5 Sustainable use of natural resources

Vision for Western Australia

Western Australia's vast landscape and seascape, intricate web of biodiversity and other natural resources are managed and used sustainably for the common good and the community is involved in management and planning processes that are transparent and visionary.

Goal

Value and protect our environment and ensure the sustainable use and management of natural resources.

Priority areas for action

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> SUSTAINABLE USE OF NATURAL RESOURCES

Much of Western Australian's wealth and sense of identity comes from the use of natural resources. Agriculture, forestry, fishing and the production of minerals and petroleum all provide employment, development opportunities and wealth. Tourism is also a significant contributor to the economy and employment and relies heavily on Western Australia's natural assets.

Much activity is occurring to identify the challenges to sustainability for these industries, and how they can become more sustainable. For example, the five natural resource management regional organisations in the South West have each developed regional natural resource management strategies. These strategies will become increasingly important determinants for the application of Commonwealth and State Government funding through the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality.

Western Australia is the biggest sub-national state in the world with a population of under two million people. By way of comparison, it is equivalent in size to the whole of Western Europe with a population in excess of 200 million people. The sheer size of Western Australia also provides certain unique challenges to the way we use natural resources sustainably and can be considered in biogeographic regions. For this reason, separate sections consider aquatic systems, the coastal and marine environments and the rangelands.

Western Australia's 20,000 km coastline is largely undeveloped and relatively pristine. Some areas of the coast are developing rapidly and in need of careful management while others are under considerable threat of cumulative impact or have become degraded or irreversibly damaged and require more urgent or remedial action. Western Australia's marine and inland waters are vitally important natural assets that are used for many and sometimes competing uses. While the marine environment remains relatively untouched, the same cannot be said for our inland waters, which are heavily impacted by surrounding land use and management.

The rangelands are similarly vast, occupying about 90% of the total area of the State. Of this area, about 40% is under pastoral lease. Much change has occurred in the rangelands in recent years, with traditional pastoralism existing alongside traditional use by Aboriginal people, land managed for conservation purposes, tourism, mining and horticulture.

The social challenge

Until recently the focus of effort in natural resource management has largely been on integrating biophysical sciences and economics. Western Australia has been at the forefront of this effort in fisheries, agriculture, mining and forestry as well as in the management of water resources such as estuaries, rivers, wetlands and ground water. The more recent challenge for natural resource management and for sustainability generally is how to better incorporate community values–an important aspect of the social dimension of sustainability.

The importance of incorporating community values into natural resource management is perhaps best exemplified by the long-running debate on the management of native hardwood forests in Western Australia. Previous government attempts to determine appropriate management regimes failed to incorporate the groundswell of deeper community responses to the forest as a recreational resource and as an ecosystem that needed to be retained for its biodiversity and intrinsic values. In other words, the social dimension of sustainability, which included ethical considerations about the inherent environmental character of an area, had not been adequately reflected in forest management plans. The government's Old Growth Forest Plan and the recently released draft Forest Management Plan represents a major step in incorporating community values, as well as scientific information and economic modelling, into forest planning and management.

Similarly the Department of Fisheries has recently released the *Policy for the Implementation of Ecologically Sustainable Development for Fisheries and Aquaculture in Western Australia*. The policy acknowledges the need to expand on the social and economic components of sustainability, particularly as this applies to allocation issues.

Agriculture and pastoralism have contributed to (and been impacted by) land degradation issues as well as declining commodity prices for many years. While the landcare movement and various funding sources have supported a range of actions, land degradation continues. Recent work by the National Land and Water Resources Audit has made very apparent the importance of the social dimension in agriculture's future. In many parts of Australia, the demography of agriculture is changing so that social considerations such as the general aging of the farming population and rural population decline are increasingly important in the debate about sustainable agriculture.

Threats to water bodies and water quality such as salinity and eutrophication are closely related to land management. Research on the Hardy Inlet, Cockburn Sound and the Peel Harvey Estuary has provided an understanding of options to improve the management of inland and marine waters. Recent work has explicitly recognised the importance of community values in developing water management options. For example, the development of the Draft Environmental Protection Policy and Environmental Management Plan for Cockburn Sound reflects the community's values associated with the use of the sound for recreation and the provision of natural and cultural heritage as well as productive uses.

In addition, the Department of Environment, Water and Catchment Protection is allocating water based on biophysical research, economic analysis and community values reflecting the extent to which water should be allocated to the environment.

A strategy is proposed below to proactively support the incorporation of community values with biophysical research and economic analyses to enable sustainable natural resource management through improved use of statutory and non-statutory planning mechanisms.

Providing a statutory basis for natural resource management

There is already significant statutory power to support the sustainable management of natural resources in Western Australia and to incorporate community values in adopting these statutory processes. For example, the *Fish Resource Management Act 1994* provides for the ecologically sustainable management of fisheries through various mechanisms, including the creation of Fisheries Management Plans, while the Conservation and Land Management Act 1986 provides for the establishment of Forest Management Plans.

The current work of the five natural resource management regional organisations in developing regional natural resource management strategies offer a mechanism for identifying environmental values. They may also provide significant opportunities to more closely involve local government and use a variety of statutory mechanisms to support the sustainable use of natural resources at a regional scale, particularly land, water and biodiversity.

Under the National Action Plan for Salinity and Water Quality, the regional natural resource management strategies will need to be accredited by Commonwealth and state governments in order to receive funding through the National Action Plan and the Natural Heritage Trust. Part of the accreditation process requires setting clear environmental targets for action and an evaluation process.

At the same time, there is a growing awareness of the importance of involving local government more directly in natural resource management in Western Australia. A State-Local Government Working Group on Natural Resource Management has been established to examine possible areas of collaboration.

The Western Australian Government has indicated that local government should be more involved with the natural resource management regional organisations. Local government has significant statutory planning powers that could be used to support the implementation of the regional natural resource management strategies. In addition, local government is democratically elected and therefore representative of their regions. For these reasons, in the medium to longer term it may be desirable for regional councils of local government to have increased responsibility for planning for natural resource management. Further, it may also be desirable to give effect to the regional natural resource management strategies through various statutory mechanisms, such as Environmental Protection Policies and regional Statements of Planning Policy as set out in the implementation model in *Sustainability and governance*.

Environmental Protection Policies also offer a statutory process with potential application to natural resource management issues; they are especially relevant as the Environmental Protection Authority is taking an increasing role in evaluating natural resource management plans

The existing State-Local Government Working Group on Natural Resource Management could explore this model as part of the deliberations of the State-Local Government Sustainability Roundtable. This process should examine whether and how local government, including regional councils of local government, could support the institutionalisation of natural resource management, building on the work of natural resource management regional organisations in developing regional natural resource management strategies.

> SUSTAINABLE AGRICULTURE

Greening Australia (WA) believes that current agricultural land-use practices are far from sustainable. Consequently, we believe that it is necessary to formulate a new vision for our rural landscapes prior to examining the methods required to achieve this vision.

Greening Australia (WA)

Developing sustainable systems for farmers is pointless if they have no understanding of the processes involved and the adoption benefits. Hence the benefit in developing systems in partnership with farmers.

WA No-Tillage Farmers Association Inc.

Agriculture continues to be an important economic driver for Western Australia. The value of the state's agricultural exports for 2000-01 was estimated at $3,802 million, which represents 15% of the state's total export and 16% of national agricultural exports.

However, the 1998 Western Australian State of the Environment Report[17] identified that the economic contribution of agriculture has come at the great cost of widespread land degradation associated with unsustainable farming and grazing systems. More recently, the 2001 Australian State of the Environment Report[18] concluded that while strenuous attempts are being made to improve environmental, economic and social sustainability in many regions of established agricultural land use, serious doubts exist as to whether agricultural industries can finance the adoption of remedial and truly conservation-oriented farming systems. The Department of Agriculture[19] also notes that changing community goals and values since agriculture was established as an industry in Western Australia means that many agricultural practices currently do not meet societal expectations of sustainability.

There are many definitions and different understandings of sustainable agriculture. The Standing Committee on Agriculture and Resource Management[20] (now the Natural Resource Management Standing Committee) identified a number of guiding principles for sustainable agriculture:

- farm productivity is sustained or enhanced over the long term
- adverse impacts on the natural resource base of agricultural and associated ecosystems are ameliorated, minimised or avoided
- residues resulting from the use of chemicals in agriculture are minimised
- the net social benefit derived from agriculture is maximised
- farming systems are sufficiently flexible to manage risks associated with the vagaries of climate and markets.

The Department of Agriculture[21] proposes a definition of sustainable agriculture that attempts to recognise the contribution of agriculture to the sustainability of rural communities:

> Ensuring profitable agricultural systems that conserve our environment whilst contributing to the economic and social well being of rural Western Australia.

[17] Government of Western Australia 1998, *Environment Western Australia 1998: State of the Environment Report*, Government of Western Australia.

[18] Hamblin, A 2001, *Land*, Australia State of the Environment Report 2001 (Theme Report), CSIRO Publishing on behalf of the Department of the Environment and Heritage, Canberra.

[19] Department of Agriculture 2002, *Submission to the State Sustainability Strategy*. Unpublished.

[20] Standing Committee on Agriculture and Resource Management 1993, *Sustainable Agriculture: Tracking the indicators for Australia and New Zealand*. Report No. 51.

[21] Department of Agriculture 2002, *Submission to the State Sustainability Strategy*.

The significant environmental impacts of agriculture–such as salinity and rangeland degradation arising from unsustainable practices–coupled with declining commodity prices and increased cost of production together with diminishing rural populations all indicate that there are very real and significant challenges to achieving sustainable agriculture in Western Australia.

Primary producers, community organizations and government agencies are recognising the significant challenge that sustainable agriculture presents and much is being done to determine how best to meet the considerable challenges that exist. For example, the widespread adoption of minimum tillage has had significant benefits in reducing erosion and runoff.

The State Sustainability Strategy will not attempt to address challenges to sustainable agriculture individually–many government and community programs are already attempting this. It will, however, propose strategies to address the most significant challenges that agriculture will face in the near future, and recommend actions which can be taken to seek out the opportunities that these challenges present and the role of government in addressing these.

The Department of Agriculture's submission provides a useful overview of the existing challenges to sustainable agriculture in Western Australia by considering the trends impacting on vibrant rural communities, profitable agricultural systems and conservation of the environment over the last 25 years as well as future challenges and emerging trends. These are summarised in Table 4 below.

Table 4. Trends influencing sustainable agriculture in Western Australia.

Vibrant rural communities	Profitable agricultural systems	Conservation of the environment
• Depopulation of rural areas	• Rationalisation of country towns into large regional centres	• Salinity
• Decreasing rural employment with increased mechanisation, comparatively low wages for the rural workforce and low diversity of job opportunities	• Weakening relationship between farm and food prices	• Loss of soil structure
• Reduction of services in rural towns	• Decreasing terms of trade	• Water-repellence of some soils
• Increasing isolation for those remaining in rural communities	• Deregulation of markets	• Waterlogging
	• Relative importance of agriculture in the nation's economy is declining	• Wind erosion
	• Introduction and spread of quality assurance schemes	• Traffic hard-pans
		• Deterioration in remnant vegetation
		• Destruction of habitat
		• Nutrient run-off causing pollution problems

However, while there is considerable awareness of the need to act on these issues, and the landcare movement has supported action in many areas, it is becoming increasingly obvious that the incremental change approach adopted has not resulted in the significant change at the scale necessary to achieve sustainable agriculture. There is an expectation that sustainable agriculture in the future would look very different from the agriculture of today.

As well as the challenging trends outlined in Table 4, a number of priority issues will impact on the future sustainability of agriculture in Western Australia. These are summarised below.

Biodiversity

Biodiversity and the conservation of natural areas as well as the preservation of important ecosystem services is very important for the maintenance of agricultural systems. Recent amendments to the *Environmental Protection Act 1986* significantly strengthen the protection of biodiversity in rural areas through regulating land clearing.

Much more effort will be needed to preserve biodiversity in some areas, particularly with the potential risk to existing reserves in the wheatbelt from salinity. New ideas are emerging, such as the development of bushland corridors linking reserves (the Wildcountry Gondwana Link project) or the Malleefowl Link concept, and the proposal to trial the EMU Plus process being successfully implemented in the rangelands.

Salinity and soil acidity

Salinity is considered to be the greatest environmental threat to Western Australia and impacts significantly on broadacre agriculture, biodiversity, water supplies, rural towns and infrastructure such as roads.

It is unlikely that the process of salinity can be reversed within current farming systems. In May 2001, the Minister for the Environment and Heritage appointed a Salinity Taskforce to review the existing salinity program and to recommend future directions. The Government responded to the Taskforce recommendations in July 2002 and indicated it would continue to protect high value public assets, invest in new technologies and industry development and provide incentives for on-ground work on private land. The government has also appointed a Natural Resource Management Council, indicated its support for natural resource management regional organisations and regional strategies and will provide increased attention to drainage, biodiversity and adjustment issues.

The removal of product from paddocks and leaching of nitrogenous fertilisers is increasing the acidity of many soils in agricultural regions. Acidity damages plant root structure, reduces plant water use and changes soil nutrient availability resulting in reduced productivity. Acidity is manageable; however, in the long term it could have a major impact on the productive potential of soils unless it is recognised as factor limiting production and appropriate management is widely adopted.

Water quality, availability and drainage

Water quality in the South West of Western Australia is declining due to processes such as salinity, sedimentation and eutrophication, and agriculture is a significant contributor to this decline.

In addition about 45% of Western Australia's water use is for agriculture and the future development of agriculture depends on continued access to water resources. Irrigation could come under increasing pressure from competing uses such as public water supply and industrial uses.

The use of drainage in rural areas is a significant issue and was highlighted in many submissions. The government's response to the Salinity Taskforce report acknowledges the important role that drainage may play in treating salinity in certain circumstances and many farmers have installed surface and sub-surface drainage. However, regional drainage schemes have not been developed and the difficult issue of where salty water should go is still largely unresolved. The government has indicated it will establish a high-level review of the regulatory framework for large-scale drainage, including planning, approval, maintenance and environmental impact and has funding to assist this process.

Greenhouse gas emissions and climate change

The agriculture sector is the second biggest contributor to greenhouse gas emissions through the emission of methane and nitrous oxide by livestock. The National Greenhouse Gas Inventory estimates that agriculture contributes approximately 27% of total national greenhouse emissions, although in Western Australia agriculture is estimated to contribute approximately 32%. Savanna and temperate grassland burning also generate emissions.

Climate change as a consequence of greenhouse gas emissions is expected to have a significant impact on the agricultural sector. Generally Western Australia is expected to become warmer and drier, particularly in the south of the state. This could mean a reduction in crop yields as a result of shorter growing season and less rainfall as well as impacting on pasture growth in the southern rangelands. Climate change could also reduce milk and meat production as a result of increased heat stress on livestock. Crops dependent on a 'chill factor' may also be impacted.

The challenge exists for agriculture to respond to increasing pressures to reduce greenhouse gas emissions; however, it is not yet clear that farmers will be able to make sizable emission reductions through changes in management practices.

Weeds, pests and diseases

Current agricultural systems are heavily reliant on the use of chemicals to control weeds, pests and disease. A number of pests and disease are already expressing tolerance to chemical control methods, threatening the productivity of agricultural systems. Resistance is expected to be a continuing problem. Exotic weeds, pests and diseases could establish themselves in Western Australia, threatening many existing agricultural systems as well as the natural environment.

Biotechnology

A main influence on broadacre farming in the future will be the impact of biotechnology. This may assist farm diversification, but it may also result in systems being increasingly crop (annual) dominant.

A number of submissions raised concerns about the risk associated with Genetically Modified Organisms in agriculture. The Western Australian Government is adopting a cautious approach to this matter. Small scale field trials are currently being undertaken to provide further information about these crops in Western Australian conditions, and consultation has been undertaken on the application of genetic modification free zones within Western Australia.

While the Federally-based Office of the Gene Technology Regulator will be responsible for ensuring issues of human safety and environmental protection, each state will be responsible for putting measures in place to safeguard its own produce and industries from a marketing perspective.

Maintaining vibrant agricultural communities

Current trends in agriculture, and other pressures in rural communities have resulted in the depopulation of rural areas. Technological advances and reduced profitability have also resulted in reduced employment opportunities in rural towns. To ensure sustainability a number of challenges facing rural communities will need to be addressed. In particular there is a tension between the desire to repopulate and revitalise rural communities when current economic conditions are encouraging larger farm businesses to grow and consolidate by buying out the smaller farmers.

As Barr and Cary[22] note:

> In many areas 'sustainable agriculture' will be as much about industry restructuring as about agricultural systems and agronomy. This raises larger questions about the acceptable rate of community change and the desirable form of rural communities.

Currently it appears that the economic and social components of sustainability are in direct opposition to each other under traditional farming systems. Consequently the challenge exists to develop rural industries that maintain or revitalise rural communities (see case study on the Oil Mallee Project) through new, diversified, low impact crops and farming systems with employment and environmental benefits.

Opportunities for sustainability

When all of the existing and possible future challenges to agriculture are considered, it is easy to be overwhelmed by the scale of the changes necessary to address these. As the Australian Natural Resource Atlas[23] suggests:

> The task of improving catchment health, particularly reducing the predicted future impacts of salinity, is a massive undertaking. A sustainable long-term solution implies significant and major changes in catchment landscapes. If we look at this task in short time frames, it is easy to become overwhelmed. History tells us that societies do not achieve such massive changes in landscape in short time frames without social disruption.

Further, the Australian Natural Resources Atlas concludes that land use change is always occurring, and in most cases this change is being driven by economic and social factors unrelated to natural resource management policy.

Attempts to pursue sustainable agriculture in Western Australia must promote all three dimensions simultaneously by developing and supporting forms of

[22] N Barr & J Cary, *Influencing Improved Natural Resource Management on Farms: A guide to understanding factors influencing the adoption of sustainable resource practices*, Bureau of Rural Sciences-Discussion Paper, Department of Agriculture, Fisheries and Forestry-Australia, Canberra, 2000, p. 4.

[23] Commonwealth of Australia 2001 http://audit.ea.gov.au/ANRA/People/docs/adjust_fact_sheet/future.html

agriculture that are profitable, environmentally beneficial and contribute positively to people living in rural areas by maintaining social capital. While fundamental changes will be necessary, this will only occur in the longer term.

A number of submissions called for the need to re-envision our agricultural and rural landscapes and use this as the basis for putting in place policies and processes to assist the transition to a more sustainable agriculture (see Box 22 Wildcountry: Gondwana Links). The new Natural Resource Management Council could assist with this, and advise government on the appropriate mechanisms to support sustainable agriculture.

BOX 22 WILDCOUNTRY: GONDWANA LINKS

The Nature Conservancy in the United States of America has developed a concept to provide links between major natural areas across agricultural regions by establishing corridors of native vegetation. This idea has been adopted by The Wilderness Society in Australia and simultaneously by a range of local conservation groups. Projects are beginning in three Australian states.

In Western Australia a partnership has been formed between Greening Australia, The Wilderness Society, Fitzgerald Biosphere Group, Friends of Fitzgerald, Australian Bush Heritage Fund and the Malleefowl Preservation Group. This project is called Gondwana Links. The partnership plans to try and link up the bushland east of Esperance, through the Fitzgerald National Park, the Stirling Range National Park, D'Entrecasteux National Park and Walpole Wilderness Area, through to the South West Forest and coast. The aim is to join up areas through the farming country between these parks through the purchase of private land, land trading of existing bush areas as well as encouraging covenanting and revegetation by local farmers.

This vision would result in a corridor of bush that could provide a continuous habitat link and an area to walk through that would cut across the entire State. Local farmers have already shown considerable interest in the project.

Opportunities that exist to support a transition to more sustainable agriculture include:

- Developing new sustainable agricultural industries that have well-developed and applied best management practices, (see Box 23) including low-input agriculture to meet future market needs.
- Further developing accreditation methodologies for agricultural systems that enable access to markets through verified compliance with production processes that ensure food safety/quality and/or sound environmental management.
- Significant research and development of new industries and innovations that are profitable and environmentally responsible, such as bio-fuels.
- Exploring new opportunities for agriculture that could be provided through the concept of valuing ecosystem services, for example along the lines of the Victorian Government's Bush Tendering system.
- Supporting the development of carbon sequestration opportunities, including commercial plantations, alley farming and landcare plantings to offset greenhouse gas emissions that could provide salinity benefits as well as large renewable energy resources for power generation. These plantings could be strategically developed to support programs like *Wildcountry* in creating important bush links across the landscape.
- Improving capacity in rural areas by establishing Regional Councils of Local Government as part of the State-Local Government Partnership Agreement.

BOX 23 ENVIRONMENTAL MANAGEMENT SYSTEMS AND ACCREDITATION FOR SUSTAINABLE AGRICULTURE

The Commonwealth and state governments have been working together to investigate the opportunities and possibilities associated with environmental management systems in agriculture. Similarly, the World Wildlife Fund for Nature and others have been investigating the place of accreditation for sustainable agricultural systems.

This work is in recognition of the international trends in the adoption of environmental management systems to other forms of primary production and the possible application to simultaneously assist with making agriculture more sustainable and benefiting agricultural producers.

The term 'Environmentally Responsible Agriculture' reflects the inter-generational equity and precautionary principles of sustainability. This is demonstrated through the adoption of management practices judged as sustainable through a transparent and scientifically rigorous process. The Department of Agriculture is developing the framework to describe processes and outputs for the achievement and demonstration of environmentally responsible agriculture. The framework will define the roles, responsibilities and communication strategies that underlie the processes and outputs and will be developed in consultation with relevant stakeholders from industry, community and government. The major processes and outputs described in the framework are outlined below:

- engagement of relevant producer and community groups
- environmental condition assessment using spatially defined zones
- natural resource management outcome targets
- industry performance standards linked to natural resource management outcome targets;
- best management practices underpinned by these standards which allow for profitable agriculture and address environmental outcomes
- sign-off and reporting to a third party on compliance with best management practices, probably the Environmental Protection Authority
- evaluating and reporting progress towards natural resource management outcome targets.

In short...

Vision

Agriculture achieves a new balance in Western Australia with production becoming more efficient and diverse while restoring ecological integrity in the landscape. Natural bush and regenerated land are linked in corridors across the state. New bio-industries based on local species are creating employment in rural towns.

Objectives

- Develop and identify agricultural systems designed to maintain or improve the condition of the State's natural resources.
- Facilitate the widespread adoption of best management practices that minimise environmental impact while improving profitability.
- Facilitate land-use changes within agriculture.

Actions underway include

- The Department of Agriculture and other state and Commonwealth government agencies such as the CSIRO and Land and Water Australia support or directly undertake considerable research, development and extension of sustainable agriculture techniques, such as best management practices for farmer groups and individuals including the development of best management practices for irrigators in the south west irrigation area.
- The Department of Agriculture and the Great Southern Development Commission are undertaking the Central South Coast Strategic Analysis to identify the constraints impeding adoption and implementation of change to more sustainable agricultural practices.
- The Western Australian Government has responded to the Salinity Taskforce's report and outlined its strategic priorities for salinity management in Western Australia.

In short cont'd...

- The Western Australian Government is amending the Environmental Protection Act to provide for improved management of land clearing.
- The Cooperative Research Centre for Plant Based Solutions to Dryland Salinity has been established.
- The University of Western Australia in collaboration with the State Government has established a Centre of Excellence in Natural Resources Management at its Albany campus
- Organizations like the Western Australian No-Tillage Farmers Association are researching more sustainable agricultural practices.
- In May 2001, the government announced an interim 5 year moratorium on the commercial production of GM Food crops to allow issues associated with market impacts, identity preservation and the feasibility, risks and benefits of establishing GM and GM-free zones to be fully debated in the community.

Proposed actions

3.1 Develop regional targets for sustainable resource use for incorporation into regional natural resource management plans.

3.2 Support diversification and landscape scale change towards sustainable land uses.

3.3 As part of the State-Local Government Partnership Agreement, establish regional councils and other processes that can meaningfully involve local government in issues of agricultural sustainability, particularly regional drainage, biodiversity conservation, regional revegetation programs, water quality and soil acidity. Local governments could then incorporate regional sustainability priorities into their local town planning schemes.

3.4 Continue to develop the government's policy on GM Food crops and the preparation of state gene technology legislation in consultation with the community.

3.5 Encourage the development of an aquaculture industry using saline waters to utilise land and waterways affected by salinity.

3.6 Improve the coordination of fox and feral animal control programs in regions to focus on core areas of regeneration and conservation where at-risk wildlife can be protected. The involvement of local government and farmers can be coordinated through the State-Local Government Partnership Agreement.

3.7 Develop with industry participation, standards and best practices for agricultural systems at regional and enterprise scale to provide the basis for accreditation of sustainable agriculture practices and to support regulatory processes.

3.8 Investigate economic incentives and innovative instruments such as biodiversity offsets, integrated ecosystem services trading, tax incentives and environmental stewardship rebates as well as land purchase, as drivers of land use change towards more sustainable use.

3.9 Investigate the application of the EMU Plus process developed in the rangelands as a means of empowering farmers and catchment groups, building capacity, facilitating change and leveraging private investment towards sustainable agriculture.

Indicators and targets

Most indicators to track progress towards agricultural sustainability are still undergoing development and testing.

Examples include:

- percentage of agricultural enterprises with positive farm business profit
- annual rates of return of agricultural enterprises

In short cont'd...

- adoption of best management practices
- extent and quality of rural and regional infrastructure
- land manager capability and capacity to change
- percentage of agricultural and nearby land with deep-rooted perennial vegetation
- condition and extent of native vegetation within individual subcatchments
- extent and changes of dryland salinity
- extent and quality of nutrient run-off into waterways.

Global opportunities

Many of the issues affecting agriculture in Western Australia, such as salinity, soil acidity, the impact of the climate change and the need to reduce greenhouse emissions, relate to sustainability in some way. Western Australians have participated in numerous agricultural development aid projects and will continue to contribute positively to resolving agricultural sustainability challenges in other countries. The more that Western Australia participates in this process the more globally relevant experience the state will gain. This will benefit farmers, consultants, industry groups and government agencies.

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National Association of Sustainable Agriculture Australia <http://www.nasaa.com.au/>

Western Australian Department of Agriculture <http://www.agric.wa.gov.au>

> SUSTAINABLE FISHERIES AND AQUACULTURE

Fisheries management and sustainability is one of the good news stories in Western Australia. This is due to a powerful regulatory system and technology and resources for monitoring and reporting. The Western Australian Government has adopted a policy on the ecologically sustainable management of fisheries that is a world first.

> *The achievement of ecosystem-based management is hampered by the absence of an overarching, bio-regional, marine planning system and the lack of integration between the implementation of the marine reserve system ... fisheries management and the Commonwealth's Oceans Policy.*
>
> Environmental Alliance

> *The WA Rock Lobster industry is the world's first fishery to receive Marine Stewardship Council certification.*
>
> Worldwide Fund for Nature

> *The rock lobster industry is global best practice in many ways, its management techniques should be translated to other fisheries, including aquaculture.*
>
> Australian Corporate Citizenship Alliance

Commercial fisheries directly account for $750 million of Western Australia's income per annum, of which over $700 million comes from exports. Additionally, an estimated 600,000 Western Australians contribute a further $500 million in annual economic activity from recreational fishing and aquatic eco-tourism. These exports represent about 30% of the national total, making Western Australia the leading state in terms of fisheries. In some regional towns in the Gascoyne and Kimberly regions, fisheries activity provides the main form of employment.

A key feature of our coastal waters is the diversity of fishes; these support well developed commercial and recreational fisheries. Within Western Australia there are 43 managed commercial fisheries, six recreational fisheries and a number of emerging aquaculture industries. These fisheries are mainly coastal and as such have been developed under conditions of low productivity compared to western shores of the other continents in the southern hemisphere.

Many of the target species are demersal and rely on specific habitats, for example coral reefs, mangroves or algal reefs that are limited in number and extent. This scenario leads to the possibility of overexploitation that could compromise the sustainability of these fish stocks and other interdependent non-target species and their habitats. Fish Habitat Protection Areas are being established as an integral part of fisheries management plans and strategies.

The *State of the Fisheries Report 2000-2001*[24] reports comprehensively on the status of Western Australian fish stocks, associated fishing activities and aquaculture development as well as the associated impacts of these industries. The report indicates that the majority of the fish stocks are in a healthy condition and, although fully exploited, are producing catches at sustainable levels. The report notes that the exception is the southern pilchard stocks which suffered an attack from an exotic virus in 1998-99 and is now showing signs of recovery, assisted by low or zero quotas for the 2000 season.

Overexploitation of our natural biological resources can compromise sustainability. The sustainability of fish stocks and conservation of their habitats are desired government outcomes reflected in the *Fish Resources Management Act 1994*. The objects of this Act are consistent with sustainability objectives and guiding principles. In addition, Commonwealth Government legislation now requires that all export fisheries undergo an assessment against guidelines for sustainability.

[24] Fisheries Western Australia 2001. *State of the Fisheries Report 2000-2001*, Department of Fisheries, Perth.

Box 24 describes the application of sustainability to the Western Rock Lobster fishery, Western Australia's main export fishery.

BOX 24 ACCREDITATION FOR SUSTAINABLE FISHERIES AND THE WESTERN ROCK LOBSTER FISHERY

The Marine Stewardship Council is an independent global organization established to harness consumer purchasing power to generate change and promote environmentally responsible stewardship of the marine environment. The Council has been operating independently since 1999, thought it was first established in 1997 with international food company Unilever and the Worldwide Fund for Nature.

The Western Rock Lobster fishery is widely recognised as one of the best managed fisheries in the world and is Australia's most valuable single species fishery, at a value of $300 to $400 million annually. In March 2000, it became one of the first fisheries in the world to receive certification from the Marine Stewardship Council.

The foundation of this success was a management package introduced by the Department of Fisheries in 1993-94 to rebuild severely depleted breeding stock. In 1997-98 and 1999-2000, these management measures resulted in bumper catches and economic prosperity for commercial fishers and the State.

The Council's accreditation process is now also paving the way for the fishery to meet its requirements in demonstrating ecological sustainability to Environment Australia-a necessary requisite for all future export fisheries under the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 2000*.

Approximately 12-25 fisheries worldwide are in various stages of assessment for accreditation by the Marine Stewardship Council. In 2002 the Council will establish an Asia-Pacific presence in Sydney that will allow it to better respond to the increasing demand for its accreditation services with considerable benefit to Australian fishing industries.

The government has recently committed $15 million to the development of a new fisheries research institute and associated community education initiatives to promote the sustainable use and management of marine resources.

The Department of Fisheries recently released the *Policy for the Implementation of Ecologically Sustainable Development for Fisheries and Aquaculture in Western Australia*[25]. This policy outlines how sustainability can be implemented within the fisheries sector. It focuses on environmental components of sustainability that are necessary to complete the assessments for export that Commonwealth Government legislation now requires. Future revisions of the policy will expand upon the social and economic components of sustainability and consider resource allocation issues.

The policy requires the preparation of sustainability assessments for each fishery, with the report being made available for public comment. Initial effort will be directed towards commercial fisheries, particularly those with a substantial export component.

The Department of Fisheries has identified the following key issues as requiring consideration in the future:

- an increased public requirement for accountability in respect to the maintenance of biodiversity and the ecologically sustainable use of the marine environment
- additional pressure placed on inshore fish stocks as a result of continuing population growth, coastal development, improved access and fishing technology, together with a growing recreational sector
- the development of high-quality recreational fisheries and low-impact eco-tourism experiences in some regions to meet increasing community interest and tourism potential
- direct involvement of the Commonwealth Government in the day-to-day management and planning of Western Australia's marine environment through the implementation of the Commonwealth's Oceans Policy initiative
- Indigenous fishing issues and the development of the law in respect to Native Title.

While the *State of the Fisheries* report indicates that the majority of commercial, recreational and acquaculture fisheries are being managed sustainably, there is concern about the status of the freshwater fish populations, particularly in the South West corner of the state. There are 14 species of

[25] Department of Fisheries 2002. *Policy for the Implementation of Ecologically Sustainability Development for Fisheries and Aquaculture within Western Australia*. Fisheries Management Paper No. 157, Perth.

freshwater fish in the South West of Western Australia and eight of these are endemic. Most are affected to some extent by habitat loss and five are considered potentially vulnerable because of this. In the South West, habitat degradation of fresh water systems has occurred because of salinity, the clearing of native vegetation, point source pollution, eutrophication, silting and the loss of riparian vegetation. Considerable effort needs to be directed to planning for the protection and management of freshwater fish.

There is also increasing pressure on the marine environment from a variety of users, including those in the aquaculture, fishing and tourism sectors together with a growing community desire for unfettered access to the marine environment and for conservation of important areas, habitats and species. For certain types of aquaculture, there is a shortage of high quality marine sites. Suitable sites tend to be in high use areas and close to major townsites. This often results in a high level of conflict between aquaculturalists and other users and the general community.

A number of state government agencies are involved with planning for the marine environment[26]:

- The Department of Fisheries prepares fish habitat protection areas plans, aquaculture plans, fisheries management plans, regional recreational fishing management plans and fisheries environmental management plans.
- The Department of Environment, Water and Catchment Protection prepares water management programs for estuaries and inlets.
- The Department of Minerals and Petroleum Production plans for resource development in State waters.
- The Department of Conservation and Land Management plans for marine nature reserves, marine parks and marine management areas.

There is currently no legislative framework for planning in the marine environment and the Department of Fisheries suggests that existing land use planning processes for coastal lands often do not integrate the use of the adjoining marine environment. This could lead to increased conflict in the absence of an integrative planning framework and a marine planning strategy is required. This strategy would complement state and regional land planning strategies.

Biodiversity conservation

The Marine Parks and Reserves Authority and the Department of Conservation and Land Management have responsibility for establishing and overseeing the management of marine parks and marine nature reserves under the Conservation and Land Management Act. The Conservation Commission of Western Australia and the Department of Conservation and Land Management have responsibility for the conservation of marine mammals such as dugong, seals, whales, and turtles.

Responsibility for management of populations of all other marine organisms is the responsibility of the Department of Fisheries under the Fish Resources Management Act. For the purposes of that Act, all those marine organisms are fish (this includes algae and marine invertebrates). Under the Fish Resources Management Act, the Minister for Fisheries may declare fish habitat protection areas for conservation of fish and marine ecosystems, for fish research and for appreciation of fish in their natural surroundings.

[26] Department of Fisheries 2002. *State Sustainability Strategy Submission*. Unpublished.

In short...

Vision

Marine fisheries are sustainably managed in a way that ensures all species, including the non-commercial species, can survive and that people can enjoy the benefits of recreational activities in marine environments. Inland aquatic systems are managed so that no further declines in fish species occur.

Objectives

- To protect biodiversity and maintain essential ecological processes of the marine environment.
- To provide effective legal, institutional and economic frameworks for ecologically sustainable development of fisheries based on sound science.

Actions underway include

- The Department of Fisheries is compiling ecologically sustainable development assessment reports for commercial fisheries for export approval under the Commonwealth's Environment Protection and Biodiversity Conservation Act. Assessment of other sectors will follow.
- The government has committed $15 million to the establishment of a new fisheries research institute and associated community education initiatives to promote the sustainability of marine resources.
- Fish Habitat Protection Areas have been established at the Abrolhos Islands, Lancelin Lagoon and Cottesloe Reef.
- Six Marine Parks have been established, including the Ningaloo Marine Park, and one Marine Nature Reserve has been established at Hamelin Pool. The Marine Parks and Reserves Authority, with the support of the Department of Conservation and Land Management, is continuing to implement the recommendations of the Wilson Report on marine conservation
- Fisheries Environmental Management Reviews are being prepared on a region-by-region basis for all fisheries and fishing activity in Western Australia's marine waters out to the 200 nautical mile Exclusive Economic Zone boundary.
- Regional recreational fisheries management strategies are being developed for the Pilbara/Kimberley, Gascoyne, West Coast and South Coast. Plans for the Gascoyne and West Coast have been developed for community consultation and a management framework is expected to be finalised during 2002. Plans for the Pilbara/Kimberley and for the South Coast will follow.
- The Western Rock Lobster Fishery has been certified by the Marine Stewardship Council, an independent body that accredits fisheries on their environmental sustainability.
- Work is being undertaken to preserve freshwater fish stocks, including research, retaining breeding stocks, working with other relevant departments, and working with a freshwater fish reference group to identify issues associated with the conservation of native fish and establish priorities for management.
- The Great Southern Development Commission is undertaking work to assess the capacity of the local fishing industry to add value to the local fish resources, find markets and make a better return.

In short cont'd...

Proposed actions

3.10 Develop social and economic aspects of sutainability to integrate with environmental assessments completed on all Western Australian fisheries.

3.11 Develop a Marine Planning Strategy, including a cross-agency framework for integrated marine planning to ensure that marine and estuarine resources are adequately protected and managed across all habitats, within a bioregional framework. This framework should enable increased collaboration between catchment and land management agencies to manage resulting impacts on the marine environment and fisheries (see also *Contributing to global sustainability: Maintaining our biodiversity*).

3.12 Develop a long-term Inland Fish and Aquatic Ecosystem Strategy to rehabilitate freshwater ecosystems of the South West to conserve the biodiversity of the state's freshwater fish stocks.

3.13 Continue to implement the Wilson Report recommendations to establish additional marine parks and reserves system with provision for substantial and well-designed sanctuary zones, so that all marine bioregions have representative reserves by 2020.

3.14 Continue to establish fish habitat protection areas to complement the marine park and reserve system.

3.15 Prepare and implement regional recreational fisheries management strategies and regional fisheries environmental reviews and plans.

3.16 Continue targeted community education programs to promote fisheries and marine conservation based at the new fisheries research institute and the Aquarium of Western Australia.

Indicators and targets

- Number of fisheries that have successfully undergone sustainability assessments.
- Area of reserves for the conservation of marine biodiversity in each marine bioregion.

Global opportunities

Global fisheries are not managed sustainably, particularly in the developing world. There are many international projects that could utilise Western Australia's expertise in sustainable fisheries management.

Further information

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Department of Fisheries 2000-2001, *Policy for the implementation of Ecologically Sustainable Development of Fisheries and Aquaculture within Western Australia*, Fisheries Management Paper No. 157, Department of Fisheries, Perth, viewed August 2002, <http://www.fish.wa.gov.au/esd/index.html>

Department of Fisheries 2000-2001, *State of the Fisheries Report 2000-2001*, Department of Fisheries, Perth, viewed August 2002, <http://www.fish.wa.gov.au/sof/index.html>

> SUSTAINABLE FORESTRY AND PLANTATIONS

The Western Australian Government has moved to end logging in old growth forests on public land and is proceeding to incorporate these areas into secure conservation reserves, including 30 new National Parks. As part of this process the government has put in place programs to restructure the timber industries to maintain social capital and regional development opportunities. This $136 million package is an essential part of how sustainability applies to forests.

Increasing global attention is being directed to our attempts to save forests, create habitat for rare and endangered species, manage feral animals and weeds. Can this become a new economic opportunity for the State? How can this help communities in rural areas?

Environmental Alliance

Western Australia's public forests and timber reserves are vested with the Conservation Commission of Western Australia. The Conservation Commission has prepared a new draft Forest Management Plan which is currently available for public comment. The government is committed to maintaining the ecological integrity of forests and woodlands, and will achieve this through the application of ecological sustainable forest management principles. This draft Plan proposes further change as ecologically sustainable forest management becomes institutionalised.

If there is acceptance by the public and within government of the proposals in the draft Plan, Western Australia will cement its position on the path to sustainability with respect of forest management.

The draft Forest Management Plan proposes substantial change in the manner in which decisions are made on levels of harvest from native forests. The draft Plan proposes a shift away from timber allocation based on the concept of Maximum Sustained Yield to incorporate some buffering and allowing room for error based on the precautionary principle. A second proposal is that the forests be managed according to the concept of adaptive management, with all that entails. Further research and monitoring to improve the knowledge base underpinning on-going management decisions will be required. The proposals are consistent with the precautionary principle.

Potentially the greatest single threat to biodiversity values in the South West, *Phytophthora cinnamomi*, sometimes referred to as jarrah dieback, is estimated to impact around 2,000 species of native plants and to cause major, permanent and irreversible changes to vegetation structure and habitat values for native animal species. Other species of *Phytophthora*, species of Almylaria, and a range of insect pests also cause significant damage.

Phytophthora species continue to pose a significant risk to the sustainability of forests in Western Australia. Disease management needs a strong commitment, such as rigorous controls on movement of vehicles and other vectors into likely uninfected areas, including those in State Forest and Timber Reserves, National Parks and Nature Reserves in the South West. A commitment to rehabilitation of areas degraded by *Phytophthora* is also required.

The forest plantation industry has an important role to play in the future sustainability of the State. Plantations have the potential to produce timber to substitute for the declining production from native forest. In addition, plantations can help deal with salinity and other land degradation issues and, if placed correctly with appropriate species can help restore biodiversity values, especially through linking existing conservation reserves and other remnant vegetation.

The Forest Products Commission has developed a Plantation Strategy for the South West which includes oil mallees, hardwoods, maritime pines and blue gums. The Small Tree Farm at Balingup has also been working to encourage productive revegetation of cleared farming land. They have developed a hybrid line of eucalypts that are suitable for sawlog production, referred to as 'fat eucalypts'.

The sandalwood industry has considerable potential to contribute to diversification in the rangelands. The opportunities that the sandalwood industry provides for diversification should be reviewed. Such a review would oversee the development of an integrated business and resource management plan that ensures the resource is managed on an ecologically sustainable basis, that maximises environmental, social, regional development benefits as well as providing adequate financial returns to the state. The review should also examine and report on mechanisms to support further development of sandalwood plantations in the agricultural region. The Forest Products Commission has commenced trials with pastoral leaseholders to reduce and where possible eliminate feral goats from sandalwood production areas.

As for other sustainability issues, there will be an ongoing need to continue to involve the community in the planning and decision-making in relation to forest management.

In short...

Vision

Western Australia's native hardwood forests are managed on an ecologically sustainable basis that includes a wide range of uses, all of which reflect the unique values of these forests. Regeneration of native forests is also a major focus, with strong community involvement. Production of sawlogs, pulpwood and other timber products from sustainably managed plantations is integrated with native forest use. Rural communities have adjusted to support the changed focus in use and management of native forests and the on-going development of plantations throughout the South West, including their uses in restoring degraded landscapes. Woodlands and sandalwood resources are also used and managed sustainably, with sandalwood production providing the basis for a new industry in the rangelands.

Objective

- Ensure that Western Australia's forests, woodlands and sandalwood resources are managed according to sustainability principles.

Actions underway include

- The Conservation Commission has prepared a Draft Forest Management Plan incorporating Ecologically Sustainable Forest Management Principles, which has been made available for public comment.
- The government has protected all old growth forests and has created thirty additional National Parks and reserves to expand the conservation estate in the forested South West.
- The Forest Products Commission has developed a Plantation Strategy for the South West.
- An agreement to develop a LVL plant from the Gnangara pine plantation creating over 100 jobs and improved ground water management possibilities.

Proposed actions

3.17 Continue to support restructuring of the timber industry, giving particular support to value-adding opportunities in the timber processing and wood working areas.

3.18 Promote the efficient use of all logs, development of high value-added timber utilisation, and harvesting rotations based on maintaining the full range of forest values including saw log production.

3.19 Actively support the Action Plan for Tree Farming in Western Australia for the further development of a plantation industry on previously cleared agricultural land within the guidelines being developed by the Western Australian Planning Commission to retain viable rural communities. Particular attention should be given to production of sawlogs as a substitute for the declining yield from native forests.

In short cont'd...

3.20 Continue to consult with communities over the final boundaries on the 30 new National Parks in old growth forests.

3.21 Review the sandalwood industry in Western Australia, the present and projected resource availability, the manner and pattern of exploitation of the resource, and the role that it might play in regional development and ecologically sustainable management of the rangelands. Develop a sandalwood management plan that is consistent with principles of Ecologically Sustainable Forest Management.

3.22 Seek to minimise the loss of natural values from State Forests and Timber Reserves and all other reserve categories within the South West as a consequence of the extraction of low value bulk commodities such as sand and gravel.

3.23 Create a comprehensive Dieback Strategy including how to:

- Establish and maintain a comprehensive database on the distribution of *Phytophthora* species throughout the South West, and use this to ensure that future timber harvesting operations and other activities do not lead to the spread of these pathogens.
- Develop and implement rehabilitation plans for selected diseases-affected areas.
- Ensure the Western Australian nursery industry follows best-practice hygiene procedures to eliminate *Phytophthora* species from all seedlings and propagating material.
- Work with relevant Commonwealth agencies to prevent the introduction of new plant diseases into Australia that could impact on the forests and forestry industry.
- Develop an education program for the general public, and private and public organisations whose activities involve use of land in dieback susceptible areas.
- Support the establishment of a Centre of Excellence for *Phytophthora* research into ecological impacts on key elements of the biota, methods of managing and counteracting impacts of diseases, and monitoring spread.

3.24 Continue to develop skills in production and marketing of fine timber products made from specialty native hardwoods.

3.25 Support accreditation of forestry and plantations as an important part of maintaining sustainable forest management in Western Australia.

Indicators and targets

All Western Australian public forests are subject to Forest Management Plans that are approved by the Minister for the Environment on the advice of the Environmental Protection Authority.

Global opportunities

The decision to stop the logging of old growth forests in the South West of Western Australia and a move towards sustainable forest management has attracted interest from around the world. When fully implemented, monitored and evaluated, this area of sustainability will be of considerable global value as the world's forests continue to decline at an alarming rate.

Further information

Forest Products Commission
<http://www.fpc.wa.gov.au>

Draft Forest Management Plan for Western Australia
<http://www.conservation.wa.gov.au>

> SUSTAINABLE MINING AND PETROLEUM PRODUCTION

Mining and petroleum production are important contributors to Western Australia's economy and are part of the state's rural landscape. In the past twenty years they have been at the cutting edge of developments in environmental science and management. It is accepted that assessment of resource projects on local environmental criteria is now well advanced but that the integration of social, economic and strategic issues needs more attention.

> *From a mining industry perspective, many of the practices of years gone by are no longer valid. There has been a gradual recognition that a healthy economic bottom line will only come if environmental and social goals are pursued in tandem. The growth of factors such as ethical investment, community expectations and human rights movements are driving significant change in the resources sector.*
>
> Rio Tinto

In Western Australia, the mineral and petroleum resources sector accounts for 25% of Gross State Product, 49% of investment, 71% of exports and 17% of direct and indirect employment. The Western Australian resources sector is 50% of Australia's total mineral resources production and accounts for 47% of the investment in mining nationally.

The expertise required to develop these resources is significant and, in Western Australia, the processes of exploration, development, processing and rehabilitation are world class. This expertise is now being exported to numerous countries with an estimated benefit to the national economy of $1 billion, with Western Australia gaining 60% of this benefit.

There are a number of key sustainability innovations that have been developed in the Western Australian resources sector, including land and water rehabilitation, eco-efficiency in mineral processing and, more recently, a range of social innovations, e.g. the training and employment of Aboriginal people. Four sustainability case studies and a background paper describe some of these innovations.

The international minerals sector has recently developed a position statement on sustainability issues across the sector in the lead up to the World Summit for Sustainable Development in Johannesburg. This major piece of work identified nine key challenges to the minerals sector, including issues of access to land and management of the environment as well as the extent to which the sector and the minerals it produces can contribute to broader social goals in society.

The project went on to identify an agenda for change based on a new vision of the minerals sector, and a program for supporting that change. The Australian minerals sector participated in this bigger project and produced a separate report that sits within the framework of *Breaking New Ground*. This report also identified some critical issues and proposes an agenda for action.

Action items include ensuring that decision-making process are open to public input and scrutiny, acknowledging that some areas are off-limits, and addressing better the potential social and environmental impacts of all aspects of the sector's activities. It is suggested that the State Sustainability Strategy could provide an avenue for this to occur through a partnership similar to that to be developed with local government.

The need for agreed principles of sustainability in operations is important for the public to recognise where net benefit considerations are occurring. It is also important for the public to see where regulations are being applied and the monitoring and reporting processes that are in place.

Some submissions to the State Sustainability Strategy suggested that Western Australia should move away from being an economy based so heavily on the resources sector.

The case studies on mining (see below) document how a number of companies have created long term futures by creative use of technology and innovative thinking. They have demonstrated that mining is a lot more than digging up the ground and are finding clever solutions to their problems. It is clear from these examples why the companies have chosen to use sustainability for the

framework they used for their innovation. And it is clear that Western Australia is at the global forefront in these applications of sustainability to mining. Box 25 below sets out how the HISmelt process has created a long-term future for Pilbara iron ore.

BOX 25 HISMELT TECHNOLOGY: A GLOBAL INNOVATION FROM WESTERN AUSTRALIA

HIsmelt technology is a globally innovative technology breakthrough from Hamersley Iron developed in Kwinana. This technology has been researched and developed with funding from Hamersley Iron and the government over the past twenty years. The project is now being assessed by the Environmental Protection Authority for full-scale application at a company owned plant in the Kwinana industrial area along the coast south of Fremantle.

In terms of sustainability the technology is a breakthrough on several fronts. First, it enables vast areas of previously uneconomic phosphate-rich iron ore to become economic, giving the Pilbara region a much longer lifetime as a producer of quality iron ore. Second, it is a fundamental change to how iron is produced with significant potential to reduce energy and greenhouse gases.

The process combines a hot air blast system, ore pre-heater, vertical smelt reduction vessel to smelt a continuous ore/coal/flux feed into high purity iron ore without the use of coking ovens. The key innovation is the use of a reduction rather than an oxidation process, which greatly increases the range of suitable and economically viable ferrous feed stocks, due to its ability to separate impurities efficiently on a continuous basis. Phosphorous, which poisons a traditional blast furnace, is no longer a hindrance. After an additional sulphur removal stage, the end-result is a high-grade pig iron, which is highly sought after by steel manufacturers.

The design of the plant will also allow for the capture of heat energy produced in the smelting process that can then be used for energy production. This new efficiency is called a 'Factor-X gain (a term used in industrial ecology to denote ecologically beneficial efficiencies in a production process that are gained through producing multiple products where formerly there was only one). In this case, the dual outcomes of iron production and energy means a much-reduced greenhouse gas output as compared to the production of these two commodities independently. This is a precursor to the next wave of production technology and regulatory requirements, which will eventually result in the retirement of older, less greenhouse efficient, stand-alone energy plants.

The sustainability benefits of the HIsmelt process are many. Locally, the Perth area gains a new industry and a value added technology, while simultaneously reducing its greenhouse gas output per unit of production. Regionally, both the Perth metropolitan area and the Pilbara benefit through the extended life of an industry that is of vital importance to both in terms of employment and economic stability. The State of Western Australia also benefits in a similar manner. Nationally, technologies such as HIsmelt will be crucial to Australia's commitment to reduce greenhouse gases, as well as ensuring a role for this country in an emerging global market through the steady progression of agreements, such as the Kyoto Protocol.

On a global scale, licensing this technology will mean that steel production can be combined with energy production in many areas (such as China, which is both heavily coal dependent and a major steel manufacturer), merging the greenhouse emissions of the two industries into one. Finally, the energy and iron/steel industries benefit through a more secure future, steel and energy production efficiencies, reduced need for carbon offset trading, fewer emissions and a greater potential ore body to mine. Furthermore, this technology, through the expanded range of viable feedstocks will facilitate the eventual merger of the iron mining and iron recycling industries. This is a microcosm of a similar transition, which is expected to occur across the mining industry over the next 50 to 100 years. Through HIsmelt, Australia has the opportunity to be a leader in this development.

The State Sustainability Strategy recognises the need for greater diversity in the Western Australian economy and this is occurring quite rapidly in terms of employment. Indeed, resource development projects are often able to make a global contribution to sustainability through demonstrating best practice. The problem of over consumption of resources would not be assisted at all by stopping resources development. This can only be addressed by consumers and by eliminating processes that support over consumption, not those who extract the resources. Global processes to reduce consumption through eco-efficiency and lifestyle changes are underway but in the short to medium term there is growing demand for non-renewable resources.

Western Australia's major resource sector developments are associated with gas extraction off the north west coast. Some submissions suggested that these developments should not be supported. As outlined in *Contributing to global sustainability: Oil vulnerability, the gas transition and the hydrogen economy*, these developments are an important part of the global transition from oil and can assist in creating the hydrogen economy. These developments need to be linked directly into a full sustainability assessment so that we can create a more sustainable future. As outlined already these developments are potentially very

important to Western Australia's future and sustainability assessment should ensure net benefit and common good outcomes.

Over the past twenty years, the minerals and petroleum production sector has developed some sophisticated land management and rehabilitation techniques so that mined land can be returned to some form of production or conservation after mining. There have also been mining activities showing net environmental benefit, for example, where companies purchase pastoral leases to mine a small proportion and manage the majority of those leases for nature conservation.

The next challenge for this industry sector is to develop the social aspect of sustainability. This needs to go beyond philanthropy and shift to strategic investment by companies into projects and programs that can make a difference in the communities in which they operate.

The Aboriginal training programs within Hamersley Iron and BHP in the Pilbara are examples of this focus (see case study *Sustainability and iron ore in the Pilbara: a regional perspective*). After five years, many local Aboriginal people are employed in the mining industry and young Aboriginal people are supported to undertake tertiary and other further education. This innovation in training is becoming an industry standard providing a clear example of how major resource companies can achieve a level of Indigenous employment that is equivalent to the region's Indigenous population (see also *Sustainability and governance: Indigenous communities and sustainability*). The Aboriginal training programs are an innovation in social sustainability that has occurred with limited government involvement. It may be appropriate that government now promotes this initiative to extend the process to other regions.

Various submissions have suggested that there is a real need for government involvement in the social side of sustainability. For example, through sustainability assessment, the government could ensure that mining companies liaise with local Aboriginal communities, local pastoralists and shires. Most companies do this but this will become even more necessary in the future and more apparent through the sustainability assessment process.

In short...

Vision

The need for global resources reduces as sustainable consumption patterns emerge and this highlights the need to extract resources in ways that offer the most all round benefits. Non-renewable resources continue to be produced from Western Australia, as it remains the most sustainable option globally, with net benefits accruing to the state.

Objective

- Continue to ensure that minerals and petroleum production in Western Australia remains at world best practice and the industries help to establish the standard for sustainability.

Actions underway include

- Environmental impact assessment has helped establish environmental bottom lines for the minerals and petroleum production sector.
- The sustainability assessment process is beginning to demonstrate how the full triple bottom line can be incorporated into major projects (Gorgon assessment).
- The Centre of Excellence in Sustainable Mine Lakes has been funded.

Proposed actions

3.26 Work towards sustainability assessment of state significant projects using sustainability criteria (consistent with the Keating Review).

In short cont'd...

3.27 With key stakeholders, develop a set of agreed Sustainability Operating Principles for the Mining Sector, including consideration of the Mining Minerals and Sustainable Development Principles recently outlined through the Global Mining Initiative through a working group managed through the Department of Minerals and Petroleum Resources.

3.28 Foster local community involvement (particularly Aboriginal communities, pastoralists and local shires) as part of the sustainability assessment process.

3.29 Establish transparent processes to enable community awareness of the regulatory system for mining and minerals processing.

3.30 Work with industry on the development of voluntary accreditation for mining sustainability.

3.31 Provide financial support for the Cooperative Research Centre in Sustainable Minerals Processing and the Cooperative Research Centre in Greenhouse Gas Technologies, should they be successful in the Commonwealth CRC funding round.

Indicators and targets

- Number of minerals and petroleum projects with Sustainability Assessments and Sustainability Reporting.

Global opportunities

Western Australia is a world leader in mining and petroleum production, especially in advancing sustainability and mining. The recent global initiative called Minerals, Mining and Sustainable Development was heavily oriented to innovations occurring in Australia, especially in Western Australia. There are already numerous examples of where global opportunities in mining and sustainability have been taken by Western Australian consultants and companies. The opportunities in this area will continue to grow.

Further information

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> SUSTAINABLE TOURISM

Tourism has much potential to support the sustainable use of our natural resources. Western Australia's unique and highly diverse natural environment offers a different kind of tourism experience that people from around the world are wanting: subtle, low impact, more natural and cultural experiences.

> *Tourism (especially passive recreation) will play a major role in the battle for sustainability. Perhaps people will come to Australia to learn how to become more sustainable.*
>
> Lisa Clarke

Tourism contributes some $4.2 billion to Western Australia's economy, which accounts for about 4% of Gross State Product. In 1999-2000, over 590,000 international and 6.21 million domestic visitors travelled in Western Australia (the majority being Western Australian residents).

Significant opportunities exist in Western Australia to promote and encourage sustainable tourism. Research suggests that this is the fastest growing tourism market and the 'Touched by Nature' tourism marketing campaign is designed to promote Western Australia. Western Australia is recognised internationally for its biodiversity, wilderness areas and other special places. Places such as the Kimberleys, Ningaloo reef, the Shark Bay World Heritage Property and the forests of the South West have put Western Australia on the map as a tourism destination.

The unique and highly diverse natural environment offers a different kind of tourism experience that people from around the world are beginning to want- more subtle, low impact, more natural kinds of experiences. Consequently, nature based tourism accounts for nearly 30% of all domestic travellers in Australia. In 2000, 47% of all tourists visited a National Park. See Box 26 about Rottnest Island's work to become a sustainable tourism destination.

The projected substantial growth in nature based tourism will need to be managed in ways that contribute to biodiversity protection and the protection of natural assets. As the Western Australian Tourism Commission states:

> There is an opportunity to design and construct innovative, low impact tourism facilities, in a range of locations throughout the State, positioning Western Australia as a world leader in low impact-tourism development.

The Western Australian Government has committed to the creation of additional parks and reserves to protect Western Australia's biodiversity. Thirty new national parks were created from the decision to end old growth forest logging. This will enhance the state's ability to deliver sustainable tourism experiences and the management of parks and reserves will need to ensure that natural values are maintained.

Significant activity is already occurring in the accreditation of nature-based tourism. The Western Australian Tourism Commission supports three programs: The National Tourism Accreditation Program from the Tourism Council Western Australia; The Nature and Ecotourism Accreditation Program from the Ecotourism Association of Australia; and Green Globe 21.

The government can assist tourism professionalism and quality through increased involvement in national and international accreditation systems and these need to be expanded and promoted in Western Australia so people enjoying and using these natural places gain maximum value from the experience with minimal impact. There is an opportunity to promote these experiences regionally to support sustainable regional development.

The development of walk trails through Western Australia can also promote this kind of nature-based tourism. Already the Bibbulmun Track and the Cape-to-Cape Trail are attracting large numbers of walkers. There is a growing demand for small scale economic development associated with these trails such as bed and breakfast facilities (just as railways and roads have facilitated growth in the past). New trails can be built right across the state when the Gondwana Links project and the Malleefowl Corridors project are implemented

(see Box 22 in *Sustainable agriculture* and Box 20 in *Contributing to global sustainability: Protecting biodiversity*).

The government is committed to the active involvement of Aboriginal communities through co-management arrangements for parks and reserves. This also provides the opportunity to introduce interested visitors to appropriate sites and knowledge, while ensuring that Aboriginal interests are properly acknowledged and that any commercial advantage based on, or that any returns from Indigenous knowledge is kept with local custodians.

Additional opportunities exist to promote Western Australia as a place where people can become involved directly in research and management programs in parks and reserves as part of a genuine learning experience as demonstrated in the Landscape Expeditions concept.

BOX 26 ROTTNEST ISLAND: A MODEL FOR SUSTAINABILITY

Rottnest Island is a valued holiday destination by West Australians with around 500,000 visitors each year.

The Rottnest Island Authority's Strategic Plan has allured the Authority to formalise its commitment to sustainability. The Strategic Plan involves as a core goal that "Rottnest Island's environment and heritage are conserved and enhanced as a model of sustainability".

This is reflected in the Authority's vision: 'Rottnest: Forever Magic', meaning that the Authority will control and manage the Island in such a way that ensures its resources and experiences are available for future generations. Its mission is to provide holidays for Western Australians and other visitors while sustaining the Island's natural environment and unique heritage.

The Rottnest Island Authority is active in recycling and composting, in-situ treatment of wastewater, desalination plants and using some grey water for irrigation. In order tor educe the Island's dependence on the fossil fuels the Authority is trailing biodiesel for vehicles, solar lighting on toilet facilities, and has received public support for the installation of a wind turbine.

The key instruments for the management of visitor impact and behaviour are education through formal learning groups and self-directed exploration and investigation programs. Investments in providing classroom facilities, the museum and the Discovery Centre are viewed by the Authority as investments in the future management and use of the Island. Strategies aimed at the general visitor population include: guided tours with trained volunteers and self-guided tours; displays; signage, brochures; talks, story telling; school environmental education programs; and an environmental awareness course designed for teachers and proactive members of the public. Education of staff is also emphasised in ensuring sustainable use of resources and activities.

Due to the large number of visitors to Rottnest Island, this commitment to sustainability principles is being communicated throughout Australia and internationally.

Some future directions that Rottnest Island is exploring include:

The Greenhouse Challenge Program and the establishment of greenhouse emission target.

Green Globe 21 accreditation (a global authentication standard for sustainable management for tourism and travel destinations).

The continued implementation of a 20 year reforestation program; and rehabilitation of the Island's swamps to re-establish declining frog populations.

Not all tourism needs to be nature-based to be sustainable. There is obviously an important role for tourism in Western Australian settlements. For this to be successful there needs to be a strong 'sense of place' which permeates and defines the settlement. The social aspects of sustainability (which are defined further in the next two sections) are also important to tourism. Cultural tourism and being exposed to 'sand groper' life is a major part of the attraction for people coming to Western Australia.

There are a number of important recommendations in other sections about social sustainability which will be necessary for tourism's future. For example, most tourists use public transport and walk or cycle a lot, hence the provision for a good public transport system and pedestrian/bicycle facilities is part of the development of more sustainable tourism.

In short...

Vision

Tourism continues to grow in Western Australia but becomes more and more a tool for natural resource management, the repair and protection of the environment and the facilitation of social capital in communities, especially Indigenous communities.

Objective

Tourism activities are sustainable.

Actions underway include

- Various accreditation programs exist for nature-based tourism.
- The government has established in the Western Australian Tourism Commission a Sustainable Product Development Unit.

Proposed actions

3.32 Facilitate nature-based recreation and tourism and Western Australia's 'sense of place' including through the marketing of the state's special biodiversity status and cross state walk trails.

3.33 Develop cultural tourism opportunities through the Western Australian Tourism Commission's Sustainable Product Development Unit to integrate social aspects of sustainability, for example, Indigenous walking tours, cultural history experiences and arts events as well as 'sense of place' markers.

3.34 Support the expansion of existing sustainable tourism accreditation in Western Australia.

3.35 Support the application of appropriate accreditation to a local government area as a way of demonstrating area-wide tourism sustainability.

Indicators and targets

- Increasing number of accredited tourism ventures.

Global opportunities

The most rapid area of growth in tourism is nature-based tourism and ecotourism. Western Australia's special status as a marine and terrestrial biodiversity 'hot spot' is a significant global marketing opportunity. The development of 'sense of place' processes will also make Western Australian settlements more attractive to visitors.

Further information

Pepper, C 2002, *Sustainability of Tourism and Ecotourism*, sustainability background paper, Draft State Sustainability Strategy CD-ROM, Department of the Premier and Cabinet, Perth.

Parsons, C 2002, *Green Globe 21*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/Green%20Globe/greenglobe.htm>

Ruane, S 2002, *Indigenous Tourism: Sustainability Issues and Opportunities*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/indigenoustourism/indigenoustourism.htm>

> PROTECTING AQUATIC SYSTEMS

There are many threats to our aquatic systems—wetlands, rivers and estuaries—and it is an enormous challenge to protect and enhance these precious assets.

> *From our perspective as a community group dedicated to the conservation of wetlands we would like to see some emphasis placed on the need to conserve biodiversity and water resources in the State Sustainability Strategy.*
>
> Wetlands Conservation Society

This section considers the sustainable use and management of rivers, estuaries and wetlands. The sustainability of our water supplies is addressed in *Sustainability and settlements: Our water future*.

Water is a highly valued resource within the community, not only for drinking, recreation and industrial uses, but also for the wide range of natural aquatic systems that occur within Western Australia. Western Australia's waterways, estuaries and wetlands are an integral part of our heritage and have important social and economic values including traditional and cultural use by Aboriginal people, as well as commercial fishing, recreation and leisure.

There are 208 major waterways in Western Australia, with a combined length of more than 25,000 km. Many of these waterways and associated catchments are degraded as a result of human activities. Water quality is generally declining across the state, with some waterways carrying high loads of nutrients, sediment, and organic matter, and in some cases toxic chemicals. A large number of rivers are also becoming increasingly saline.

Waterways also provide important ecological functions. They form important links between landforms and are home to a wide range of plants, animals, and micro-organisms. Permanent pools within a river system are an important refuge for fauna during prolonged dry seasons, and estuarine basins provide unique conditions for fresh and marine species. Often a riparian corridor is the only connection between remnant natural bush habitats.

A decrease in rainfall across the state since the 1970s is a significant threat to many river systems. Many systems and natural seeps have stopped flowing, resulting in significant impact on the ecology of these systems. The low rainfall trend appears to be continuing, and this along with human impacts and other pressures, is considered a significant threat to the integrity of many waterways in the state.

Estuaries are the receiving water bodies for catchments via river networks and their fates are intertwined. Environmental quality and human health are also closely related. The estuaries are highly impacted both from the population pressure in close proximity and by the highly degraded, generally agricultural catchments which drain into these estuaries. The Swan-Canning, Peel-Harvey, Leschenault, Vasse-Wonnerup and the Albany Harbours are all impacted by both urban and agricultural contaminants. In all of these estuaries urban development and habitat destruction are at least as important as contaminant discharge in affecting environmental health.

Most estuaries affected by agricultural runoff are deteriorating. In agricultural areas habitat destruction, land salinisation and water abstraction have reduced water quality over large areas. In some cases these effects are exacerbated by wastewater and mine discharges. The current pattern of use for many of our rivers and estuaries is clearly unsustainable in that the water quality and habitat value are both declining.

No statewide estuarine management framework currently exists. In the past a number of estuarine management approaches have been explored, most notably with Management Authorities across key estuaries at risk. This approach provided a framework for community involvement in decision-making and was one of the first of its kind in Australia, forming a foundation for the way much community decision-making is made today. Newer models of community decision-making have been developed for the Vasse-Wonnerup (Geocatch) and

Cockburn Sound (Cockburn Sound Management Council) which are proving effective. The Swan River Trust is the only actual estuarine management entity in Western Australia with planning and decision powers.

Significant loss and degradation of wetlands has also occurred over many years. On the Swan Coastal Plain 80% of wetlands have been lost or degraded since European settlement and this continues. A recent assessment of wetland loss in the Perth metropolitan area highlighted a significant rate of loss due to development impacts on conservation category wetlands that are without any form of legal protection. Over many other areas of the state there is limited knowledge of the full extent of wetland areas and condition to properly understand the loss that is likely to be occurring in those regions.

The Western Australian Government's *Wetlands Conservation Policy for Western Australia* provides a strategy for implementation that includes 62 action items and is overseen by the Wetlands Coordinating Committee made up of relevant government agencies and other stakeholders. The role of the committee is to coordinate the implementation of the policy and the activities of relevant agencies with respect to wetlands.

The ever-increasing pressure on our aquatic systems requires a commitment to change through a catchment focus, community participation and involvement in decision-making, and a shift in community values. The environmental values of our aquatic systems are also poorly understood by the general community and undervalued as a consequence. Our scientific understanding of the functioning of these ecosystems and their response to human impact is itself poor, especially in the North of Western Australia.

The current focus of natural resource management planning is through the development of community based regional strategies, which provide opportunities to promote sustainability. Government agencies must work closely together with the community to provide for sustainable management of our aquatic systems, including through regional natural resource management strategies, in combination with appropriate regulation. A significant opportunity now exists through the National Action Plan for Salinity and Water Quality and the second phase of the Natural Heritage Trust to implement large-scale improvements.

In short...

Vision

The hydrological processes of all aquatic systems are understood. Community-derived environmental values are set for each water system and they are managed through an Environmental Protection Policy and Statement of Planning Policy.

Objectives

- Improve understanding of aquatic systems.
- Protect aquatic systems of high environmental, scenic and heritage significance.
- Manage aquatic systems to agreed conditions for a range of environmental values.
- Incorporate social and cultural values when managing aquatic systems.
- Increase community awareness and involvement in the management and protection of aquatic systems.

Actions underway include

- The State Water Quality Management Strategy is being developed for implementing the National Water Quality Management Strategy in Western Australia.
- Development of the Waterways WA Framework, incorporating the State Algal Management Strategy, will establish key priorities, principles for waterways management, and a framework for waterways management across Western Australia.

In short...

- A statewide Waterways Management Needs Assessment methodology has been developed as a means of developing priority groupings of waterways across the state based on an assessment of their condition, pressures, values and level of management response. A total of 208 waterways have been assessed via this process and a report released.
- The Swan-Canning Environmental Protection Policy and the Swan Canning Cleanup Program have been implemented in the Swan region. *Geocatch*-a major river restoration and catchment management initiative-has been implemented for Geographe Bay. A whole-of-catchment restoration program has commenced for the Watershed-Torbay catchment and the Wilson Inlet Action Plan has been completed. The community-based Ord Land and Water Management Strategy is moving towards regional scale initiatives.
- A River Restoration Manual that defines Western Australian solutions to restoration issues has been completed.
- The government's proposed environmental harm legislation makes it an offence to clear wetlands without approval.
- Significant steps are currently being made to protect conservation category wetlands on the Swan Coastal Plain through the Environmental Protection (Swan Coastal Plain Wetlands) Policy which is a revision of the existing *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (Lakes EPP).
- A $500,000 Restoration and Revegetation Program for Perth's river shorelines has been established.

Proposed actions

3.36 Protect water dependent ecosystems while allowing for the management of water resources for their sustainable use and development to meet the needs of current and future users.

3.37 Ensure that the full social, environmental and economic values of aquatic systems and the impacts of development are taken into account in decision making and planning processes.

3.38 Identify the environmental values and designate environmental quality objectives for all of the State's aquatic systems and embed these within Environmental Protection Policies.

3.39 Increase the scientific understanding of aquatic systems to derive environmental quality criteria for the state's aquatic ecosystems to act as benchmarks to assess where the objectives are met or not met and management action is required.

3.40 Ensure that activities in catchments are actively managed to ensure that environmental values of downstream environments are not compromised degraded or destroyed through management, community partnerships and legislation.

3.41 Continue the work of the State Wetlands Coordinating Committee in ensuring the State Wetlands Conservation Policy is implemented.

3.42 Continue the process of nominating significant wetlands for inclusion on the Ramsar Convention list of Wetlands of International Importance.

3.43 Ensure the protection of our wild and scenic rivers and develop management plans, in partnership with Indigenous peoples, for the safeguarding of these unique river systems.

3.44 Investigate innovative mechanisms for ensuring sustainable use of catchments, such as transferable development rights, pollution offset schemes and integrated property management plans for accredited water cycle management.

In short cont'd...

Indicators and targets

- Proportion of Western Australia's aquatic systems with designated Environmental Values, Objectives and Criteria.
- The areal extent over which the environmental values are protected in each aquatic system.
- The proportion of new development proposals that is consistent and compatible with the designated environmental values.

Global opportunities

Protecting aquatic systems is a priority the world over. All global indicators show that water availability and quality is in decline. Western Australia's ability to protect and manage aquatic systems could provide a significant contribution to global effort.

Further information

Carew-Reid, L 2002, *The Lake Toolibin Recovery Project for a Sustainable Future*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/LakeToolibin/LakeToolibin.htm>

Holland, K 2002, *Ribbons of Blue: Communities Caring for Water Catchments*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/ribbonsofblue/ribbonsofblue.htm>

Waterways WA <www.wrc.wa.gov.au/protect/waterways>

Government of Western Australia 1997, *Wetlands Conservation Policy for Western Australia*, Department of Conservation and Land Management, Perth.

> SUSTAINABLE COASTAL AND MARINE ENVIRONMENTS

The coast and the marine environment are highly significant to Western Australians; many of our settlements cling to the coast and much of our recreation, leisure and tourism rely on the ocean, beaches and surrounds.

> *I am at the beach looking west with the continent behind me as the sun tracks down to the sea. I have my bearings...*
>
> Tim Winton[27]

Western Australia's coast and marine waters are important community assets and their sustainable use and management are closely interrelated. The vast majority of the state's population lives within 20 km of the coast. Urban and industrial development in Western Australia generally has a coastal focus and shipping ports are associated with most of these coastal developments. Commercial fishing of wild stocks is an important industry and aquaculture is expanding rapidly. Petroleum exploration and production activity is high and focussed on the offshore waters of the North West Shelf and the Timor Sea. Domestic recreation has a strong marine focus and fishing is a popular recreational pastime. Nature based tourism servicing both the domestic and international market is growing.

Much of our coastline is largely undeveloped and in a relatively pristine state. Some areas are developing rapidly and in need of careful management to ensure their values are not adversely affected while others are under considerable threat of cumulative impact or have become degraded or irreversibly damaged, for example through development occurring on primary dune systems, and require more urgent or remedial action.

Western Australia's coastline spans a range of climatic zones, grading from temperate on the south and lower west coast, through tropical semi-arid on the northwest coast to monsoonal in the north. Tides range from about 1 m in the south to 10 m in the north.

Coastal waters on the south and west coast are generally nutrient poor and very clear whereas inshore waters along the northwest and northern coast contain higher suspended sediment loads and are more turbid. The continental shelf is over 100 km wide along the Pilbara coast (the Northwest Shelf). The Leeuwin Current flows southward along the continental shelf break in winter, maintaining relatively high seawater temperatures and providing a mechanism to transport tropical species into temperate waters. The current also prevents significant 'up-welling' of nutrient-rich waters from the deep ocean that sustains the highly productive anchovy/sardine fisheries off the west coast of South America and South Africa.

This physical setting has produced a wide variety of ecosystem types with many unique features. For example:

- extensive arid-zone mangrove communities (Pilbara coast)
- a 270 km long fringing coral reef less than 6 km offshore (Ningaloo Reef)
- an inverse-estuarine ecosystem maintained by 20,000 km^2 of seagrass meadows (Shark Bay)
- an extensive high latitude coral reef complex (Abrolhos Islands)
- nutrient-poor coastal lagoons/embayments protected by limestone reefs and characterised by highly diverse and endemic seagrass flora (central west and south coasts)
- nutrient-poor high-energy coast with granite reefs and cliffs and highly diverse and endemic floral and faunal assemblages (lower west and south coasts).

[27] T Winton 1993. Land's Edge, p.6

Contaminants of the marine environment can come from a range of human-derived sources as well as natural sources. The human derived sources enter the marine environment through point source discharges such as pipelines and drains and from diffuse sources like groundwater and air. The Department of Environment, Water and Catchment Protection has established a generic inventory of contaminant sources to coastal waters. This inventory has been completed for the metropolitan coastal waters to the south of Perth, including Cockburn Sound and is currently being completed for the Northwest Shelf region between Exmouth and Port Hedland.

The many unique features of Western Australia's marine environment pose a challenge to sustainability because traditional management methods developed for overseas ecosystems are often not appropriate for our conditions. To achieve sustainability, management must be underpinned by a sound understanding of our ecosystems and the effects of human-induced pressures on the structure of these systems and on the key ecological processes that sustain them. This in turn relies on a fundamental understanding of the key ecological processes that sustain the system naturally and the identification and understanding of key threat-response pathways for each combination of activity and ecosystem type.

The State Water Quality Management Strategy is being developed to protect and enhance the quality of our water resources while maintaining economic and social development. This Strategy is underpinned by the National Water Quality Management Strategy and relies on defining environmental values and specific environmental quality objectives through consultation with the community. Environmental quality criteria are established as benchmarks from which environmental quality can be judged. This environmental quality management framework has been implemented for Cockburn Sound via the draft Cockburn Sound Environmental Protection Policy.

A fundamental requirement of environmental management for sustainability is knowledge of how the natural environment functions and varies naturally, and how it responds to human induced pressure. The Western Australian Government has established a strategic marine research fund to support a collaborative partnership between state government agencies and Commonwealth and local research institutions to underpin the sustainable management of Western Australia's marine environment. It is envisaged that a main output of this study will be the establishment of key baseline reference sites to understand natural variability and separate natural from human-induced change.

However, even with the best understanding of an ecosystem and of the consequences of a particular human activity, there is always a risk that something that was unlikely or unforseen will occur and damage part of the environment and the biodiversity it supports. To offer the best chance of preserving all components of our marine biodiversity in perpetuity, it will be important to ensure the establishment of a comprehensive and representative system of secure marine protected areas. In the interim, areas of high conservation significance must be identified and protected from threatening activities.

Many submissions related to the marine environment and particularly the near-shore coastal environment. It is clear that the State Sustainability Strategy should highlight the value of the coast and recommend a way forward to simultaneously accommodate sensible coastal development and protection of the marine environment. The strategy should seek to protect the natural values of our coast and near-shore waters without compromising social and economic opportunities for future generations.

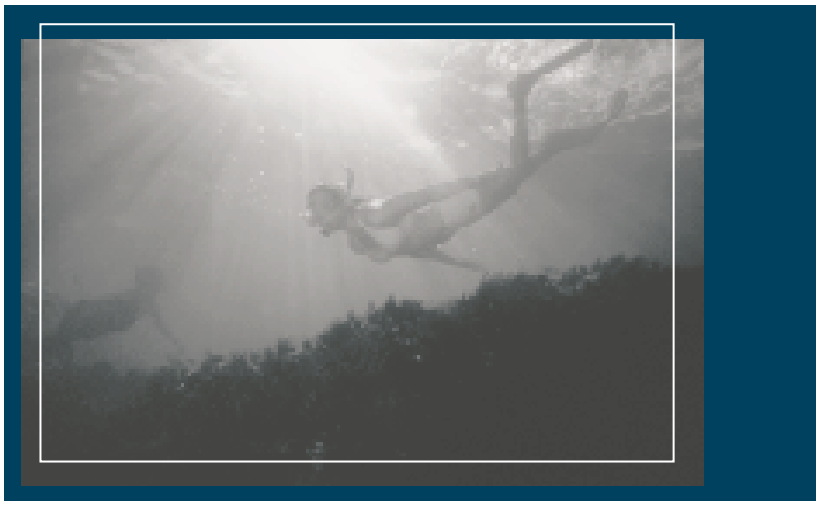
The government has recently reviewed coastal planning through a Ministerial Taskforce concerning Structural Arrangements for Coast Planning and Management in Western Australia. The Taskforce has suggested that coastal planning should be more transparent and engaging of the public because of Western Australian's deeply felt values about the coast and that there should be a sustainability-based approach to coastal planning.

The Taskforce has suggested that a Coastal Council be established with broad community and government representation, including local government and Indigenous people, to report to the Western Australian Planning Commission.

The Taskforce also recommends that the Western Australian Planning Commission prepare two statutory planning documents: a State Coastal Strategy and a State Marine Planning Strategy (covering state territorial waters). These strategies would build in sustainability values, identify areas for high priority conservation, provide guidelines for access and development, identify areas for detailed planning strategies and rehabilitation work, review all coastal Crown Land and coastal pastoral lease lands to see what should be excised and provide clear information including coastal resource atlases.

The State Sustainability Strategy is suggesting a model for implementing the Strategy through regional planning processes and the possible use of Statements of Planning Policy and other policy measures. Establishment of a Coastal Council, together with the proposed marine and coastal strategies, should provide an effective management framework to address the coastal issues raised in submissions.

However, there may be a need to address particular coastal areas where development issues are so complex that a separate sustainability assessment or regional sustainability plan is required.



The Cottesloe Reef Fish Habitat Protection Area was created in September 2001 and provides many recreation opportunities.

Source: Glen Cowans, CMPG.

In short...

Vision

Western Australia's coast and marine environment remains accessible to the public and is protected through statutory policies and plans and other mechanisms that reflect community values.

Objectives

- Enable coastal areas to be managed in a way that reflects their special value for Western Australians.
- Establish sustainability principles in coastal planning and management.
- Protect and maintain the ecological integrity of our marine ecosystems, and the habitats and communities dependent upon them.

Actions underway include

- Report of the Coastal Planning and Management Ministerial Taskforce.
- An environmental quality management framework that utilises environmental quality objectives has been developed for the marine waters of the State starting with Cockburn Sound.
- The Cockburn Sound Management Council has been established to facilitate the multiple-use and sustainable management of the marine waters of Cockburn Sound to ensure the objectives of the Cockburn Sound Environmental Protection Policy are met.
- A marine habitat protection policy is being developed to help protect ecological integrity and the dependent biodiversity of our coastal waters.
- Contaminant input inventories are being developed for Cockburn Sound and the North West Shelf region to identify pressures and threats to the Environmental Values and inform management.
- Multi-disciplinary environmental studies are being conducted to facilitate multiple use management and protection of the marine ecosystems on the North West Shelf.
- A strategic marine research fund has been established to support a collaborative partnership between state government agencies, commonwealth and local research institutions to underpin the sustainable management of Western Australia's marine environment.
- The Department of Conservation and Land Management is establishing a representative system of marine reserves, to facilitate conservation and multiple-use management.

Proposed actions

3.45 Progressively identify the environmental values and designate environmental quality objectives for all of the state's marine ecosystems.

3.46 Obtain the scientific understanding to derive environmental quality criteria for all of the state's marine ecosystems to act as benchmarks to assess where the objectives are met or not met and management action is required.

3.47 Reinforce and promote the principles of best management practice in coastal and marine management and continuous improvement for existing activities and ensure they are demonstrated for new proposals.

3.48 Recognise and consider the potential for cumulative impacts and synergistic effects of multiple activities in environmental impact assessments of new proposals and in the management of ongoing activities.

In short cont'd...

3.49 Evaluate the findings of the North West Shelf Joint Environmental Management Study in terms of a decision-making strategy based on the principles of sustainability.

3.50 Develop a State Coastal Strategy and a State Marine Planning Strategy with appropriate consultation.

Indicators and targets

- Proportion of coastal area managed through statutory plans with community based values, goals and management strategies.
- Proportion of the state's marine ecosystems with designated environmental values, objectives and criteria.
- The areal extent over which the environmental values are protected in each aquatic system.
- The proportion of new development proposals that is consistent and compatible with the designated environmental values.

Global opportunities

The way Western Australia manages its coastal and marine environment provides real opportunities to tap a different kind of global market, a growing tourist niche of those wanting a natural or wilderness experience.

Further information

McAuley, H 2002, *Cottesloe Reef: Community Managed Natural Resources*, sustainability case study, Department of the Premier and Cabinet, Perth, viewed 15 August 2002, <http://www.sustainability.dpc.wa.gov.au/CaseStudies/CottesloeReef/CottesloeReef.htm>

Review of the Structural Arrangements for Coastal Planning and Management in Wetsern Australia <http://www.dpi.wa.gov.au/planning/coast/coast.htm>

> SUSTAINABLE RANGELANDS MANAGEMENT

There is concern about on-going degradation of the rangelands and the commensurate loss in productivity and profitability, as well as the loss of social capital from the regions.

> *Across Australia's extensive semi-arid and arid pastoral lands, stocking rates as perceived by early squatters (usually viewed during better seasons), have been as rosily optimistic as humpback whale quotas perceived by eager whalers. Over recent decades as environmental degradation of pastoral lands proceeded faster than cuts in stocking rates, the carrying capacity of grazing lands has declined despite token management measures - paralleling the decline of humpback stocks and the cuts in annual quotas. And within our strictly limited areas of arable land, degradation (in the forms of salination, erosion, compaction, acidification, loss of organic debris & species diversity, etc.) are now cutting into the high hopes of sustainable yields.*
>
> Graham Chittleborough

The rangelands of Western Australia account for some 90% of the state's land mass. Many different land uses occur in the rangelands including pastoralism, mining, tourism, horticulture as well as traditional use by Aboriginal people. Almost half of these rangelands are vested as pastoral leases, and a considerable proportion of the remainder is unallocated Crown Land and Crown land reserved for particular uses.

The *Land Administration Act 1997* provides the legal framework for the administration of much of the land in the rangelands. This Act establishes the Pastoral Lands Board with responsibility for managing pastoral leases on behalf of the Western Australian Government. The Act specifically requires that the Board ensure that leases are managed on an ecologically sustainable basis. Under the present arrangements, the government will be able to exclude areas from pastoral leases for public purposes including conservation provided notice is given by December 2002. The government is currently considering which areas are to be excluded.

It is clear that management decisions and practices on the pastoral rangelands have not often been based on the principles of sustainability. While recognising real efforts of some within the industry, much of the rangeland under pastoral management is severely degraded, with a greatly reduced productive capacity. Both natural and social capital have been seriously eroded. Moving to a position of sustainability in the long-term will require rebuilding this capital, and wise management of the intact portions. The task of rebuilding presents some enormous challenges; however, they are challenges that must be met for the sake of future generations, in accordance with the principles of sustainability.

The Western Australian Government is committed to achieving sustainable resource management in the areas of agricultural and pastoral production, and to building markets based on clean and green accreditation. The government has continued support for the rural reconstruction strategy in the Gascoyne-Murchison region, which has been a useful pilot project for the state's rangelands as a whole.

The government has established a broad-based 'Pastoralism for Sustainability' Working Group to achieve sustainable land management on pastoral rangelands and ways to achieve nature conservation outcomes on pastoral lands. This will help define required reserves as well as off-reserve conservation measures.

The sandalwood industry has considerable potential to contribute to local economies and to diversification in the rangelands. Elsewhere in this draft Strategy (see *Sustainable forestry and plantations*), it is recommended that the sandalwood industry be reviewed, to enable the development of an integrated business and resource management plan that ensures sandalwood is managed on an ecologically sustainable basis that maximises environmental, social, regional development benefits as well as providing adequate financial returns to the State.

Biodiversity conservation is not well catered for in the rangelands. The Conservation Through Reserves Committee Review in the early 1970s did not deal with those regions under pastoral management. This deficiency was acknowledged in the Gascoyne-Murchison Strategy (see Box 27) a comprehensive regional initiative to address the long-term decline of that region. A specific allocation was made within this initiative for land acquisition for the conservation estate, as part of a lease adjustment program. To date, around 15 whole pastoral leases and parts of 15 other leases have been acquired for conservation. The Gascoyne-Murchison Strategy has also piloted an innovative program to embed sustainability into pastoralism through the Regional Environmental Management Program. The components of this program are described in Box 27.

BOX 27 GASCOYNE-MURCHISON STRATEGY

The Gascoyne-Murchison Strategy (GMS) is a regional initiative addressing critical economic development, structural adjustment and natural resource management needs of the pastoral industry in the Gascoyne-Murchison region of Western Australia.

Pastoralists in the Gascoyne-Murchison region are progressing toward sustainable production. The GMS has assisted pastoralists to formulate and coordinate a number of sustainability initiatives. The GMS is comprised of four core programs, one of which is the Regional Environmental Management Program. The aim of this program is to improve natural resource management from the paddock scale through to the regional scale encompassing advancement of sustainable pastoral production.

Key components of the Regional Environmental Management Program are:

- making provision for biodiversity conservation in the matrix (off-reserve conservation)
- empowering managers of leases to better manage each lease through an understanding of landscape processes
- providing tools for monitoring and an adaptive management framework
- providing access to markets through accreditation of products and services
- providing options for diversified local and regional economies
- ensuring that all activities are consistent with sustainability principles and practices through developing Environmental Management Systems for all scales of management.

These key components are currently being implemented through the work of the Ecosystem Management Unit (EMU) project linked in with an accreditation program (collectively referred to as EMU Plus).

There are significant opportunities for the pursuit of sustainability to contribute to a viable future for the rangelands. There is potential to extend the work of the Gascoyne-Murchison Strategy Regional Environmental Management Program to other parts of the rangelands to ensure sustainable management into the longer term. In addition, such a process could provide the mechanism by which the government would recognise accreditation prior to consideration of lease renewal, so that the state in its capacity as land owner and landlord can be confident about the likelihood of future management being consistent with sustainability principles. There could also be institutional change to enable licences to be issued in support of enterprise diversification across the rangelands.

Application of the Implementation Model (as discussed in the *Sustainability and governance*) to rangelands would mean involving local government more in decisions on how these areas are managed. For example, the Gascoyne-Murchison has four local government authorities that could form a Regional Council as part of the and develop an Statement of Planning Policy for their region that would guide each local area into the future. The Statement of Planning Policy would be based on the innovative work done by many of the pastoralists in the Gascoyne-Murchison and enable it to be spread to other leaseholders. This model could be repeated in other regions.

Beyond the areas of the rangelands that are managed for pastoral purposes, these remote areas face significant management problems. These management issues include the presence of feral herbivores including goats, camels and donkeys, the presence of foxes and feral cats, invasion by weeds including buffel grass, unmanaged access by 4WD vehicles, and uncontrolled wildfires.

In short...

Vision

In the rangelands, there will have been a major shift in the manner in which the properties are configured and managed: properties will be less reliant on fences with grazing management organised via controls around watering points. There will be a wide variety of grazing and browsing animals across the landscape all of which will be managed and exploited in a sustainable manner. Production will be economically viable because of reduced costs and because of the premium prices that the accredited produce will attract. In addition, the rangelands enterprises will have diversified significantly into new industries.

Objectives

- Ensure the Western Australian pastoral rangelands are managed sustainably in accordance with the Land Administration Act.

In short cont'd...

- Provide diversified and sustainable production from the rangelands.
- Ensure that all areas of unallocated Crown land in the rangelands are managed in a way that adequately reflects their biodiversity conservation values

Actions underway include

- The Gascoyne-Murchison Strategy has piloted a range of initiatives in support of sustainability in the rangelands, particularly through its Regional Environmental Management Program.
- The Minister for Planning and Infrastructure has established 5 working groups to examine alternative models of land tenure, Aboriginal access, access to pastoral leases, pastoralism for sustainability, and pastoral industry economic monitoring requirements.
- The Western Australian Rangelands Monitoring System provides regular up-dates on the condition and trends of native vegetation on pastoral leases; this system is due to be expanded to incorporate explicitly some key biodiversity values.
- Comprehensive biological surveys of the Nullarbor, eastern Goldfields the southern Carnarvon Basin and the Great Sandy Desert have been completed, and parts of the Little Sandy Desert and the Kimberleys have been surveyed.
- The program of mapping land systems across the pastoral rangelands of the state is almost complete and provides a sound basis for on-ground management including locating water points and fences

Proposed actions

3.51 Establish a Rangelands Working Group of the Natural Resource Management Council to develop a comprehensive vision of the rangelands and advise government of the priority sustainability issues requiring consideration.

3.52 Complete the review of pastoral lease boundaries in relation to biodiversity values through the Pastoralism for Sustainability Working Group.

3.53 Review the arrangements for managing unallocated Crown land within the rangelands to ensure that future arrangements adequately recognise the biodiversity conservation values of those lands.

3.54 Develop a Regional Council of Local Governments in the Gascoyne-Murchison area and create a Statement of Planning Policy on Sustainable Rangeland Management as a demonstration for other regions.

3.55 Further develop the Environmental Management Systems currently being trialed within the Gascoyne-Murchison Strategy Regional Environmental Management Program to provide a framework for accreditation of sustainable pastoralism in the rangelands.

3.56 Encourage universities to do more research and teaching on sustainable rangeland management in recognition of its significance in Western Australia, especially on capacity building for the EMU Plus program.

Indicators and targets

- Proportion of pastoral area under approved environmental management plans.
- Number of bioregions and sub-regions which have achieved appropriate levels of reservation for conservation.

Global opportunities

Rangelands throughout the world are under severe pressure and desertification is a major concern of the United Nations Environment Program. Successful development of a model sustainable rangelands program will have important potential applications in other parts of the world, especially north and southern Africa and the Middle East.