed that in addition to improvements in processes for managing livelihoods research, there was a need to support Indigenous peoples' active exploration, testing, building and refinement of innovative livelihood options. Such funding is desirable to bridge the inevitable research -development gap, which is particularly wide in this area of work. And it will also reduce the incentive for communities and individuals to agree to participate in research projects in which they have little real interest but take up because they offer an apparent, but often frustrated (because incomplete), pathway to livelihoods development.

Failure of research indicating economic and operational plausibility then to lead to sustainable livelihood development can occur for many reasons. They include the stop-start nature of many government support programs, frequent shifts in priorities, and the tendency to treat research as an end in itself. Participants disinterest in taking up difficult or marginal livelihood options may also be

a factor, as may other opinions about what constitutes a successful enterprise (Sections 8.16 and 8.21 below).

Whatever the influences, there is a demonstrable need for programs designed explicitly to join the research - development dots rather than just add more research dots. There is some evidence of a shift in approach at the federal government level in the strong attention given to Indigenous opportunity to engage with carbon markets (Section 7.5 above), but even here policy development has sometimes been clumsy (see various NAILSMA submissions[49]).

Research funding bodies, research agencies and Indigenous organisations should collaborate on better processes to ensure that expectations and obligations of the various parties to research and development in Indigenous livelihoods are well understood.

Funding should be provided for conduct of livelihood development trials so that promising options can be properly tested and offer communities real prospects of effective implementation.

8.9 Beyond opportunity

Laissez faire approaches to northern and Indigenous development stop at the identification of opportunities: it is assumed that local people will have all the assets and capabilities need to take them up. That this assumption rarely holds doesn't seem to stimulate realistic programs to promote application of good research or other analysis.

The Carbon Farming Initiative has been a notable exception to this general rule, with considerable effort and funding going to support projects under a variety of guises. The land use package includes components for projects in biodiversity-friendly carbon; soil carbon and biochar; government purchase of innovative non-Kyoto credits; and development of methodologies and governance systems for Indigenous carbon farming. There are significant funds for training and other "old-fashioned" extension work. Notably, however, this effort has gone into programs with environmental rather than developmental objectives. There is a need for similar levels of "beyond opportunity" commitment to plausible livelihood projects (based on natural resources) identified on their economic and social credentials as well as their contributions to conservation.

Commitment to Indigenous engagement shown with implementation of the Carbon Farming Initiative should be duplicated in processes for regional development planning. Support for planning and research must be backed by committed funding for implementation of favourable options. The pilot study approach already agreed for the North Australian Beef Industry Strategy offers a suitable model.

8.10 Piecemeal government investments

The opportunity costs of investment in regional development or land management initiatives are inescapable, and are particularly prominent in northern Australia, where additional investments in housing, health and educational services and other basic infrastructure are urgently needed to improve well-being. In the social policy sphere, Governments' formal responses to the competition for limited funds have been to turn away from remote landscapes and communities and emphasise

[49] http://www.climatechange.gov.au/government/submissions/closed-consultations.aspx

support to larger centres. Government funds have reached remote areas, outstations and homelands chiefly through conservation programs like Caring for Country, Working on Country or Indigenous Protected Areas.

Coordination has improved with more recent programs, but relationships of various investments to developing sustainable regional economies has not been clear, particularly given the short time horizons applying to many of them. Indigenous organisations have struggled to maintain continuity of focus, effort and employment when juggling the competing demands and onerous reporting requirements of many separate funding processes (Putnis et al. 2007). Disjunct objectives, mismatched timeframes, and different reporting methods and criteria for satisfying contractual obligations are more likely to evoke formulaic, form-filling responses, instead of the learning and adaptive loops that can contribute to improved performance and growing capability (Berkes 2010).

An orderly approach to northern development, whatever the mix of land uses and enterprises under consideration, capable of dealing with the needs and aspirations of the north's growing Indigenous populations and their major land holdings, will require ongoing improvement in coordination of funding programs. At the same time, there is a need to guard against one-size-fits-all approaches that end up being better at exclusion than engagement. Better coordination does not require homogeneity. Some diversity of funding sources and goals can contribute to diversity of opportunity, provided demands are matched to the capacities of regional, remote and Indigenous organisations (Sullivan and Stacey 2012).

Programs should be designed explicitly to deal with the biophysical and social realities of the north, rather than require north Australians to apply ill-fitting programs that were designed to meet the needs and capabilities of southern Australia. Well-informed regional development plans and strategies may help provide the missing context for better designed and more appropriately-delivered programs of support.

Support for regional development planning and livelihoods research needs to be backed by dedicated funding to implement promising options.

Regional development (and livelihoods) plans should provide vehicles for coordinating other government programs.

8.11 Mixed enterprises - economies of scope

Building institutions for managing new enterprise need not start from scratch. Some Indigenous organisations have proved highly resilient and supported successful businesses over decades (e.g. BAC 2010). But many of those organisations also manage delivery of services supported by government funding which may interact in various ways with local enterprise, including commerce based on delivery of ecosystem services (Altman and Cochrane 2005).

In remote settings with limited resources and weak local economies, taking advantage of economies of scope by grouping compatible activities within a single institution makes good operational sense (Altman and Cochrane 2005). But it also creates additional complexity in designing systems to avoid unreasonable and potentially damaging cross-subsidy, whether inadvertent or considered. For example, efforts to sustain an unprofitable business (see Nikolakis 2010) should not be permitted to compromise delivery of basic services by a host organisation. Designing and implementing

governance systems for institutions handling multiple product types and income streams with different accountabilities, while avoiding inappropriate cross-subsidy, should be given priority.

Indigenous organisations and government should support development of improved governance systems for regional Indigenous enterprise, to deal with increased demand for services, including more frequent interaction with markets as well as continued engagement with government programs.

8.12 Role of formal collaborations - economies of scale

Ensuring continuity of supply of some products, whether in orthodox markets or under PES arrangements (see above), is perhaps best addressed through cooperatives that pool supplies delivered from a number of participating groups. Localised failures can be made up by supplies from other sources (see Whitehead et al. 2006). Steps in this direction have been proposed through Indigenous Australian Foods Ltd for marketing bushfoods, but the organisation does not appear to be active beyond apparently on-going arrangements between a bush-food processing company and major supermarket[50]. Aboriginal Bush Traders[51] may provide logistical and other support to Indigenous arts, bushfoods and tourism businesses.

Many land management projects work best at large spatial scales and so will require collaboration among clans and even different language groups. The West Arnhem Land Fire Abatement (WALFA) project operates successfully over an area of 28,000 km^2 and several language groups (Russell-Smith et al. 2009). Catchment management plans that provide for consideration of change in upstream watersheds on downstream neighbours will need to operate at very large scales. Agreements on IPAs and their operational management also require effective coordination among neighbours. These sorts of arrangements are difficult to establish and maintain in any setting (Prager et al. 2012). In the Indigenous domain they can draw on inter-clan relationships and traditional mechanisms for collaboration (Yibarbuk et al. 2001).

Action is required to build on such Indigenous models to create formal collaborations that are strong enough to operate in a commercial environment and yet avoid adding too much to transaction costs or compromising effective decision-making and capacity- building at the local level.

Support should be sought to explore models for collaborations among smaller Indigenous enterprises and service providers to improve capacity to supply reliably and to realise economies of scale.

8.13 Value adding and cultural assets

It is axiomatic that suppliers of raw materials for markets are relatively poorly rewarded parts of value chains, with larger benefits going to processors and various middlemen. Indigenous people in northern Australia provide raw materials for value-adding processes in areas like crocodile farming, where eggs are taken and hatched by others, and in providing access to their lands and their natural and cultural resources for tourism offerings organised by others.

[50] http://www.cse.csiro.au/research/nativefoods/nativefoods_website.pdf
[51] http://www.aboriginalbushtraders.com/

Important value-adding to products characterises arts and crafts, where the natural materials used in production have little monetary value but the intellectual and artistic input is highly valued in markets; and a substantial proportion of the total value reaches the artists (~60%: SCECITA 2007). Incomes have been protected in part by creation of Indigenous art centres whose staff act on behalf of individual artists to secure fair prices. Moves are being made on jointly-managed reserves to create joint ventures where Indigenous people also capture the employment benefits of tourism in which Indigenous culture is an important component of the experience sought.

As noted in regard to fire management (Section 7.7 above), another important area of services where Indigenous people are positioned to add particular value is in the design and carrying out of specialised land management services. Here detailed knowledge of the character and dynamics of landscapes, their biota and responses to disturbance are obviously great assets. Just as in the visual arts, it will be important that Indigenous people realise benefits from their knowledge and skills by taking control over as many parts of the value chain as possible. This will require creation of businesses to hold credits from activities like carbon farming, perhaps including over-arching Indigenous-owned enterprises with the capacity to aggregate credits across projects and negotiate strongly with purchasers over price.

Horizontal coordination across product types (see Section 8.12 above) and vertical integration to reduce the number and cost of intermediaries are important strategies. And as discussed in regard to employment models (above) deploying the skills and experience gained in one value chain to access others should form part of any long-term livelihoods development strategy. An example might be to take experiences gained in management of an Indigenous Protected Area to develop biodiversity and other ecosystem services products, marketed as offsets for mining companies or other major developers.

These examples of areas where success has been achieved or appears imminent make use of the strengths of Indigenous culture and its long connection with sustainable use of natural assets. Here cultural norms and skills are well matched to the demands of generating valued products. But other cultural norms, like demand sharing, precedence given to meeting family obligations, or time commitments to participate in ceremony, may be less well-matched to the processes required to get products to market and manage all related transactions. Experience in longstanding and successful Indigenous businesses operating in environments where activity is directed by Traditional Owners provide functional models that may be adaptable to a range of settings. Work done by the Australian Institute of Aboriginal and Torres Strait Islander Studies on successful organisations is also relevant here[52].

Support to develop and apply institutional and organisational models that take relevant features of existing working arrangements (like regional arts and business centres) to build structures and processes able to handle a diverse range of activities is desirable. And to do so in ways that assist Indigenous people to keep their culture alive rather than damage it. Some funds have been committed to work of this sort under the Indigenous Carbon Farming Fund, and support is also provided under IPA consultation processes.

Indigenous organisations should seek government and/or NGO support for a substantial cross-jurisdictional study of successful Indigenous commercial business models that successfully manage

[52] http://www.aiatsis.gov.au/research/success.html

the integration of business activity with social and cultural obligations, with a view to implementation where rapid expansion of delivery of environmental services is likely.

8.14 Indigenous knowledge and intellectual property

As shown with the savanna fire abatement methodology (Section 7.7 above), protection of Indigenous intellectual property in natural resource management is perhaps best achieved by drawing on existing documentation to prevent others claiming exclusive use through patents (see discussion in Spencer and Hardie 2011). Indigenous advantage will then depend on skilled application of knowledge and perhaps on accreditation schemes that certify genuine Indigenous participation and application of customary methods (Section 8.15 below).

Seeking protection through law may be illusory, as in the case of benefit-sharing arrangements specified in regulations under the federal *Environment Protection and Biodiversity Conservation Act* and various state and territory laws on bioprospecting, because there are too many ways of avoiding obligations. Patents are granted for limited periods, require full disclosure of the "invention" and protect individual rather than group rights (Janke 2009). The high costs of securing formal legal protection nationally and globally, delays in approvals, the improbability of universal observance of legal protections and the extraordinary costs of seeking redress in Australian and overseas courts dictate that only assets of extraordinarily large and demonstrated commercial value be protected in this way (Drahos 2011).

Funds available to Indigenous groups may be better spent to develop regional knowledge centres equipped to record and store knowledge for the exclusive and well-managed use of the originating community. Additional to intrinsic cultural value, securing customary and situational knowledge that helps to protect and use natural resources sustainably would appear to be in the national interest and hence a candidate for systematic government and other support.

Support should be sought for systematic development of regional knowledge centres accessible to Indigenous communities under protocols developed to meet their specific needs and obligations. Facilities offered by roll-out of the National Broadband Network may be important.

8.15 Branding and fair trade

With the exception of tourism (Section 7.11.1 above) and visual arts (Section 7.28 above), few Indigenous products have been tested in Australian markets to determine whether an Indigenous connection has a positive influence on price. Cherikoff (2000) writing on bushfoods thought not. In carbon markets, standards like those developed by the Climate, Community and Biodiversity Alliance are designed to recognise projects that deliver co-benefits, including social benefits (CCBA 2008) and attract a premium price in voluntary markets. The Australian Government is supporting efforts to develop Indigenous co-benefit standards for carbon farming projects.

Spencer and Hardie (2011) argue that an Indigenous fair-trade certification system may be useful to brand Indigenous products and so prevent the sort of abrogation of skills, ideas and other intellectual property that occurs with products like didjeridus (Whitehead et al. 2006). Consumers who want to support Aboriginal enterprises and community development goals can do so more confidently if certification standards are applied and well-publicised.

Whilst the idea is sound in principle, costs are likely to be high and difficult to justify when the evidence for improved competitiveness or better prices in markets is unavailable. Work should be done to demonstrate price and other competitive advantage. It will also be important to avoid confounding different benefit streams and implications that multiple benefits are delivered without increasing effort or other costs (Section 8.6 above).

Further studies of the benefits of branding and fair trade mechanisms for trade in Indigenous products should be completed, including their relationship to national and international standards in environmental services.

8.16 Opportunities and incentives to take up employment and enterprise

Individual decisions about livelihoods are influenced by many factors, including personal interests (what's good for me), family considerations (family needs), personal attributes (skills and confidence), social considerations (local norms and expectations), and external enablers or constraints (credit availability, grants). The demonstration of potential for economic and operational viability that is typically the endpoint for much livelihoods research in northern Australia (e.g. Whitehead et al. 2006; Anon. n.d.) arguably takes too little account of other influences on probability of uptake.

The availability of welfare safety nets means that individuals, families, and communities resident in remote areas where formal employment is very limited are rarely forced by necessity to take up uncongenial livelihoods. This obviously reduces incentives to search assiduously for livelihoods that will, in most remote situations and for people with limited formal education, require hard physical and/or monotonous work in difficult conditions that challenge even those in good physical health. They may prove impossible for those in relatively poor health or with responsibilities to care for others. Perhaps more significantly, the strictures of some forms of employment may conflict with maintaining a favourable position within local society, which may base its assessments of social value on timely and unfettered discharge of obligations to family and kin rather than a job (McCrae-Williams and Gerritsen 2010).

Willingness to take up unrewarding livelihoods in remote locations can be expected to vary, just as it does in non-Indigenous communities. It is unrealistic to expect uniformly enthusiastic, bottom-up exploration of the often unappealing livelihood options that may be all that is available, especially if accessing them substantially weakens discharge of responsibilities to family and lands recently recovered.

This obvious but unwelcome conclusion highlights the value of giving priority to what have been described as "propitious niches" in enterprise and employment options (Greiner 2010): propitious because they align with family and social obligations. They may, for example, allow willing and able workers who would otherwise struggle because of educational disadvantage to find rewarding work to take up significant and respected roles that they can align with customary responsibilities.

Accepting a prominent or, in some situations, dominant role for land management work is consistent with the APONT (2011) model for establishing employment pathways in remote and regional settings. Arguably, the refinement of such entry points and pathways should be integrated with regional development and employment strategies. Ingamels and others (2010) argue that small, isolated communities tend to build on their legacies through local creative processes rather than

responding rapidly to external stimuli or pressures. Indigenous relationships to land, and obligations and attachments to place, are extraordinarily potent legacies that it would be foolish to de-emphasise in any livelihoods development program.

In selecting livelihood proposals for serious regional trials, those that draw on demonstrably favourable niches should be emphasised among more challenging options.

8.17 Pathways

Under various closing the gap initiatives, major investments have been made in basic infrastructure and health and educational services in a number of centres. These investments, if supplemented with livelihoods development investments, could enhance capacity to pursue personal and community development in tandem with enterprise development, as would seem to be necessary to achieve sustainable change.

But the same neo-liberal ideology that drives proposals to withdraw or reduce welfare also works in opposition to government subsidy or other intervention to "pick winners" in enterprise, in remote regions or elsewhere (Duff and Tonts 2000). With the exception of the CFI, there has been little apparent appetite for purpose-built programs to support enterprise development built around natural resource use in remote areas. Nonetheless, it is desirable that livelihoods of the types explored here and selected on their match to regional circumstances be developed in parallel with improved educational programs so that there are plausible pathways from school to workplace.

Poor school attendance remains a major barrier to realising the benefits of increased investments in education. In addition to other social determinants of attitudes and responses to educational programs, perceptions of irrelevance to local people and their futures are likely to also influence attendance (Fogarty and Schwab 2012). The contemporary two tool kits approach to Indigenous land and resource management provides many opportunities to link school curricula to issues that demonstrably remain important to Indigenous people residing on or within reach of their traditional lands. Enterprise associated with fire management work for example, in addition to high level operational skills and practical knowledge of fire behaviour and ecology, requires people skilled in computing, geographic information systems, interpretation of satellite imagery, quantitative assessment of areas burned, team management and production of related reports.

Fire work provides niches for people with deep customary knowledge and skill in applying it, but little formal education as well as places for those successfully using the formal educational system. Parents are exposed to the value of formal education and students to the value of customary skills. Greater use of the two tool kits in formal curricula may make an important contribution to community engagement with the education system and so contribute to development of negotiable employment pathways. "Pathway" models like APONT's (2011) proposals should also lead to scholarships for Indigenous students for pursuing higher education in natural resource management.

At present relatively low level jobs are available through government-supported Ranger services. These do not always recognise the level of skills and authority brought to management roles by some Indigenous participants. It is desirable that greater formal recognition be accorded to traditional skills, but attempts to do so in government parks and wildlife service's have made limited progress (PJWhitehead, personal observation). Indigenous-owned and operated organisations and businesses may be better placed develop their own systems of recognition. Real efforts should be

made to adjust job design to take up Indigenous knowledge and skills and to accommodate cultural obligations.

Institutionalising respect and space for customary skills, authority and social obligations is only one side of a healthy employee-employer relationship. Over time, adaptable younger people with different experiences and ambitions may find new ways to meet family and wider cultural obligations that also respect workplace cultures and *vice versa*.

The employment pathways models discussed here assumes that skills developed in land management roles will be transferred to other employment. But the fact that many jobs in communities remain filled by non-Indigenous people after many years of land management work indicates that these pathways are not routinely taken. This observation reinforces the obligation to understand motivation and barriers better, and to develop strategies for overcoming disincentives or blockages. This might be done in association with the livelihoods pilots proposed at Section 8.1 above.

The value of land and sea management work as an entry to pathways to wider employment should be formally recognised and supported in regional development plans, employment and workforce development plans.

Support should be sought from government and NGOs for Indigenous scholarships in natural resource management.

8.18 Planning and risk management

Invoking trends in other nations, Holmes (1990, 1992, 2002, 2008, and 2010) has over a period of several decades tracked a shift in the savannas away from orthodox production. A "post-productivist" status has been postulated for many landscapes in northern Australia, designating a shift from management regimes designed to maximise production of orthodox (agricultural) products to other environmental and consumer benefits. This trend is said to be in part exemplified by Indigenous land rights shifting land use to Indigenous customary purposes. There is debate about the full array of drivers and significance of such shifts, but there is no doubt that landowners faced a different set of options and demands than applied a generation ago.

Transfer of land to Indigenous people has greatly outpaced access to the resources needed to support use or management of it, or even to take up residence, so adverse impacts from fire, weeds and feral animals, go unmanaged. Entrenched socioeconomic disadvantage demands urgent attention, so landowners feel obligated to extract incomes from their land. Taken together, these factors place great pressure on traditional landowners to make important decisions about the future use of their lands; now rather than later.

At present they face starkly contrasting options. One class of accessible options involves inclusion of lands in the state or national protected lands system. Joint management systems under which lands are formally declared as reserves and often held by the state under long term leases place the greatest constraints on future land use, in exchange for long term commitments to employment of community members in park management. Indigenous protected areas (IPAs) place fewer restrictions on use and the funding available and have proved highly attractive to landowners, even though government financial support is usually modest relative to declared, jointly-managed areas.

Partnerships with conservation NGOs may also be proposed and funding from non-government sources is increasingly common.

Another distinct class of options for orthodox production derives entirely or mostly from access to large areas of land rather than other specific advantage. This may encourage proposals for marginal uses that depend for their viability on attribution of low or no value to the land on which they take place, but which may generate some employment attractive to communities. For example, a valuer put an annual rental of \$3 $ha^{-1}.y^{-1}$ on Tiwi lands (cited in SECARC 2009) used for a forestry venture which required clearing of native forest from 30,000 ha. The project has now collapsed. Such ventures and their after-effects may also restrict future uses.

Landowners facing such stark choices require high quality, unbiased, non-ideological, advice that weighs up costs and benefits and openly acknowledges risks. Arguably, land owners have not always had access to advice of the necessary comprehensiveness and quality. Consultations for formal approvals of particular proposals can be complex and costly and often require that landowners consider options in isolation from properly analysed alternatives, with too little regard for context.

Formal land use planning processes in Australia are not well-matched to Indigenous interests and approaches (Hibbard et al. 2008), although recent moves supported by the National Water Commission to develop a Water Resource Strategy for the Tiwi Islands that "will be developed and managed by the Tiwi people" and is due to conclude in 2012 may provide some pointers to better process[53]. Supporting Indigenous landowners and communities to develop land use and economic development plans as a framework for decision-making - rather than treating plans as a response to decisions already made (such as declaration of an IPA or other land use change) - may be productive investments for governments, NGOs and Indigenous organisations. The use of scenario planning as developed as part of the TRaCK program (Pantus et al. 2011) coupled with simple models capable of incorporating local knowledge (Collier et al. 2011) may provide useful approaches. Karjala and Dewhurst (2003) report that such methods can help reveal the complexity of Indigenous views of sustainable resource use in ways that permit meaningful planning responses.

This document embraces the notion that Indigenous livelihoods can be advanced by appropriate planning at a range of scales. But planning without expectation of adequate resources to implement ideas is worse than useless because it squanders time, money and energy. But failure to plan is also debilitating. Roles for planning at the different scales covered here can be summarised as:

8.18.1 Regional

Planning at the regional scale provides for identification of powerful external influences on opportunities and challenges and broad understanding of community interests and capabilities. Through participation and formal endorsement of such plans, governments can indicate their commitment to directions in regional development, as well as understand specific issues that have strong community support and may warrant investment. Regional development plans provide context for more localised planning and most importantly, can be used as vehicles for government at all levels to commit to supportive investment and policy.

[53] http://www.nretas.nt.gov.au/natural-resource-management/water/water_allocation/plans/?a=7498

8.18.2 Country-based planning

Cadastral boundaries rarely coincide with ecological or Indigenous estates and interests. Indigenous people in many parts of northern Australia have adopted tenure-blind, country-based planning in which they identify issues of interest or concern across all of their traditional country. These plans can then be used to create partnerships for achieving shared goals (Smyth 2012). If well-managed, such processes can provide essential community-based statements of both aspiration and capability to inform regional plans and influence government decisions on policy and investment. And communities can consider where and how they will access the resources to advance their ideas.

8.18.3 Estate or property-level planning

When plausible livelihood goals have been set and tested, then individual landowning groups can plan for their on-ground achievement, taking advantage of the supportive policy and investment commitments, and identifying the investments and actions they and their local organisations must take to succeed.

Support is required for country-based planning and preparation of the equivalent of property management plans for Indigenous land holdings where these are not already covered by other arrangements. These would be matched to context provided by broader regional development and conservation plans.

8.19 Land ownership, livelihoods development and competitiveness

The significance of pathways to employment and enterprise, matched to readiness of Indigenous people to take up opportunity, was noted previously (e.g. Section 8.17). Opportunity exists to protect pathways by exploiting restricted access by outsiders (public and corporations) to Indigenous-owned lands and the resources they support. The competitive advantage this might provide for Indigenous start-up enterprises is enhanced by Indigenous knowledge of country and resources.

However, restricted access by external interests also limits exposure to new ideas, innovations, expertise and potential enterprise partners – all of which are key features of successful economies elsewhere. The challenge is to support an opening up of remote societies to innovation and partnerships, but at the same time manage the risk of snuffing out local enterprise and further disadvantaging communities.

Understanding and meeting that challenge through various forms of community-industry partnerships could be a highly productive focus of livelihoods trials or other research. Tax or other incentives for industry investment in Indigenous economic development may be part of the solution (Gunya Australia 2007).

Governments, Indigenous communities and industry should work together to explore ways of building incentives for private investments in Indigenous enterprise on Indigenous lands.

8.20 Livelihoods and water management - significant interactions

Relationships between livelihoods and water can be considered within the categories erected earlier: custodial that protect the availability and quality of the water resource; consumptive that

use and draw on water directly so that the supply available for other uses and the environment is reduced; and contingent that do not consume water directly but gain from particular attributes of water systems or water-dependent assemblages of plants and animals. All of these categories of livelihoods can affect each other and may directly or indirectly affect the availability and utility of the water resource.

Self-evidently, strongest interactions occur between consumptive livelihoods that require or permit substantial water extraction and those consumptive or contingent livelihoods that depend for their viability on the continued presence of abundant and high quality surface or ground-waters. It is beyond the scope of this study to develop scenarios comprising different choices of individual livelihoods or combinations of livelihoods to explore implications for water management in detail. However, it is clear that acceleration of livelihoods development will increase the need for Indigenous landholders and communities to be involved in water planning and allocation decisions.

Well-informed participation in the water planning process is needed for more than protecting important values from poor decisions about total allowed extraction, or to secure a portion of the consumptive pool (Section 7.27). Involvement is essential to make the water allocation process as robust as possible, so that Indigenous holders of hard-won water entitlements do not feel pressure to forgo use of those entitlements to protect the integrity of the water system or other livelihoods.

In addition to protecting their interests *vis a vis* others in a catchment or region, through participation in broad scale processes, Indigenous communities need to be positioned to manage impacts of land and water use decisions at finer scales. Impacts will often be more intense in and around sites of change in resource use, and Indigenous owners will be answerable to other members of their landholding group as well as non-Indigenous neighbours and external government regulators. Frameworks need to be developed for deploying decision-making tools and processes for water management as an element of a wider livelihoods development process. The regional development and country-based planning arrangements outlined above (Section 8.18) offers important structural elements for that framework.

There are apparently serious proposals for development of substantial water impoundments in all three northern jurisdictions. Protecting environmental and cultural values will face extraordinary challenges, especially on associated floodplain systems. Indigenous people will need to ensure that they are involved in all aspects of decision-making, including design and management criteria.

Water allocation planning should be strengthened in all jurisdictions to: secure meaningful Indigenous participation; take context from regional and local development and conservation plans; deal with all significant uses and users; include well-informed analysis of likely development pathways; protect water-dependent cultural and ecological values.

8.21 Successful enterprises

Little systematic work has been done to determine the factors that influence success or otherwise of Indigenous business or livelihood activities, although AIATSIS has done some important work on what makes for successful organisations[54]. Nikolakis (2009) describes success for north Australian Indigenous enterprise as survival, but in ways that are "congruent with each … community's values".

[54] http://www.aiatsis.gov.au/research/success.html

He argues that survival is promoted by: development of business skills; integrating cultural norms with the business; separating business from community politics; and greater independence from government. Arguably these sorts of influences on success operate in any setting. But clearly they will operate more strongly and be more difficult to manage in small, often isolated communities where business skills are in short supply, social norms diverge from orthodox business culture, local politics are difficult to escape, and independence from the state may mean abandoning, at least in the short to mid-term, the most plausible sources of investment and recurrent funding.

Art centres are the great business survivors of Indigenous northern Australia. Certainly they emphasise an integration of cultural norms with the business as a particular strength. Art and artefact production is regarded as suitable activity for both men and women. Production is highly personalised and has no impact on the freedom of others to undertake different livelihoods. Distributing rewards is less likely to stimulate community-wide "political" dispute over rights to incomes. Although centres may receive some support from government, demand for product, the nature of product, manner of production etc are not determined by government and have "independence" from the sort of whimsical change in government programs that has marred some other areas of government intervention. Clearly the arts and crafts industry has many other attributes that contribute to sustainability. For example, products are durable, individually valuable and relatively easily transported, so that storage and transport are relatively less significant costs. Long established arts centres have also developed strong governance arrangements and sound business practices.

Perhaps most importantly, there is an apparently robust market for works of a variety of types and styles. Capacity to understand and respond to that market has arguably been a significant determinant of success. There is, however, little information on markets for products of the other types listed in Table 2 (e.g. Whitehead et al. 2006), except where durable demand has been demonstrated by the long term survival of businesses. Exploring markets thoroughly should be a pre-requisite for any investment in an individual livelihood activity or class of activities.

Success from the perspective of Indigenous communities is even less studied than influences on economic performance. Even if healthy markets are found, there should be no assumptions made about the willingness or capacity of communities to meet market demands. Ends sought by Indigenous participants in enterprise are diverse and include a willingness to persist with economically marginal activities provided they deliver other social and cultural benefits. Many of the benefits sought derive directly from employment. Others, like opportunities to maintain and transfer knowledge and culture, may appear peripheral and distracting from a business perspective, but key determinants of willingness to participate and to persist (B. Austin, unpublished manuscript).

In all regional development planning and livelihoods development, the Indigenous view of success should be a key influence on program or project design and judgments about viability.

9 Conclusions

The concurrent Northern Land and Water Task Force and TRaCK work streams have made major contributions to understanding and debate about the issues confronting sustainable development in northern Australia. Together they help position the communities of the north to enjoy the benefits of economic growth while avoiding the misuse and overuse of natural resources that have scarred and continue to compromise some of southern Australia's most productive lands.

The Task Force has drawn on a large array of supporting analyses (Appendix 1) to frame a view of the most likely sustainable trajectory for northern development. That view challenges extravagant, northern cornucopia fantasies around an excess of monsoonal waters driving huge increases in agricultural production from much of the northern landscape. Their vision for irrigated agriculture is a modest but significant one, with a particular focus on more intensive pastoralism on suitable sites. Over the next 20 years or so, mining is seen as a principal source of income, and tourism as an important employer. Wild-catch fisheries have continued to operate sustainably, with growth coming from aquaculture.

The most striking shift in thinking is embedded in the proposition that, as the population and economy grow, those working to maintain healthy ecosystems despite increased intensity of resource use should be recognised for this effort and paid for their essential contribution to the well-being of the region and the nation. Since the report was presented a major step has been taken to develop a national market in ecosystems services through the Carbon Farming Initiative. Institutionalising an ecosystems services economy has already begun to cause shifts in thinking about the most appropriate use of land and its resources.

That report was also unique in presenting a strong Indigenous perspective on the future of a large part of the Australian continent: not as a quirky tangential view but as recognition of the demographic, land tenure and economic realities of the north and the central place of Indigenous people in shaping northern development.

The particular value of the TRaCK consortium program, much of which concluded after delivery of the Task Force report in late 2009, has been to add important layers of detail and some entirely new analysis. Among the most significant of these for Indigenous livelihoods are:

- Better knowledge of assets and values associated with northern rivers, including Indigenous views of values (Zander and Straton 2010; Straton et al. 2011; Jackson 2008; Zander et al. 2010; Finn and Jackson 2011; Woodward et al. 2012);
- Classifying tropical rivers and catchments according to their socioeconomic, biophysical and eco-hydrological characteristics, so that impacts of patterns of variation and likely effects of interventions can be better predicted across the north (Olden et al. 2012; Kennard et al. 2010a,b; Taylor et al. 2011);
- Models of the effects of land use and climate change on the sources, amounts and movement of water, carbon, sediment, and nutrients and for assessing water quality and quantity, to allow better predictions of the effects of change (Robson et al. 2010; Chessman and Townsend 2010; Brooks et al. 2009; Townsend and Padovan 2009);
- Better understanding of food webs in aquatic systems so that the effects of change on the animals and plants can be predicted and used to determine important management parameters

like environmental and cultural flows (Cook et al. 2012; Chan et al. 2010; Hamilton 2010; Burford et al. 2008);
- Examination of aspects of Indigenous livelihoods and options for livelihoods development in northern catchments, focusing on rights in resources and ways of benefiting from their use and management (ODonnell 2011; Nikolakis and Grafton 2009; Nikolakis et al. 2010; Nikolakis and Grafton 2011; Concu 2011; Russell 2011); and
- Ways of putting all of this together in development and change scenarios to inform decision-making by all interests in river and water management (Pantus et al. 2011; Jackson et al. 2012; Nolan et al. 2010).

Whilst much of the TRaCK work has yet to appear in peer-reviewed publications, useful summaries are available in progress and final reports to consortium management. In conjunction with the wider literature on Indigenous livelihoods as summarised here, these studies confirm that among the most important issues for development of sustainable Indigenous livelihoods are:

- the centrality of rivers and wetlands to Indigenous customary livelihoods and well-being;
- the particular importance of attributes of rivers that are little considered by non-Indigenous people to Indigenous valuations of rivers and Indigenous well-being;
- the sensitivity of some of these attributes to change in flows and hence decisions about water use and catchment development more generally;
- the ongoing economic marginalisation of Indigenous people in northern Australia;
- the continued significance of the customary economy;
- the problems created by the functional separation of the Indigenous economy from the non-Indigenous;
- a consequent need for structural change for Indigenous people to access the benefits of northern development;
- constraints placed on development of Indigenous livelihoods by weak or absent rights in resources associated with land ;
- weaknesses of present systems for engaging Indigenous people in planning for change that will affect river and landscape values of particular cultural significance;
- need for improved planning and decision-making systems to allow decision-support tools to be effectively deployed; and
- problems in asserting rights to access resources (especially water) to protect existing livelihoods and develop new livelihoods.

The TRaCK consortium, as a research program with a strong biophysical emphasis and focus on rivers and waters, was not placed to lay out comprehensive processes or pathways for Indigenous livelihoods development. But it has provided a great deal of information and tools useful to Indigenous interests when accessing those processes and pathways. The TRaCK products are presently most valuable in equipping Indigenous people to ensure that the values important to their culture and economic futures are protected from unnecessary harm, and to promote recognition of rights to equitable access to the resources needed to support livelihoods development.

Going further than defending Indigenous values and rights will require additional information and action. Smyth and Whitehead (2012), based in part on the TRaCK livelihoods experience, have questioned whether research of the sort valued by the academy is an appropriate vehicle for

exploring these questions. There may be much greater value in testing ideas and developing insights by active trials of a scale large enough and long enough to deliver information of real practical value, and to refine understanding and approaches by adaptive management. Such experiments would be informed by prior highly applied research in the nature of feasibility study, and meeting agreed standards. Such experiments will require careful management, but risks are likely to be outweighed by benefits.

Perhaps the most striking feature of the disparate elements of the array of literature on Indigenous socioeconomic disadvantage and livelihoods is their disconnection. The formal rhetoric of closing the gap, the often ideological and sometimes strident demands to solve problems exclusively through enterprise and markets, and actions actually taken to facilitate livelihood development take place in parallel systems operating to different drivers. The extraordinary legal steps to address symptoms of social disadvantage and associated dysfunction (such as amendment of the federal *Racial Discrimination Act* to protect discriminatory policy and actions from challenge) and the investment of large sums in housing, education and health infrastructure contrast striking with rather half-hearted commitment to legal policy and financial investment in regional and remote Indigenous livelihoods development. Banal, uninspiring regional development strategies (e.g. RDANT 2011), that sometimes appear to seek no more than to reinforce the *status quo,* illustrate that weakness (Beer et al. 2005).

Agencies active in Indigenous enterprise and employment, like the ILC and IBA, however well they work within their relatively narrow briefs, lack the mandate and the funds to launch serious, large-scale, long-term initiatives in regional and Indigenous livelihoods development. They are not positioned for comprehensively addressing intractable problems of Indigenous engagement in the national economy. In the absence of riskier but higher reward investments in real livelihoods initiatives, the gap between well-meaning and often high quality research and the capacity to implement its findings will remain impassable. Responding effectively will require coordinated actions on a number of fronts, among which a much stronger, less bureaucratic and properly resourced approach to match and complement regional development and environmental programs should be a centrepiece.

Much of the debate about pathways to improved socioeconomic conditions and hence livelihoods relates to the extent to which Indigenous people can be expected to modify their views of themselves, acceptable ways of meeting local social obligations, and expressions of commitment to place and obligations to country. Attitudes, expectations and commitments will differ with social history and geography, and these variations will dictate locally variable responses to the context established by shifts in government policy. Strategies for livelihoods development should promote genuine choice in the way lands, waters and natural resources are used and cared for to secure the well-being of north Australia's Indigenous people.

Indigenous people and their representatives need to resist any tendency to circumscribe their interests in northern development. They need to participate fully in any processes that set patterns for resource allocation or conditions of use. To do otherwise is to risk being consigned to narrow roles like natural conservationist or picturesque land manager, while others get on with business in ways that close future options. They can position themselves to make the best possible use of opportunities like government or other investments by undertaking country-based planning for the lands in which they have an interest to capture ideas and aspiration for livelihoods development.

The role of this paper is to prompt discussion, not provide convenient answers. But that discussion will require focus if it is lead to real action to promote improvements in Indigenous livelihoods and well-being; so proposals for change have been offered. Many of the suggestions made to provide that focus will be contested, perhaps vigorously, and that is as it should be. But the goal of that debate should not be deflected from the real issues into arid academic dispute or ideological contest. The issues are too important for self-indulgence.

10 Principal recommendations

Recommendations are drawn from the array of key issues and associated discussion in Section 8. They are directed primarily to governments, including local government, and Indigenous organisations. They may also be of interest to NGOs seeking to work with Indigenous groups.

(1) Serious regional development planning involving all levels of government is required to encourage Indigenous livelihoods development.

(2) Land Councils and other relevant Indigenous organisations should participate fully in regional development planning as an essential input to Indigenous livelihoods development.

(3) Support for planning by Government and Indigenous organisations must be backed by commitment to facilitate implementation of favourable livelihood options emerging from the planning process.

(4) Regional development plans should provide context for and link to:
- employment and workforce development programs;
- market-based environmental services purchases by government;
- offset policies;
- regional conservation initiatives, including contributions to larger scale (e.g. corridor) proposals; and
- water allocation processes.

(5) Funding for regional planning should incorporate livelihood development trials to properly tests promising options and offer real prospects of effective implementation; e.g. the pilot study approach agreed for the North Australian Beef Industry Strategy may offer a suitable model.

(6) Local and regional Indigenous organisations should position themselves to take advantage of improved support for regional development through "country-based planning".

(7) Utility of land and sea management work as pathway to other employment and enterprise should be formally recognised in regional development plans, and in related employment and workforce development plans.

(8) Land Councils and equivalent bodies should review processes for analysis and approval of commercial land use agreements to reduce unnecessary complexity, costs and delays.

(9) When sought by Indigenous landholding groups, support should be provided to prepare the equivalent of property management plans for Indigenous land holdings:
- matched to context provided by regional development and conservation plans; and
- to help streamline approvals for development proposals.

(10) In all regional development planning and livelihoods development, Indigenous views of favourable livelihoods and ways of assessing success should influence program or project design and judgments about viability.

(11) Water allocation planning should be strengthened in all jurisdictions to:
- secure meaningful Indigenous participation;
- take context from regional development and conservation plans;

- deal with all significant uses and users, including mining and petroleum exploration and extraction;
- include well-informed analysis of likely development pathways; and
- protect water-dependent cultural and ecological values.

(12) Laws governing access to renewable resources should be reviewed to link title to rights to use renewable resources commercially.

(13) Simplification of law and policy for commercial use of renewable resources, better matched to real sustainability needs, should be initiated in all jurisdictions.

(14) Indigenous organisations and state/territory jurisdictions should seek input to the Department of Regional Australia, Local Government, Arts and Sport (DRALGAS) study of market-based provision of environmental and land management services, to ensure that:
- implications for Indigenous people are fully understood;
- successful public sector programs are not compromised; and
- any tendency to regress to a simplistic single "best" model that does not meet the needs of northern Australia is resisted.

(15) Indigenous organisations should seek support to improve governance systems for regional Indigenous enterprise to cope with increased demand for services (including environmental services) and more frequent interaction with open markets, additional to continued engagement with government programs:
- a substantial cross-jurisdictional study of durable Indigenous business models that successfully manage integration of commercial activity with social and cultural obligations, would be useful; and the
- role of collaborations among smaller Indigenous enterprises and service providers (cooperatives) should be explored to improve capacity to supply reliably and to realise economies of scale.

(16) Indigenous organisations should work with communities on equitable approaches to distribution of benefits from PES schemes that recognise the social value of employment on country.

(17) Governments and Indigenous organisations should work together on devolution of regulatory and associated surveillance, monitoring and evaluation roles:
- particular attention should be paid to fisheries and co-management of wildlife species especially significant to Indigenous people.

(18) Research funding bodies, research agencies and Indigenous organisations should collaborate on better research management processes to ensure that obligations of all parties to livelihoods research and development are well understood.

(19) Governments, Indigenous communities and industry should work together to explore ways of building incentives for private investments in Indigenous enterprise on Indigenous lands.

(20) Support should be sought for systematic development of regional knowledge centres accessible to Indigenous communities under protocols developed to meet their specific needs and obligations. Centres should draw on the capabilities of the National Broadband Network.

(21) Further studies of the benefits of branding and fair trade mechanisms for trade in Indigenous products should be completed, including their relationship to national and international standards in environmental services.

(22) In developing employment pathways, support should be sought from government and NGOs for Indigenous scholarships in natural resource management.

(23) Controls over use of exotic plants (and associated assessments of invasiveness and impacts) should be reviewed and strengthened given the prospect of expansion of improved pastures and biofuels into new areas.

Other suggestions for individual livelihood types are embedded in the text of Sections 7 and 8 above.

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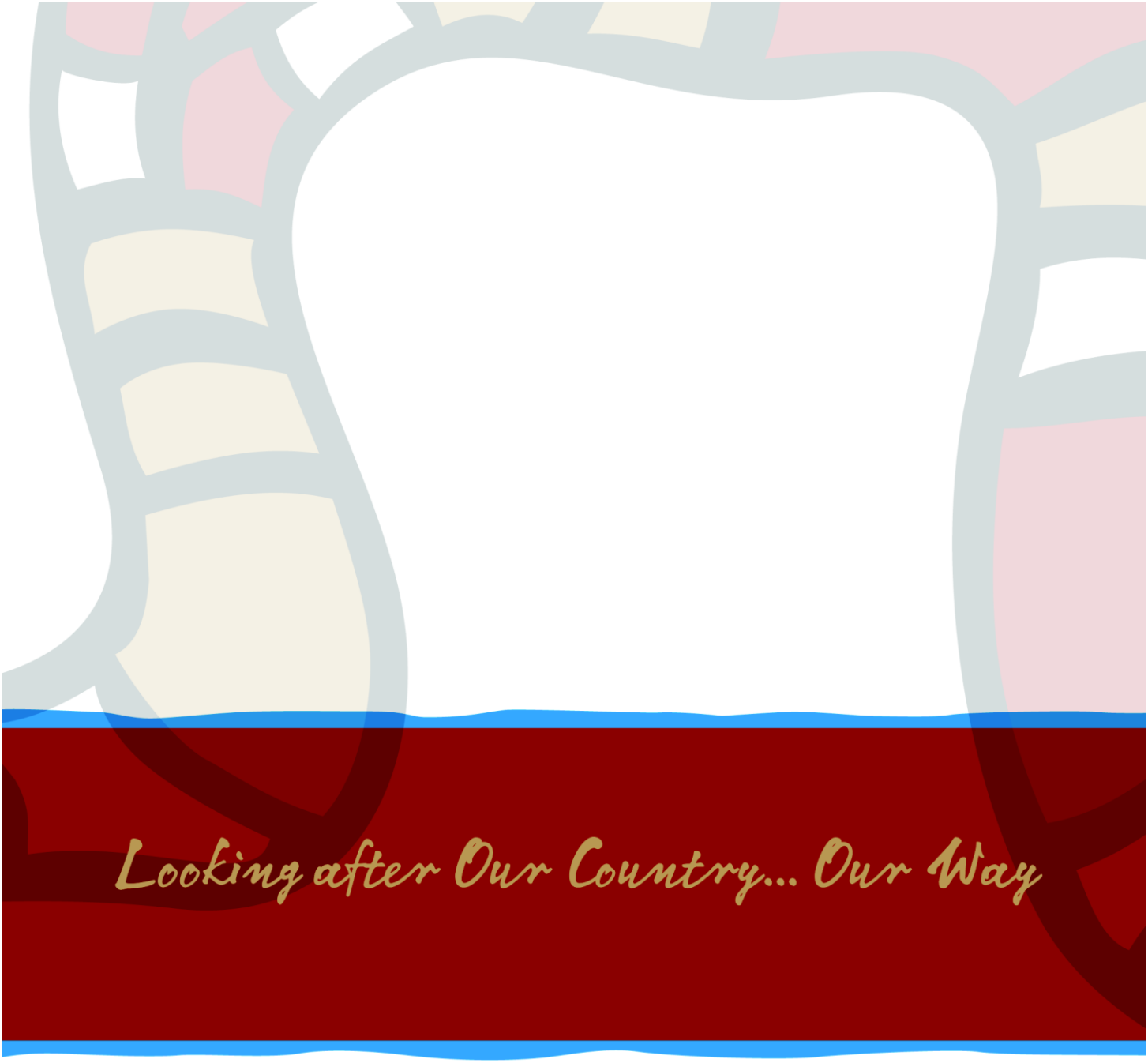

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