



Contributing to global sustainability

Vision for Western Australia

Western Australia contributes to the solution of global sustainability issues particularly population pressures and poverty, climate change, threats to biodiversity, and oil vulnerability and in so doing creates significant local opportunities for new jobs in the rapidly growing sustainability economy.

Goal

Play our part in solving the global challenges of sustainability.

Priority areas for action

> Population, development aid and environmental technology	86
> Maintaining our biodiversity	91
> Responding to greenhouse and climate change	101
> Oil vulnerability, the gas transition and the hydrogen economy	104

Our biggest challenge in this new century is to take an idea that seems abstract – sustainable development – and turn it into a daily reality for all the world’s people.

Kofi Annan, Secretary General, United Nations (March, 2001)⁹

Ecologists understand that all economic activity, indeed all life, depends upon the Earth’s ecosystems. Economics knows how to translate goals into policy. Economists and ecologists working together can design and build an eco-economy, one that can sustain progress.

Lester Brown¹⁰

Sustainability gained wide acceptance globally in the 1980s. It was a political response to the tension that existed between the ecological perspective, which highlighted the impacts that development was having on the Earth, and the social justice perspective which argued that the 1 billion people whose basic needs were not met needed development to provide housing, health care and jobs.

In 1987 the Brundtland Commission attempted to resolve this tension by saying that it was possible to redefine development so that it enabled the poor to benefit and did not increase the burden on the world’s ecological systems. Sustainable development required that social and ecological considerations be incorporated fully into economic development not ‘bolted on afterwards’, and required economic decisions to occur within an ecological and social context.

In this section, the State Sustainability Strategy considers the global sustainability agenda and suggests how Western Australia can contribute to global sustainability. Economic opportunities are also emerging for nations and states that take the sustainability agenda seriously and these are highlighted.

Because global sustainability issues occur in a global context it is necessary for most international negotiation to be conducted by national governments, e.g. on issues such as immigration, foreign aid and climate change. Nevertheless for all such negotiations and contributions to sustainability issues, there are significant ways that States like Western Australia can contribute. This is primarily because land and water, biodiversity, rural and urban infrastructure, and most community issues, are in the main State responsibilities.

The role of States in global sustainability will be enhanced through the Network of Regional Governments for Sustainable Development, of which Western Australia was a founding member.

The Strategy identifies four key areas that provide opportunities for Western Australia to contribute to global sustainability:

- Population, development aid and environmental technology
- Maintaining our biodiversity
- Responding to greenhouse and climate change
- Oil vulnerability, the gas transition and the hydrogen economy.

⁹K Annan (Secretary General United Nations) 2001, *Secretary General calls for break in political stalemate over environmental issues*, media release, United Nations, 14 March.

¹⁰L. Brown, *Eco-Economy*, Norton, 2001, p. 4.

> POPULATION, DEVELOPMENT AID AND ENVIRONMENTAL TECHNOLOGY

The government will participate in the global sustainability agenda to reduce global population growth, contribute to development aid, reduce consumption and improve technology.

The World Bank has reported that there are now 25 million environmental refugees. The world population today is divided between the high consumer, high living standard nations with near stable populations and the desperately poor in the third world countries whose populations are growing rapidly. The world's richest nations with 20% of the world's population account for 86% of the world's consumption while the poorest 20% of the world's people account for only 1.3%.

Sustainable Population Australia (WA)

The global population needs to stabilise, as a continuously growing population undermines sustainability. The world's population increased to 6.2 billion in 2001, more than double the population in 1950,¹¹ though recent estimates suggest that if birth rates continue to decline then the population may stabilise at 8 to 9 billion.¹² About half the anticipated reduction in population growth is due to fertility decline (most developing countries moving rapidly to replacement levels of 2.1 children per household) and half due to AIDS.

Population issues and the capacity of Western Australia to absorb growth are considered under *Sustainability and settlements*, particularly the sections on *Our Water Future* and *Managing urban and regional growth*. This section largely concentrates on the global aspects of population and what Western Australia can do about it.

Extensive evidence suggests that high birth rates in developing countries begin to drop quickly when:

- women are educated
- people have enough food so that their children don't have to work
- there is political security
- children attend school
- basic health care is provided, and
- some form of social security is available.

Social and economic development is therefore critical to stabilising global population growth and it is important to consider what Western Australia can do to play its part in addressing this fundamental sustainability issue.

Some Western Australian firms and individuals are already involved (see Box 23) as are non-government organisations, such as Oxfam Community Aid Abroad, and government agencies (see Box 24). The Western Australian government also has a number of sister-state relationships overseas which frequently involve exchanges related to sustainability.

BOX 23 HARRY NESBITT: THE RICE GOD OF CAMBODIA

Harry Nesbitt, a Western Australian scientist, went to Cambodia on an Australian aid project to help reconstruct agriculture after the 'killing fields' virtually destroyed rice-growing capability. Over thirteen years Harry developed a team who identified the best rice to use for local conditions and trained people in new production techniques. Cambodia is now an exporter of rice and Harry's contribution has been recognised by many international and Cambodian awards as well as with an Order of Australia in 2003.

Western Australia can play its part in supporting development by encouraging research on sustainability technologies with a global sustainability focus and ensuring government agencies are sharing their expertise with developing countries. Many agencies are already involved in aid projects providing expertise through funding provided by the Asian Development Bank, selected UN agencies, the World Bank and bilateral donors such as AusAID. New

BOX 24 GOVERNMENT AGENCY INVOLVEMENT IN OVERSEAS PROJECTS

Western Australian government agencies have been involved in overseas aid projects for many years. AgWest International is the international project unit of the Department of Agriculture. This unit is undertaking work in:

- East Timor - developing maps on agriculture and training locals to create maps through GIS
- India - training people in apple production techniques
- Vietnam - potato production training
- China - training in livestock, post harvest and crop production techniques
- Middle East - training in horticulture and livestock in Egypt and Jordan.

The Department of Land Information, is working in Bangladesh, Sri Lanka and East Timor on developing land titling and administration systems that are critical to enable financing for any development.

Environment agencies are involved in pollution control projects in Indonesia, Vietnam and Thailand, after long term involvement in several Middle East countries. The Water and Rivers Commission conducted a detailed water plan for the Sultanate of Oman.

The Department of Education and Training, through TAFE International WA, has recently won a \$50m oil and gas training project in Qatar. Training projects have been undertaken in China, East Malaysia, Hong Kong, Mauritius and the United Arab Emirates. Training international students who come to study in Western Australia is an important contribution to international development, contributing some \$600m annually to Western Australia.

The Department of Industry and Resources has projects in Leeds (UK) on its GEMS technology and with the Asian Development Bank on electronic procurement strategies. The Department has also delivered a number of overseas projects related to mining, oil and gas exploration and development, the administration of mining tenements, environmental assessment and legislation. Projects have been undertaken in Eritrea, Pakistan, Ethiopia, Mongolia, China, Vietnam, Hong Kong, Myanmar, Sri Lanka and India. The biggest project involved a series of training exercises through the Channar Fund in China.

opportunities can also be pursued through the trade agenda. The government can encourage reduced resource consumption through a variety of initiatives and undertake research to better understand the relationship between population and consumption issues in Western Australia.

Given its location on the Indian Ocean, Western Australia has a special advantage over other States in developing social and cultural and trading relationships with the countries of the Indian Ocean Rim and other overseas destinations. Cultural understandings are central to sustainability and development of business, trade, social and security relationships in the region. The arts and cultural sector is particularly well placed to assist Western Australian trade and industry to exploit these relationships through research and exhibition partnerships, cultural exchanges and sharing of cultural maintenance and conservation skills. Similarly, the Western Australian Museum can contribute to global sustainability by forming networks and partnerships with museums worldwide. This fosters dialogue, research, ideas and actions to clarify and expand the role of museums in securing a sustainable future for their communities.

Population, consumption and technology

It is obvious that many sustainability issues are related and overlap. Addressing sustainability will require recognising these relationships and seeking ways to resolve them. Population influences many different issues and this was reinforced by many submissions. In particular, submissions pointed to the links between population, consumption and technology (see Box 25).

The Strategy will address consumption and technology by suggesting audit processes such as ecological footprinting, highlighting the many ways of reducing unnecessary and wasteful resource use, and the technologies that offer hope in many areas.

BOX 25 POPULATION X CONSUMPTION X TECHNOLOGY

Professor Paul Ehrlich defined global environmental impact as a combination of three factors based on the simple formula:

I

=

P

R/P

*

I/R

Input

Population

Consumption of resources per person

Technological impact per unit of resource used

Ehrlich and many others emphasise population as the issue; others tend to suggest the real problem is consumption or lifestyle, and others emphasise technology. This Strategy will try to account for all three factors and to find the opportunities that this difficult formula presents.

Some general points will be made first about the global context though most of the detail on consumption and technology will be found in particular issues in the Strategy.

One side of the sustainability debate asserts that there is a case for the poor of the world to have greater access to the fruits of the earth. The other side of the debate asserts that overall the world should learn to reduce its ecological footprint—to learn to live with less energy, less water, less materials and less land. Both should be possible.

There is a new market for firms that can demonstrate resource efficiency while improving quality of life, and a need for infrastructure and government processes to facilitate this. Such opportunities will become important parts of the new global economy. For example, if people in Western Australia can show how they can adapt to living with a more constrained use of water, then this will have global ramifications. Many other examples of how reduced consumption can be achieved, while improving quality of life, are outlined in the Strategy, including through procurement, full life cycle assessments, greater use of recycled materials in buildings, stronger local communities and so on.

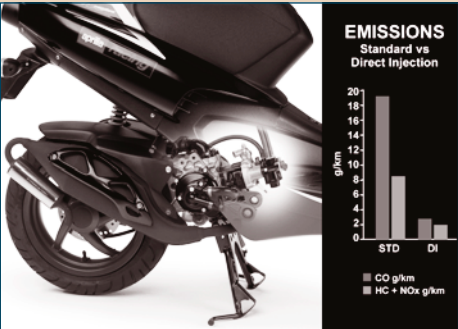
There are many global processes attempting to guide technological development so that it is more sustainable. Increasingly it is found that small-scale renewable energy systems or clever waste management or more energy and water efficient buildings, are not just for villages in the developing world, but for everyone.

Environmental technology is the fastest growing area of technology today. The global market is conservatively estimated at \$1 trillion by a recent Federal Government report that said, ‘We are entering the era of sustainability, with the environment industry moving into the mainstream of business life.’¹³

This report urges Australians to invest in sustainability, as there are endless opportunities for innovation and employment in this global market. Already in Western Australia there many firms and individuals developing globally significant environmental technology (see Box 26).

¹³Leaders Group, *Investing in Sustainability*, Department of Industry, Science and Resources & Environment Australia, Canberra, 2001.

BOX 26 WESTERN AUSTRALIAN INNOVATIONS IN ENVIRONMENTAL TECHNOLOGY



Source: Orbital Engine Corporation



Source: Peter Newman

Orbital Engine Corporation

Orbital Engine Corporation has developed a 2 stroke motorbike engine that has much reduced emissions. The economic opportunities and the air quality improvements for smoggy Asian cities are significant. The 4 stroke car engine has been demonstrated to provide significant air quality benefits as well.

Ecomax and Biomax

Ecomax and Biomax are two of several Western Australian companies that have developed small-scale sewage treatment systems and are also involved in several aid projects. One such project provided sewage treatment to a squatter village in Indonesia and demonstrated that a small community can manage waste and improve health with the aid of these simple new technologies.

As part of the approach to global sustainability that recognises the role of environmental technology in solving the sustainability problems of the future, the government will support a number of initiatives including promoting Western Australian environmental technologies and facilitating research and development (see *Research and development for sustainability*).

In short...

Vision

Global population is stable and consumption is reduced to achieve a smaller ‘ecological footprint’ through sustainable technology and management. Basic needs are met for all people and global ecosystem processes are restored and in balance with human needs. Western Australia contributes significantly to this transition.

Objectives

- Ensure that Western Australia takes part in the global economy through environmental technology.
- Enable Western Australia government agencies, industries and non-government organisations to be linked into global aid programs that can assist in grass roots development and population control.
- Facilitate education at all levels about global sustainability issues, including population.
- Create new opportunities for research and development on global sustainability issues to ensure that Western Australia is well placed to contribute to major global aid projects.

In short cont'd...

Actions underway

- Research and development in environmental technology is facilitated through funding research bodies such as Curtin University’s Centre for Cleaner Production and Murdoch University’s Intenational Environmental Technology Centre—now a UN funded Partnership Centre for the Asia Pacific region.
- Department of Fisheries provides advice to Indonesia and the Pacific Islands on fisheries management practices and associated issues.
- Perth Zoo fosters a strong in-situ conservation ethic by participating in internationally renowned conservation breeding programs, for example Sumatran tigers and Sumatran orang-utans.
- The government provides some industry facilitation in support of global environmental technology markets.
- Some local industries and universities are involved in global sustainability markets.

Actions

- 2.1 Facilitate the development of the Global Centre for Sustainability to bring Western Australian expertise into global development aid projects and facilitate global contributions to sustainability.
- 2.2 Encourage the Commonwealth Government to increase its commitment to aid projects for global sustainability.
- 2.3 Assist government agencies where appropriate to be positioned to secure or participate in global aid projects in developing countries.
- 2.4 Promote market development of Western Australian environmental technologies in global trade and aid through the International Development Business Unit in the Department of Industry and Resources.
- 2.5 Facilitate research and development in environmental technology through the support of new and continuing State Centres of Excellence in Science and Innovation and Commonwealth Cooperative Research Centres.

Global opportunities

There are considerable and growing economic opportunities for Western Australians to be involved in the global sustainability issues of population, development aid and environmental technology. Government agencies can become significant participants in this global economy, particularly in aid projects, which often require substantial government involvement for credibility and capacity building. Partnerships with business and researchers will be made through the Global Centre for Sustainability to attract large aid projects to Western Australia. The key step is for Western Australians to recognise that their innovations in sustainability have global significance.

Further information

Australian Government Overseas Aid Program
<http://www.ausaid.gov.au/>

Maher, K. *The Environmental Technology Centre: a case study for sustainability*,
<http://www.sustainability.dpc.wa.gov.au/CaseStudies/ETC/environmenttechnologycentre.htm>

United Nations Environment Program, International Environmental Technology Centre
<http://www.unep.or.jp/>

> MAINTAINING OUR BIODIVERSITY

Western Australia’s biodiversity is globally significant—it is one of the world’s ‘hotspots’. Conserving biodiversity is a global responsibility.

There has been significant loss of biodiversity through impacts from various developments and over-exploitation of natural resources. Biodiversity loss continues as a result of salinity, over-grazing, invasive species and diseases, habitat loss for developments, wetland degradation, altered fire regimes and climate change.

Western Australia cannot have a truly sustainable future unless we all work to eliminate biodiversity loss in all of our areas of enterprise.

Biodiversity is the key to maintenance of the world as we know it... It holds the world steady.

E.O. Wilson, 1992

Biodiversity is a combination of the words biological diversity. In its broadest sense, the term ‘biodiversity’ refers to the variety of life, encompassing all living things. Most treatments of biodiversity, however, consider only the living components that occur naturally in the landscape and thus exclude ourselves and the plants and animals we have imported, whether that import was intentional or not. In this strategy we will follow this convention and consider biodiversity to only cover the naturally occurring living elements of the landscapes and seascapes of the State.

The National Strategy for the Conservation of Australia’s Biological Diversity (the strategy) was signed by the Prime Minister and all State Premiers and Territory Chief Ministers in 1996. The strategy defines biological diversity as:

‘the variety of all life forms – the different plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part.’

The strategy identifies that biological diversity needs to be considered at three levels:

- genetic diversity – the variety of genetic information contained in all of the individual plants, animals and microorganisms that inhabit the earth
- species diversity – the variety of species on earth and
- ecosystem diversity – the variety of habitats, biotic communities and ecological processes.

Biodiversity provides the natural biological processes upon which we depend for our survival. The air that we breathe and the food we eat have been produced at least in part as a result of biodiversity.

Biodiversity is valued by our society for a variety of reasons, many relating to the services that it provides to maintain our well-being, or the ethical notion that we have a stewardship responsibility to protect all of the naturally occurring plants and animals. A biologically diverse environment also provides resilience to change and maximises the chances of recovery of ecosystems following natural disasters or human impacts.

Australia has been isolated from the rest of the world for millions of years. This isolation has led to the development of thousands of unique species of flowering plants, hundreds of unique vertebrate animals and countless unique invertebrates and microorganisms. At the State scale, Western Australia contains a rich variety of landscapes and seascapes that support a high degree of endemic terrestrial, aquatic, subterranean and marine biodiversity that in many respects matches or exceeds the levels of biodiversity in other States, with, for example, over 50% of Australia’s flowering plants found within this State. This is partly attributed to the large size of the State, but also to its isolation from the rest of Australia (mostly separated by desert and highly arid lands) and its isolation from the rest of the world.

Western Australia’s biodiversity is very important on a global scale. Some of the key features of the State’s biodiversity are listed below.

- The South West Region of Western Australia has recently been identified as one of only twenty-five Global ‘Biodiversity Hotspots’¹⁴ due to the high number of species it supports, the high degree of endemism of these species, and the degree of threats to these biodiversity values. No other part of Australia has achieved this recognition. The Fitzgerald River National Park for example has as many species of plants as the whole of the Murray Darling Basin (around 100 times the area of the Park).
- The west coast of Western Australia (between the North West Cape and Perth) is also recognised as one of the eighteen world tropical marine biodiversity hotspots, ranked second in terms of endemism.¹⁵
- The State’s marine ecosystems are diverse in species, although their values are poorly documented. The coral reefs off the west coast of the State are of particular global significance.

BOX 27 SCALE AND BIODIVERSITY OF WESTERN AUSTRALIA

- 2.5 million km² of land area
- 27,000km of coastline
- 26 of Australia’s 80 biogeographic regions (from sub-alpine to tropical rainforest and desert), with 8 ranked high or very high priority, 11 as moderate priority and 7 as low priority for further conservation reservation
- 149 of Australia’s 210+ mammals including 25 that are endemic
- 439 reptile species, including 187 that are endemic
- 1600+ fish
- Unknown enormous diversity of invertebrate animals
- 12,000+ species of vascular plants (8,000+ described)
- Unknown total number of non-vascular plant species (1500 described)

Past substantial declines in Western Australia’s biodiversity were largely a result of widespread land clearing, salinity, over-grazing, weeds, introduced animals, draining and filling of wetlands, and pathogens such as *Phytophthora cinnamomi*. As well, there are newly emerging issues that have the potential to impact on biodiversity. For example, there are the now widely accepted risks of climate change and the risks that genetically engineered organisms and other genetically manipulated material could escape into the wild and affect the reproduction of naturally occurring plants and animals.

Effective biodiversity conservation is inextricably related to issues such as landuse planning and development, greenhouse gas abatement, and the management of natural resources.

The State’s global biodiversity conservation values, and our responsibilities to conserve these, are well recognised, and there are increasing global processes to monitor our performance in the management of these values. Whilst we have a moral obligation to ensure that Western Australia’s special biodiversity status is recognised and maintained, the State has entered agreements with the

Commonwealth to implement the Commonwealth’s obligations under international treaties related to biodiversity such as:

- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar, Iran, the Ramsar Convention)
- Asia-Pacific Migratory Waterbird Conservation Strategy: 2001-2005
- Montreal Protocol on Substances that Deplete the Ozone Layer
- Convention on Biological Diversity (Biodiversity Convention)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and
- Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention).

The responses to date to Western Australia’s biodiversity conservation obligations include:

- The ongoing establishment, protection and maintenance of the State’s terrestrial conservation reserve system. As at 30 June 2003 terrestrial reserves covered 16,757,613 hectares or 6.6% of Western Australia’s land area, with a further 4,748,241 hectares of pastoral leases purchased to be incorporated as reserves and a further 698,790 hectares of forest land identified for inclusion under the government’s ‘Protecting our old-growth forests policy’. The total project area once these lands are incorporated is 22,204,644 hectares or 8.8% of the State’s land area, still short of the 15% benchmark target. The government has also identified a further 1,466,421 hectares of pastoral lease it is seeking to have excluded at the time of pastoral lease renewal in 2015 for incorporation into the reserve system.
- The ongoing establishment, protection and maintenance of the State’s marine reserve system, with a total of 1,145,940 hectares of marine park and marine nature reserves in place as at 30 June 2002. The government is also establishing new marine reserves at Jurien Bay, and in the Montebello/Barrow Islands, Dampier Archipelago, Geographe Bay to Cape Leeuwin area, and the Walpole-Nornalup area.
- Ongoing major programs for threatened species and threatened ecological community recovery, including actions by recovery teams involving community, government and scientific institutional members. The implementation of the Western Shield program for the control of foxes has led to the recovery of three native mammal species to the extent that they have been removed from the State’s list of threatened fauna. **The woylie is one of these species and has also become the world’s first mammal species removed from the international threatened species list, maintained by the World Conservation Union, as a result of management recovery action.**
- The continuous improvement in the conservation management of the Shark Bay World Heritage area. Two of the six pastoral leases in the area have been purchased for conversion to conservation reserve.
- The expansion of World Heritage Areas within the State with the proposed nomination of Ningaloo Marine Park and Cape Range National Park in addition to the successful listing of the Purnululu National Park in 2003, joining the long-established Shark Bay World Heritage area.
- The inclusion of twelve State wetlands in the global list of Wetlands of International Importance under the Ramsar Convention, as areas managed and monitored to ensure the ongoing conservation of their special biodiversity conservation values.
- The ending of old-growth forest logging and the forthcoming establishment of thirty new national parks, which will assist the State in establishing a comprehensive, adequate and representative conservation reserve system.

¹⁴ Myers et al. ‘Biodiversity hotspots for conservation priorities.’ Nature Vol 403.24 February 2000. pp. 853-858.

¹⁵ Roberts et al, ‘Marine Biodiversity Hotspots and Conservation Priorities for Tropical Reefs’, American Association for the Advancement of Science, vol. 295, 2002, pp.1280-4.

- The State has contributed native seeds of a number of poorly known species to the Millennium Seed Bank Project for flora conservation at the Royal Botanic Gardens, Kew, south of London, as a cooperative effort between the Department of Conservation and Land Management, the Botanic Gardens and Parks Authority and the Royal Botanic Gardens.
- Ongoing research and conservation programs on Western Australia’s biodiversity by the Perth Zoo, the Botanic Gardens and Parks Authority, the Department of Conservation and Land Management and the Western Australian Museum, which are contributing to an increased knowledge and understanding of the State’s biodiversity, and are providing the basis for the conservation and recovery of biodiversity.
- The release of the Government’s Consultation Paper ‘A Biodiversity Conservation Act for Western Australia’ in December 2002 signalled the government’s intention to repeal and replace the outdated *Wildlife Conservation Act 1950* with a new Biodiversity Conservation Act for the 21st century. The proposed new Act will provide a whole new suite of initiatives and controls to greatly increase our capacity to conserve biodiversity including new community partnership provisions, while also providing a sustainable future for our human communities. The government has also announced an intention to establish a Biodiversity Conservation Strategy to assist in guiding the implementation of the proposed Biodiversity Conservation Act and biodiversity conservation across all activities.

BOX 28 BIOREGIONAL SURVEYS FOR WESTERN AUSTRALIA

The Government's environment policy includes a commitment to ‘complete the program of comprehensive bioregional surveys designed to establish an inventory of the State’s terrestrial and aquatic biodiversity and to identify areas of significance for nature conservation’.

The Department of Conservation and Land Management (often with the assistance of the Western Australian Museum and scientists from other organisations) has a long-standing commitment to undertaking regional biogeographic surveys of the State.

Since the 1970s, the Department and its predecessors have conducted and published major regional surveys of the Eastern Goldfields, Nullarbor, Kimberley rainforests, and the southern Carnarvon Basin. A survey of the Wheatbelt (as part of the State Salinity Strategy) is nearing completion. Other completed major surveys include those of the Great Sandy Desert, parts of the southern forests and numerous existing and proposed conservation reserves.

The Pilbara biological survey is the current priority and commenced in July 2002.

Biodiversity research and conservation programs in Western Australia are varied, and carried out by a number of different agencies, industries and interest groups (see *Research and development for sustainability*).

Recent research has demonstrated the valuable role that the Woylie (*Bettongia penicillata*) plays in the regeneration of sandalwood trees and illustrates how biodiversity conservation is intimately related to the development of sandalwood as a native biological resource.

Source: Babs and Bert Wells/ Department of Conservation and Land Management



BOX 29 CACHING OF SANDALWOOD SEEDS BY THE WOYLIE IN DRYANDRA WOODLAND, DEMONSTRATING A RANGE OF SUSTAINABILITY BENEFITS THROUGH BIODIVERSITY CONSERVATION

Sandalwood (*Santalum spicatum*) is a hemiparasitic tree that is native to Western Australia. The scented heartwood of sandalwood is valuable for the production and marketing of sandalwood oil, an export industry that is worth more than \$10 million annually. Since European settlement, a decline in the natural distribution of sandalwood has been observed. This has largely been a result of widespread land clearance in the agricultural region and inappropriate land use and land management practices, in combination with the naturally poor seed dispersal of the species.

In the past, it was speculated that the woylie (*Bettongia penicillata*) played an important role in dispersing and caching (hoarding) sandalwood seeds, and that the decreasing number of woylies due to habitat destruction was partially responsible for the low recruitment of sandalwood populations. This speculation was tested in 2002 by Murdoch University Honours student Marie Murphy. In conjunction with the Forest Products Commission, Ms Murphy carried out a study to examine the relationship between woylies and sandalwood to determine if woylies do actually play a role in the distribution and recruitment of sandalwood through the caching of sandalwood seeds.

The study was carried out in Dryandra woodland, where woylies occur, and in Wickepin, where there are no known woylies. The study found that in areas where woylies were present, they collected and buried sandalwood seeds in caches away from the parent tree, therefore assisting in the broader distribution and regeneration of sandalwood trees. In areas where woylies were not present, juvenile sandalwood trees were fewer, and were generally found to occur under the crown of the parent tree. The findings of Ms Murphy's study suggest that past speculations about the relationship between sandalwood and woylies are correct; and the findings will be valuable for designing a silvicultural system that mimics natural processes and for the establishment of sandalwood recruits.

This illustrates how biodiversity conservation and the potential for sustainable use of a native biological resource (sandalwood) can be intimately linked. See photo below.

Source: Murphy, MT 2002, ‘Caching of sandalwood seeds (*Santalum spicatum*) by the woylie (*Bettongia penicillata*) in Dryandra Woodland: Implications for the development of a sustainable sandalwood industry in Western Australia.’ Unpublished thesis, Murdoch University, Western Australia.

In addition to attempting to ensure that Western Australia’s biodiversity is adequately conserved, it is also important to acknowledge the growing demand in the use of natural biological resources. It is essential that the use of biological resources in industries such as wildflower picking, seed collection, and emu and crocodile farming is ecologically sustainable. These industries not only provide economic benefits to the State, but their sustainable use provides an incentive to conserve and protect these resources and the habitats they depend on in perpetuity. Bioprospecting in Western Australia is a relatively new concept that has particular potential to be economically viable, whilst, at the same time, provide benefits to biodiversity conservation. The role of traditional knowledge in bioprospecting is also a matter that is receiving increased attention.

The global market for nature-based tourism and recreation is large and growing rapidly. It is critical that future developments based on this industry are consistent with sustainability principles so that the biodiversity on which the tourism depends is adequately conserved for the future growth of this industry.

Community awareness, support and involvement in biodiversity conservation in Western Australia is integral in meeting our biodiversity conservation objectives and strategies. Many conservation and research programs undertaken in Western Australia are accessible to members of the public, as volunteers (Box 30) or as participants of the Department of Conservation and Land Management’s Landscape Expeditions.

BOX 30 VOLUNTEERS AT THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Volunteers in nature and biodiversity conservation express the Western Australian spirit that is so fundamental to sustainability.

Throughout Western Australia, the Department of Conservation and Land Management has 5,000 volunteers who help manage the State's National Parks and reserves, assist with maintenance of plant collections at the Western Australian Herbarium and care for injured wildlife.

Volunteers range from young students who volunteer on weekends and during their holidays, to retirees people who may spend several days a week on the job. Volunteers are given significant responsibility and have training commensurate with this.

As Keiran McNamara, A/Executive Director of the Department of Conservation and Land Management, says, 'Our volunteer program is a key part of working with the Western Australian community'.

There are obvious social dimensions to biodiversity conservation activities. The importance of activities like nature-based tourism and community-based nature conservation is not just economic, but it is part of what defines our identity as Western Australians and as local communities. Western Australians are proud of the State's wildflowers, interesting fauna, and vast landscapes, and this is an important part in defining our 'sense of place' in our community. Box 31 outlines how the Malleefowl Preservation Group has helped generate a sense of community in the Gnowangerup area.

BOX 31 IT'S 'GNOW' OR NEVER ...

The Malleefowl Preservation Group formed ten years ago with the goal of saving the Gnow bird, Nyoongah for malleefowl. By the 1980s, the bird on the Gnowangerup Shire emblem appeared to be endangered. The local community began to rally around the cause of saving habitat and protecting the malleefowl from foxes and cats.

A sophisticated network tracks the birds to their nesting mounds and informs local action to protect them. Fences are constructed and people even camp nearby for critical phases of the nesting. Intensive baiting of feral animals is also undertaken.

Suzanne Dennings, the President of the Malleefowl Preservation Group, says that the local community has been strengthened by their actions to save the malleefowl: 'Not only do we share a common interest but it has helped us all to get to know and love our local environment so much more. As a result the broader issues of managing the land more sustainably are able to be addressed.'

The vision of the group is to construct wildlife corridors through private farms linking known malleefowl sites to reserves. These corridors are being planned to stretch 1500 km north-south and are attracting enormous support from farmers and community groups keen to link their actions to a major visionary conservation exercise. They are part of the Gondwana links project (see *Sustainable agriculture*).

A heritage centre called Yongegnow is being planned in nearby Ongerup, which will be a major tourist attraction focussing on the malleefowl and its habitat. The story of Ongerup and similar towns is a reflection of the status of this 'icon' bird and hence its revival and rehabilitation is an important part of the revival of the region. The Yongegnow centres will act as a scientific base where eggs will be incubated and taken to new areas along designated malleefowl corridors.

The Malleefowl Association plays a critical role in defining the character of the communities of the southeastern wheatbelt and helps to create a clearer sense of their future. See photo below.

Indigenous involvement in biodiversity conservation and land management is an integral part of Aboriginal history and culture (read about Mike Hill who is featured in the Sustainability WA exhibit on the CD-ROM), and plays an important role in improving our understanding of biodiversity conservation and land management in Western Australia. The Western Australian Government is now moving to recognise how this can be directed into creative public and private enterprises. Indigenous involvement in managing National Parks and creating nature-based tourism ventures has significant growth potential and can be a very important contribution to sustainability in Western Australia, as will be Indigenous involvement in bioprospecting.



The Malleefowl Preservation Group has demonstrated the importance of community partnerships in preserving endangered species, including its namesake, the Malleefowl (*Leipoa ocellata*). The success of this group is a demonstration of social entrepreneurship in sustainability.

Source: Babs and Bert Wells/ Department of Conservation and Land Management

In short...

Vision

Western Australia is contributing to global biodiversity targets to ensure that it has a comprehensive, adequate, representative and integrated terrestrial, freshwater, estuarine and marine conservation reserve system. Functioning land and seascapes that adequately provide for their full range of biodiversity will be conserved and protected, by ensuring that off-reserve conservation areas complement the conservation reserve system and that the intervening matrix of different land use is managed so as to minimise threatening processes. The loss of native species of flora, fauna and other organisms and habitats is being addressed, and programs are being developed to recover threatened species and ecological communities. There is widespread knowledge and understanding of, and appreciation within all parts of the community for, the need to ensure the conservation of the State's biodiversity. Some natural biological resources are used in an ecologically sustainable manner as a source for new products, and this production contributes to Western Australia's economy. Western Australia plays a significant part in meeting high demands for nature-based tourism opportunities.

Objectives

- To continue to improve our knowledge and understanding of Western Australia's biodiversity and the processes that threaten biodiversity.
- To establish a comprehensive, adequate and representative marine and terrestrial conservation reserve system in Western Australia.
- To ensure the effective management of conservation reserves and other recognised special biodiversity conservation areas.
- To ensure the protection and recovery of species and ecological communities that are threatened or in special need of protection.
- To conserve landscape/seascape scale ecological systems (integrating reserve and off-reserve conservation).
- To ensure that all use of biological resources is ecologically sustainable, and enable industries to grow that can protect and enhance or provide incentives to conserve Western Australia's biodiversity.
- To encourage awareness and appreciation of the biodiversity values of Western Australia, and promote the involvement of the public in the conservation of these values.
- To implement programs for monitoring and evaluating effectiveness and efficiency in achieving biodiversity conservation outcomes in Western Australia.

Actions underway

- The government is committed to an ongoing program of regional biogeographic surveys throughout Western Australia by the Department of Conservation and Land Management, in conjunction with the Western Australian Museum and scientists from other organisations.
- The biological survey for the Wheatbelt Bioregion is nearing completion, and the Pilbara Bioregion biological survey has commenced.
- Government continues to expand the terrestrial conservation reserve system in order to achieve a comprehensive, adequate and representative conservation reserve system, including the creation of thirty new National Parks in the south-west forests, the acquisition of pastoral leases under the Gascoyne-Murchison Strategy and the process of renewal of pastoral leases in 2015.

In short cont'd...

- A system of marine parks has been proposed to protect marine environments. The government has committed to creating new marine reserves at Jurien Bay, and in the Montebello/Barrow Islands, Dampier Archipelago, Geographe Bay to Cape Leeuwin area, and the Walpole-Nornalup area over the next two years.
- Between 2003 and 2015 and subject to ongoing negotiations, around 1.4 million hectares will be excluded from pastoral leases in the rangelands and incorporated in conservation reserves to increase the area of the conservation estate in the State's pastoral rangelands. Other areas will be set aside for conservation management within pastoral leases under conservation agreements.
- Management plans will continue to be developed and implemented by the Department of Conservation and Land Management for the State's conservation reserve network.
- The government will nominate additional World Heritage Areas in Western Australia, with the initial focus being Ningaloo Marine Park and Cape Range and will also nominate additional wetlands as Wetlands of International Importance under the Ramsar Convention.
- State strategies/programs are being implemented to protect biodiversity from threatening processes, such as salinity, feral/introduced animals, weeds, dieback and fire. These include recovery teams implementing recovery plans for fourteen threatened animal species, and a further seventeen recovery groups implementing recovery plans for threatened flora and threatened ecological communities at an area, community or species scale.
- Programs for threatened species research, protection and restoration are being lead by the Department of Conservation and Land Management, the Botanic Gardens and Parks Authority, the Perth Zoo and the Western Australian Museum.
- The State has dedicated project approval processes, including the assessment of proposals under the *Environmental Protection Act 1986* to ensure that land use proposals are only approved if biodiversity conservation values have been considered and addressed.
- A consultation paper for a new Biodiversity Conservation Act was released for public comment in December 2002. Over 150 public submissions were received, and public comments will be taken into account in the preparation of a draft Biodiversity Conservation Bill.
- Work is being undertaken with pastoralists (see Box 45) to gradually transform management practices of pastoral leases towards meeting sustainability objectives, including setting aside areas for the protection of biodiversity values.
- The existing conservation reserve system is progressively being complemented by the implementation of off-reserve conservation programs such as conservation agreements with land/leaseholders, nature conservation covenants through the Department of Conservation and Land Management and the National Trust, and other initiatives such as the Land for Wildlife program.
- The continued implementation of the State's innovative Salinity Strategy and Salinity Action Plan programs, including the ongoing implementation and expansion of the program of natural diversity recovery catchments, integrating production and biodiversity conservation planning and action at the catchment scale.
- Communication and education programs for the public are available on biodiversity conservation.
- Programs are available for the community and volunteers to be involved in biodiversity conservation and management (see Box 30).

In short cont'd...

Actions

- 2.6 Replace the *Wildlife Conservation Act 1950* with a new Biodiversity Conservation Act for Western Australia, which is focussed on providing protection for all biodiversity. Develop a State Biodiversity Conservation Strategy to complement and guide the application of the Biodiversity Conservation Act.
- 2.7 Continue to carry out the ongoing systematic regional biogeographic survey throughout Western Australia.
- 2.8 Seamlessly link environmental databases in a whole of government environmental database that incorporates the results of the ongoing biological surveys and monitoring program, and the research and development programs dealing with management of the biodiversity values in-situ, and ensure that communities wishing to be involved in management, research and monitoring of biodiversity have access to this database.
- 2.9 Establish a plan for a Biodiversity Research Consortium that includes marine and estuarine capability and brings together the research and databasing capacity of the Department of Conservation and Land Management, the Western Australian Herbarium, the Western Australian Museum, and the Botanic Gardens and Parks Authority.
- 2.10 Complete the Biological Survey for the Pilbara Bioregion by 2010.
- 2.11 Continue to identify and acquire land for addition to the terrestrial conservation reserve system so that it is comprehensive, adequate and representative.
- 2.12 Implement within the State, Australia's international commitments on environmental protection and biodiversity, and establish a long-term monitoring and reporting program to demonstrate that the State is fulfilling its global biodiversity conservation obligations.
- 2.13 Continue to work towards meeting national biodiversity conservation objectives and targets to which the State is a signatory.
- 2.14 Identify key threatening processes that result in the loss of Western Australia's biodiversity, and develop mechanisms (such as threat abatement plans, recovery plans or management plans) that will control or manage the impacts of the threatening process.
- 2.15 Account for biodiversity conservation in all land-use planning, where clearing of native vegetation is involved, and management decisions in Western Australia.
- 2.16 Ensure that mechanisms are in place for the identification, protection and recovery of Western Australia's threatened and specially protected biota.
- 2.17 Ensure that all landholders, managers and project proponents take into account the requirements for biodiversity conservation as a standard and vital component of their planning and management activities.
- 2.18 Continue to expand off-reserve conservation programs, such as conservation agreements, nature conservation covenants and Land for Wildlife.
- 2.19 Expand the existing natural diversity recovery catchment system from six to twenty-five recovery catchments over the next ten years in partnership with the community and the Commonwealth Government under programs such as the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust.

In short...

- 2.20 Review and improve the current licensing system to ensure that access to biological resources is properly regulated, and develop wildlife management plans to ensure that the use of particular biological resources is ecologically sustainable. Ensure that the right of Indigenous people to use native biota for customary purposes is continued on a sustainable basis.
- 2.21 Facilitate opportunities for nature-based recreation and tourism in Western Australia that are compatible with, and promote, the State's biodiversity conservation status.
- 2.22 Plan a major science-education facility that can assist in the education of the community on Western Australia's biodiversity.
- 2.23 Increase opportunities for the community to learn about and gain hands-on experience with biodiversity conservation issues.
- 2.24 Establish and implement a program for monitoring and evaluation to measure trends in resource conditions and management actions for biodiversity conservation in Western Australia.

Global opportunities

The biodiversity conservation efforts in Western Australia are already contributing to global conservation outcomes. These efforts can be expanded substantially through increased resourcing, both throughout Australia and through international aid programs to assist countries throughout the Asia-Pacific region in biodiversity conservation research, monitoring and evaluation.

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Department of Conservation and Land Management, <<http://www.calm.wa.gov.au>>

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> RESPONDING TO GREENHOUSE AND CLIMATE CHANGE

A comprehensive Greenhouse Strategy is being developed to address the issues of greenhouse emissions, adaptation, sequestration and new industries.

It would be naïve to ask governments to put their economic interests aside. I hope, however, that a better appreciation of the costs of inaction and the economic benefits of innovation in technologies and lifestyles will generate a more balanced economic vision.

Michael Zammit Cutajar, Retiring Executive Secretary of the UNFCCC, January 30, 2002

The evidence is overwhelming: human activity has interrupted the global carbon cycle and is beginning to have a profound impact on the Earth's climate.

Over the past 25 years, the South West of Western Australia has experienced a significant reduction in rainfall and major falls in run off to water storage dams. Scientists have suggested that this is at least partly due to global climate change. We must now adapt to climate change and work to achieve a global reduction in greenhouse gas emissions.

In 1992, the World agreed to stabilise the concentration of greenhouse gases in the atmosphere through the United Nations Framework Convention on Climate Change (UNFCCC). Achieving this goal will require a 60-70% reduction in global greenhouse gas emissions.

The Kyoto Protocol, which was agreed in 1997, is the first step toward implementing the UNFCCC. The Kyoto Protocol establishes limits on greenhouse gas emissions that challenge Western Australia's energy intensive society and economy and the type of economic development prospects offered by our huge deposits of natural gas. We must anticipate and position ourselves for future greenhouse gas emission limits before they are applied globally in coming decades. The economy is moving inevitably towards reduced carbon intensity.

The changes that are required to address climate change can offer an opportunity for innovation and economic development. If we are able to use reductions in greenhouse emissions as a driver for economic modernisation, efficiency and innovation then we can create a strong economic future for Western Australia while making a fair contribution to reducing global greenhouse gas concentrations.

Greenhouse has become a pre-eminent global sustainability issue. If the climate is changing due to human activity then how can we be looking after the future from an economic, social or environmental perspective? Our sustainability principles could be undermined by climate change unless we take proper account of this issue as a priority.

The world is rapidly moving towards a consensus of action on greenhouse matters and a new economy is emerging where 'early movers' in greenhouse can begin to find opportunities for new technology and new services. Even those countries not signing the Kyoto Protocol are committed to shifting their economy towards less carbon intensive production.

The increasing requirement to sequester carbon may provide Western Australia with significant opportunities. Western Australia has all the requirements:

- substantial land that was cleared in 1990 and can be revegetated before 2010-12
- satellite photography and scientific analyses that enable verifiable calculations to be made of the potential carbon dioxide that would be sequestered
- carbon rights legislation that enables a clear, legal process to be established.

However a Commonwealth Government system consistent with global standards will be required to truly encourage this process.

The Western Australian Government is committed to meet the challenges of climate change. A Greenhouse Strategy is being prepared by the State Government to outline how Western Australia can respond to greenhouse and climate change (see Box 32).

BOX 32 WESTERN AUSTRALIAN GREENHOUSE STRATEGY – KEY DIRECTIONS

- The Western Australian Greenhouse Strategy builds on the following directions agreed by State Cabinet:
- Managing greenhouse emissions to ensure the State contributes to global efforts to reduce the greenhouse effect.
 - Promoting organic carbon sequestration, especially where associated natural resource and regional development benefits can be gained, and providing a focus for considering geosequestration options
 - Ensuring adaptation options are understood by all sectors of the State community and that essential state values, such as biodiversity are protected
 - Facilitating business opportunities that might emerge from climate change;
 - Demonstrating government leadership
 - Providing information to the community and helping local government to provide local leadership
 - Guiding climate and greenhouse research, and
 - Representing Western Australia's interests when national and international agreements and policies are being established.
- Key proposals will address matters such as:
- How industry, agriculture and other major emitters in Western Australia can reduce their greenhouse emissions at least cost
 - How organic sequestration can be promoted in Western Australia
 - How information about Western Australia's greenhouse emissions can be continually improved to support ongoing policy development and more focused emission control programs
 - How climate research can be coordinated to ensure Western Australians are able to prepare for unavoidable climate changes, and
 - How Western Australia's particular circumstances can be successfully represented in national and international agreements and policies.

Throughout the State Sustainability Strategy a range of other proposed initiatives related to industry, energy, buildings, transport, water, planning and agriculture will lead to reduced greenhouse emissions.



The rapid establishment of plantations on cleared agricultural land in Western Australia means that land-use change is now a net sink for greenhouse emissions in Western Australia.

Source: Forest Products Commission

In short...

- Vision**
- Climate change stabilises through concerted global action including reduced emissions, new technology, new ways of living, substantial revegetation and stabilised population growth. Western Australia contributes significantly to this process.
- Objectives**
- To contribute to global solutions for greenhouse-related issues.
- Actions underway**
- A Draft Western Australian Greenhouse Strategy is being prepared for public release and comment.
 - Government has established a Sustainable Energy Development Office.
 - Carbon rights legislation has been proclaimed.
 - Government has required government agencies to reduce greenhouse emissions by reducing their energy consumption by 12% between 2001-02 and 2006-07 through the Energy Smart Government Program.
 - The government-owned electricity generation portfolio has begun to achieve significant reductions in carbon intensity due to more efficient power stations and greater use of gas.
 - Through the Strategic Environmental Assessment of the Power Procurement Process, the government has ensured that greenhouse is a significant factor in future power plant decisions.

- Actions**
- 2.25 Finalise and implement the Western Australian Greenhouse Strategy after consultation.

Global opportunities

Many global opportunities arise from the greenhouse effect. There is a rapidly growing market for Western Australian gas (as evidenced by the recent contract with China for Liquid Natural Gas) as the world moves towards less carbon intensive energy futures. Western Australia's rural areas offer opportunities for revegetation and reforestation, which could be supported through State, national or global carbon trading markets. Western Australian innovations in greenhouse-related technologies offer scope for economic development here. For example, small-scale biomass power as is being developed through the Oil Mallee project at Narrogin, wind power systems at Albany and greenhouse-related services such as construction of new rail systems or climate adaptation strategies could support new fields of economic endeavour.

- Further information**
- Australian Greenhouse Office
<http://www.greenhouse.gov.au/>
 - Commonwealth Scientific and Industrial Research Organization
<http://www.csiro.au/>
 - Indian Ocean Climate Initiative
<http://www.ioci.commerce.wa.gov.au/>
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 - Western Australian Greenhouse web site
<http://www.greenhouse.wa.gov.au>

> OIL VULNERABILITY, THE GAS TRANSITION AND THE HYDROGEN ECONOMY

One of the most difficult issues facing the world is the transition away from fossil fuels that have been the basis of industrial economies for several hundred years. In particular oil has been the basis of most economic growth in the past fifty to eighty years as the world has become very mobile.

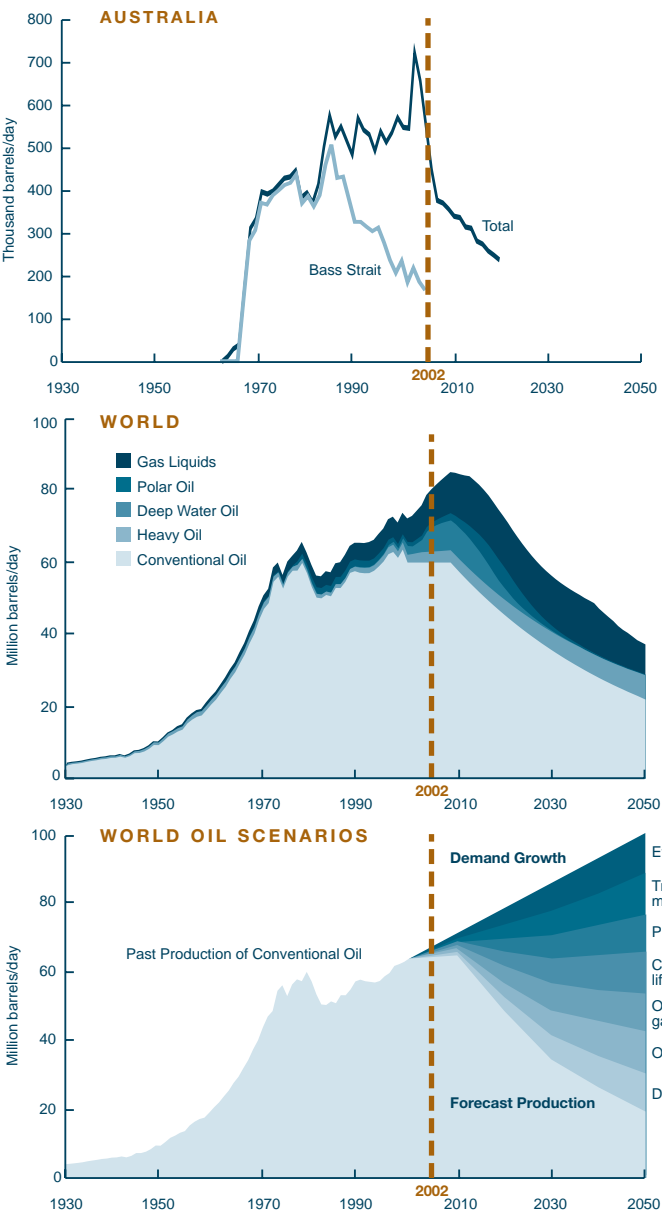
Transport's current dependence on cheap oil supplies is not a sustainable activity. Estimates of the life of cheap oil supplies range from 3 to 50 years however the sooner we start the transition to a sustainable system the easier it will be.

Royal Automobile Club of Western Australia

Since 1995 Australia has been consuming oil and condensate at three times the rate of discovery. Australia should urgently shift to natural gas based fuels to replace oil based petroleum products, and develop other alternatives like hydrogen and ceramic fuel cells, especially for transport.

Brian Fleay

Figure 6 Oil Vulnerability (existing and projected production)



Since the first oil crisis in 1972 there has been increasing awareness that oil vulnerability is an issue of concern. The concentration of oil reserves in politically unstable areas means that there is a distinct possibility of political control of oil prices and oil availability. Apart from this the world is using oil at a much faster rate than it is being found—four barrels are used for every one found (some estimates suggest this could be as high as nine). Added to this are the problems of greenhouse emissions from oil use and the car dependence in cities.

Global awareness of oil vulnerability has grown since September 11 and it was the basis of several key industry submissions to the Strategy. There is just one week's supply of petrol in storage in Western Australia for emergency purposes and in the medium term the oil and gas industry is also suggesting a major global oil crisis could occur (see Box 33).

Figure 6 outlines the problem and this is explored in some detail by Bruce Robinson's background paper (and an update based on new global data). Adam Hawke's background paper looks at medium-term technological options (see Box 33) and Lisa Garrity's background paper examines how Western Australia can prepare for the long-term future hydrogen economy. A Federal Government initiative on the hydrogen economy is underway and the Western Australian Government now has a web site based on its work in this area. <www.dpi.wa.gov.au/fuelcells>

Source: See B.Robinson, *Global Oil Vulnerability: the Australian Situation*.

BOX 33 THE TRANSITION TO SUSTAINABLE TRANSPORT FUELS AND TECHNOLOGY¹⁶

As oil supply becomes less certain and its use less environmentally acceptable, governments worldwide are implementing strategies that introduce tough emissions standards, encourage responsibility for pollution and greenhouse gases, and foster sustainable transport industry upstream and downstream.

Australia's oil vulnerability in particular is highlighted by the fact that it faces a \$7.6 billion deficit on trade in liquid hydrocarbons by 2010 from a surplus of \$1.2 billion in 2000. Given Western Australia's major natural gas resources and strong public support for protecting the environment, the State is well placed to play a major role in meeting this challenge. There is a global transition to the use of gas for greenhouse reasons as well as economic and air quality reasons.

The global pool of transport technology is rapidly growing and there are no obvious benefits to any one technology; it is therefore not possible to second-guess which technology combination will eventually provide the solution. Government must therefore facilitate the transition to lower emissions fuels and vehicle technology without picking winners. It needs to be part of trials and remove barriers to the rapid integration of new technology. Demonstration projects with LPG and CNG, biodiesel and hydrogen fuel cells, are all underway and need to be carefully monitored.

There is also awareness that there are/will be multiple benefits if we use less energy in transport. Transport energy demand can be minimised through urban design, quality public transport, and bicycle and walking options.

Western Australia is well placed to create economic opportunities from the global oil situation though we also have some constraints of concern. The opportunities come from:

- the globally significant gas resources in our North West
- the political and economic security for developing these resources into value-added products like liquid fuels as a short-term or transitional solution
- the opportunity to create biodiesel from waste animal fat and from canola so that we increase our portfolio of transport energy sources and thereby increase the resilience of our economy
- oil refineries being able to process gas condensates and produce high quality fuel suitable for the future in engine technology
- the electric train system which enables local fuels to be used for transport including a growing amount of renewable electricity
- the Hydrogen Fuel Cell Bus trial in which Perth is the only non-European participant (the global trial is supported by the European Union) and
- long-term potential for hydrogen to be produced from the substantial renewable energy resources of wind in the south, solar in the Pilbara and tides in the Kimberley, with potential pipeline and cryogenic facilities linking these areas (see paper by P Newman, Sustainability and the Hydrogen Economy in Western Australia).

The constraints are:

- Western Australia is a highly transport fuel intensive State due to its large distances and the nature of our economic activity
- the nature of Perth's development which has been highly car dependent, and
- the oil intensive nature of Western Australian agriculture.

The State can show global leadership in considering how best to address oil vulnerability and has established a Sustainable Transport Energy Program in the Department of Planning and Infrastructure. A taskforce to pursue the issues of oil vulnerability, gas transition and the hydrogen economy has also been established - the Transport Energy Strategy Committee - involving industry, community, university and government expertise. The Committee is assessing the global oil situation, examining Western Australia's liquid fuel situation in short and long-term supply, assessing how best to use Western Australia's gas in transport, how this can lead to a hydrogen economy and the implications for sustainable transport policy. Their interim report was released in July.

¹⁶A Hawkes, *Evolution towards a Sustainable Transport Energy Source*, Background Paper for the State Sustainability Strategy, CD-ROM, 2002.

There is potential for the Kimberley to be a demonstration site for the hydrogen economy due to the possibilities associated with the Ord Hydro scheme, remote power through fuel cells in mining and Indigenous communities, tidal power options, use in road trains etc. Other areas in the world with hydrogen economy innovations tend to be in remote areas, for example Iceland and Antarctica (see paper by Dr Bruce Hobbs).

In short...

Vision

Oil-based transport moves quickly to a combination of gas-based systems and there is an increase in the provision of public transport, cycling and walking infrastructure as a means to forestall oil vulnerability. Then hydrogen becomes the basis of the provision of power for our economy, using fuel cells and hydrogen gas produced from renewable energy.

Objectives

- Assess global oil vulnerability and position the State's options as cheap oil becomes less available.
- Consider how to optimise the State's gas reserves in order to ensure that the global gas transition is addressed sustainably and to the state's long-term advantage.
- Facilitate Western Australia's involvement in the emerging hydrogen economy.
- Provide 'whole of government' perspectives on transport energy sustainability issues that can enable innovation and leadership to occur.

Actions underway

- An emergency fuel storage plan has been prepared.
- The Ministerial Council on Energy (Federal and State Ministers) has a Strategic Energy Supply and Security Working Group.
- A revised government vehicle fleet environmental policy, aimed at a significant and cost-effective reduction in vehicle fleet fuel consumption, and providing an option for emission offsets will be completed in 2003-04.
- Negotiations have been finalised regarding the commencement of a hydrogen fuel cell bus in Perth, which will be the only non-European city participating in the this trial.
- Local firms, such as Orbital Engine Corporation, are making global contributions to fuel efficiency (see Box 26 in *Population, development aid and environmental technology*).
- A Sustainable Transport Energy Program has been established in the Department of Planning and Infrastructure. This initiative is leading the way in reducing the use of transport fuel by purchasing cars with smaller engines and purchasing twenty Toyota Prius hybrid cars.
- A Transport Energy Strategy Committee has been established to provide advice to the Minister for Planning and Infrastructure on how best to ensure future supplies of transport energy for Western Australia. The Committee's Interim Report was released in July.
- A major trial of biofuel in Transperth buses has been established in the Public Transport Authority.

In short cont'd...

Actions

- 2.26 Ensure all future buses purchased for the Transperth bus fleet are powered by compressed natural gas.
- 2.27 Finalise and implement the report of the Transport Energy Strategy Committee after public consultation.
- 2.28 Evaluate the effectiveness of the Department for Planning and Infrastructure's Sustainable Transport Energy Program and provide recommendations on broadening its implementation across government and into the first steps towards a hydrogen economy.
- 2.29 Adopt a revised government vehicle fleet environmental policy to increase the use of 4 cylinder vehicles and significantly reduce fuel consumption (and CO₂-emissions) per km, provide greenhouse emission offset option and continue the use of LPG powered vehicles where appropriate.
- 2.30 Examine the feasibility of the Kimberley as a demonstration area for the hydrogen economy.
- 2.31 Commence the hydrogen fuel cell bus trial in July 2004 with three test buses.

Global opportunities

The oil problem is Western Australia's golden opportunity to establish global leadership in how to move towards the better use of gas in transport and to help lead the world towards a hydrogen economy. Economic opportunities in this area of sustainability abound.

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