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Chapter Fourteen

# Environment

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Australia has been geographically isolated from other continents since its final severance from Antarctica 35 million years ago and a unique animal and plant life has evolved. Australia's biodiversity, that is the number and diversity of all life forms, is significant in the world context. It is not a fixed entity, but a constantly changing pool that is augmented by new genetic variation and diminished by extinctions.

Seven families of mammals, including the platypus and the koala, four of birds and twelve of flowering plants are endemic to Australia — far more endemic families than any other country. It is estimated that 88 per cent of Australia's reptiles, 70 per cent of birds and 94 per cent of frogs occur nowhere else in the world.

Australia has the planet's second highest number of reptile species (686), is fifth in flowering plants (23,000) and tenth in amphibians (197).

Over the past 200 years since white settlement, activities such as agriculture, urbanisation, clearing, draining of wetlands, the introduction of exotic species and pollution

have had profound changes on Australian ecosystems. It is estimated that about half of Australia's forests have been cleared, and almost all other parts of Australia have been grazed to some extent by domestic stock or introduced feral animals. This has resulted in structural changes in vegetation communities and the loss of native species. It is estimated that 2.9 per cent of Australia's vascular plants which include trees, shrubs, grasses and ferns and 7 per cent of marsupials have been lost.

With a coastline of some 37,000 kilometres, Australia has a diverse marine environment ranging from the tropical mangrove and coral reef habitats of the far north, and Coral, Arafura and Timor Seas, to the subantarctic and antarctic habitats of the southern external territories. The fauna of the coastal water surrounding the Australian continent has a high diversity of species.

Although Australia covers a land area of 768 million hectares, nearly 75 per cent of the population lives within 50 kilometres of Australia's coastal cities. About 35 per cent of the total population lives in Sydney and Melbourne.

**AUSTRALIA'S BIODIVERSITY**

<i>Flora</i>	<i>Number of species</i>
Vascular Plants	22,000 species, more than 90% occur naturally in Australia At least 209 species endangered, a further 784 vulnerable
Non-Vascular Plants	About 20,000 species of algae About 3,500 species of mosses, liverworts and lichens About 10,000–20,000 species of large fungi About 250,000 species of microfungi
<i>Fauna</i>	<i>Number of species</i>
Birds	850 species of which 70% occur naturally only in Australia 10 species are extinct, 26 species endangered
Reptiles	700 species, 88% occur only in Australia
Insects	65,000 known insects with at least as many to be identified
Mammals	276 native land mammals. 20 species extinct. 43 species endangered or vulnerable
Amphibians	About 180 species, all of which are frogs. 94% of frog species occur nowhere else
Fish/Molluscs	3,600 species of fish

Source: Australian National report to UNCED, Draft, 30 July 1991.

## ENVIRONMENTAL INDICATORS

Environmental indicators are increasingly seen as a necessary tool for helping to set the course towards a sustainable future. The OECD has been undertaking work on indicators as part of its program on environmental economics that would integrate environment and economic decision-making. Indicators need to be viewed in a dynamic context, so the set of indicators can change to reflect the changing nature of policy

and the seriousness of different environmental problems.

The following data are indicators reflecting economic and population changes of environmental significance. The indicators have been prepared by OECD and show a comparison of Australia with some selected countries. Developments are proceeding in Australia on further environmental statistics and indicators for Australia, States or specified regions.

## OECD ENVIRONMENTAL INDICATORS, 1991

Indicator		Canada	U.S.A.	Australia	Nether-lands	Sweden	U.K.	Total OECD	Total world
Carbon dioxide (CO <sub>2</sub> ) emissions from energy use (million tonnes of carbon)									
	1971	94	1,209	48	44	27	187	2,427	4,380
	1975	109	1,240	56	46	26	170	2,522	4,811
	1980	124	1,369	63	50	24	167	2,756	5,528
	1985	115	1,339	66	48	22	159	2,648	5,802
	1988	124	1,433	71	51	21	163	2,793	6,256
Per unit of GDP (kg/\$US '000)	1988	316	324	404	380	194	317	286	635
Per capita (tonnes)	1988	4.8	5.8	4.3	3.4	2.5	2.9	3.4	1.2
Greenhouse gas emissions (million tonnes of carbon) Late 1980s									
CO <sub>2</sub>		126	1,443	72	51	21	166	2,840	6,400
Methane		79	692	90	26	5	75	1,290	5,100
CFC		34	332	20	17	6	67	901	1,300
Total		239	2,468	182	94	32	307	5,030	12,800
Per unit of GDP (kg/\$US '000)		608	558	1,035	705	295	599	516	662
Per capita (tonnes)		9.2	10.0	11.0	6.4	3.8	5.4	6.1	2.5
Protected areas ('000 sq. km)									
	1970	148.2	234.5	108.6	0.9	5.0	13.0	586.3	1,597.1
	1980	214.6	473.9	250.7	1.1	10.6	13.2	1,107.7	3,566.2
	1985	229.5	649.5	354.1	1.6	15.9	15.5	1,437.4	4,237.7
	1989	718.6	790.4	364.8	1.5	17.1	25.7	2,180.5	5,290.8
Per cent of land area	1989	7.8	8.6	4.8	4.4	4.2	10.6	7.1	4.0
Use of nitrogen fertilisers applied to arable land (tonnes/sq. km)									
	1970	0.7	3.9	0.4	46.1	7.4	12.4	3.9	2.2
	1975	1.3	5.0	0.4	53.3	8.6	15.0	4.8	3.1
	1980	2.1	5.7	0.6	56.2	8.2	17.7	5.6	4.2
	1985	2.8	5.0	0.7	55.6	8.2	22.2	5.6	4.8
	1988	2.6	5.1	0.8	46.7	7.6	20.9	5.7	5.4
Threatened species (per cent of species known) Late 1980s									
Mammals		7.3	10.5	13.4	48.3	15.4	31.2	n.a.	n.a.
Birds		3.8	7.2	3.3	33.1	6.8	15.0	n.a.	n.a.
Fish		1.2	2.4	..	22.4	4.6	3.4	n.a.	n.a.
Reptiles		2.4	7.1	1.6	85.7	0.0	45.5	n.a.	n.a.
Amphibian		2.4	3.6	4.0	66.7	38.5	33.3	n.a.	n.a.
Vascular plants		0.8	0.5	12.3	..	8.2	9.6	n.a.	n.a.

... continued

OECD ENVIRONMENTAL INDICATORS, 1991 - *continued*

<i>Indicator</i>		<i>Canada</i>	<i>U.S.A.</i>	<i>Australia</i>	<i>Nether-lands</i>	<i>Sweden</i>	<i>U.K.</i>	<i>Total OECD</i>	<i>Total world</i>
<b>Waste generation</b>									
Municipal waste									
Total ('000 tonnes)		16,400	208,800	10,000	6,900	2,650	17,700	420,000	n.a.
Per capita (kg)		632	864	681	467	317	353	513	n.a.
Industrial waste									
Total ('000 tonnes)		61,000	760,000	20,000	6,690	4,000	50,000	1,430,000	n.a.
Per unit GDP (tonnes/\$US mill.)		155	186	146	50	37	97	146	n.a.
Hazardous ('000 tonnes)		3,300	275,000	300	1,500	500	4,500	303,000	n.a.
<b>Growth of economic activity</b>									
GDP @ 1985 prices and exchange rates (Index 1970 = 100)									
	1975	129	112	121	117	114	110	115	n.a.
	1980	156	131	139	133	121	121	136	n.a.
	1985	180	151	162	140	133	133	155	n.a.
	1989	208	173	187	154	146	155	177	n.a.
GDP (\$US billion)	1989	401	4,544	184	138	111	530	10,070	n.a.
Per capita (\$US '000)	1989	15.5	18.4	11.1	9.4	13.1	9.3	12.2	n.a.
<b>Private final consumption expenditure @ 1985 prices and exchange rates (Index 1970 = 100)</b>									
	1975	136	116	124	119	113	113	120	n.a.
	1980	162	135	142	141	117	125	140	n.a.
	1985	184	160	166	141	120	139	159	n.a.
	1989	217	180	187	157	136	173	182	n.a.
Total (\$US billion)	1989	235	2,944	107	83	59	346	6,254	n.a.
Per capita (\$US '000)	1989	9.0	12.0	6.5	5.6	7.0	6.1	7.6	n.a.
<b>Energy intensity</b>									
Total primary energy requirements/unit GDP (tonnes of oil equivalent (TOE) per \$US '000)									
	1970	0.80	0.60	0.54	0.55	0.58	0.61	0.54	n.a.
	1975	0.76	0.57	0.53	0.57	0.55	0.53	0.52	n.a.
	1980	0.74	0.53	0.53	0.55	0.52	0.49	0.48	n.a.
	1985	0.66	0.45	0.48	0.49	0.55	0.44	0.43	n.a.
	1988	0.64	0.44	0.47	0.48	0.52	0.41	0.41	n.a.
Energy requirements (TOE) per capita	1988	9.6	7.8	5.0	4.4	6.7	3.7	4.8	n.a.
Total TOE (mill. tonnes)	1988	249.5	1,928.4	82.7	64.5	56.2	208.5	4,002.9	n.a.
<b>Transport trends</b>									
Road traffic									
10 <sup>9</sup> veh. km	1970	126	1,787	79	48	35	179	3,288	n.a.
	1989	225	3,307	153	89	61	357	6,343	n.a.
Change (%)		79	85	94	85	73	99	93	n.a.
Motorways (km)	1970	2,760	53,700	1,030	980	400	1,060	72,800	n.a.
	1989	7,450	83,960	1,100	2,070	1,000	2,990	133,300	n.a.
Change (%)		170	56	7	113	148	183	83	n.a.
Passenger vehicles in use ('000 vehicles)	1970	6,600	89,200	3,800	2,500	2,300	11,800	173,200	n.a.
	1989	12,100	143,700	7,600	5,400	3,600	21,600	339,800	n.a.
Change (%)		84	61	98	118	56	83	96	n.a.
<b>Population</b>									
('000 inhabitants)	1970	21,300	205,100	12,800	13,000	8,000	55,600	715,100	3,694,300
	1975	22,700	216,000	13,900	13,700	8,200	56,200	750,300	4,076,900
	1980	24,000	227,800	14,700	14,200	8,300	56,300	779,900	4,449,500
	1985	25,400	239,300	15,800	14,500	8,400	56,600	807,500	4,837,300
	1990	26,500	249,200	16,700	14,800	8,300	56,900	831,100	5,292,000
Change from 1970 (%)		24.4	21.5	30.3	13.5	3.2	2.3	16.2	43.3
<b>Population density (inhabitants/sq. km)</b>									
	1990	2.7	26.6	2.2	362.7	18.4	232.4	25.9	39.0

Source: OECD Environmental Indicators 1991.

## ENVIRONMENTAL LAW

The Australian Constitution does not include a reference to environment or conservation. Commonwealth powers in environmental protection, nature conservation and related fields arise from, or are incidental to, other specified powers. These specific Commonwealth powers include the power to legislate with respect to Territories of the Commonwealth, overseas and interstate trade and commerce, external affairs, corporations, taxation, defence, quarantine and granting financial assistance to States. Effectively the powers relating to environment and conservation are divided among the Commonwealth Government and the State and local governments. In practical terms, however, most decisions on environmental protection, nature conservation, land use and land management in the States are the responsibility of the State Governments.

In October 1990, the Heads of Government at the Federal, State and Territory level held the first of a series of Special Premiers' Conferences (SPCs) aimed at reforming intergovernmental relations in many areas. At the July 1991 SPC, the leaders reaffirmed the desirability of an Intergovernmental Agreement on the Environment. A working group was formed to draw up an agreement to give effect to national arrangements for setting consistent environmental standards across Australia. One model could see the establishment of a Commonwealth-State-Territory Ministerial body, supported by complementary legislation in each jurisdiction for the purpose of creating standards.

In the Commonwealth budget delivered in August 1991, the Government allocated funds towards the establishment of a Commonwealth Environment Protection Agency. A position paper for public comment outlined the role, structure and functions suggested for the EPA. The work of the agency would be divided into a number of major program areas, including: environment quality, industry and technology, monitoring, reporting, auditing and databases; legal and economic analysis; environment assessment; and education and information.

The *Environment Protection (Impact of Proposals) Act 1974* was the first piece of Commonwealth legislation to specifically

address environmental issues. The Act defined environment as comprising 'all aspects of the surroundings of human beings, whether affecting them as individuals or in social groupings', and set up procedures to review the environmental impact of development proposals which involved Commonwealth Government decisions.

Other legislation currently administered by the Commonwealth portfolio relevant to environment protection includes:

- *Environment Protection (Alligator Rivers) Act 1978*;
- *Environment Protection (Nuclear Codes) Act 1978*;
- *Environment Protection (Sea Dumping) Act 1981*;
- *Hazardous Waste (Regulation of Exports and Imports) Act 1989*; and
- *Ozone Protection Act 1989*.

In New South Wales, a number of State agencies have responsibility for environmental matters. These include the Department of Planning, Waste Management Authority, State Pollution Control Commission and the National Parks and Wildlife Service. An Environment Protection Authority is planned. Some of the relevant legislation includes:

- *Environmental Planning and Assessment Act 1979*;
- *Heritage Act 1977*;
- *Coastal Protection Act 1979*;
- *Clean Air Act 1961*;
- *Clean Waters Act 1970*;
- *Environmentally Hazardous Chemicals Act 1985*;
- *Ozone Protection 1989*; and
- *Environmental Offences and Penalties Act 1989*.

In Victoria, the Department of Conservation and Environment, established in January 1991, is responsible for wildlife, fisheries, national parks, land protection, water resources, flora and fauna. The Office of the Environment is responsible for climate change issues, coastal management, environment consumer information and coordination of the State Conservation Strategy. The Environment Protection Authority is responsible for protecting and improving the air, land and water environments through management of

wastes, control of noise and control of pollution. Some of the legislation includes:

- *Environment Protection Act 1970*;
- *National Parks Act 1975*;
- *Water Act 1989*;
- *Wildlife Act 1975*;
- *Groundwater Act 1969*; and
- *Flora and Fauna Guarantee Act 1988*.

The Queensland Department of Environment and Heritage is responsible for environment protection, nature conservation and the management of national parks. Responsibilities for planning and development are divided between a number of other departments. A proposal to form an Environmental Protection Agency is being investigated. Relevant Queensland legislation includes:

- *Beach Protection Act 1968–1990*;
- *Clean Air Act 1963–1988*;
- *Clean Waters Act 1971–1988*;
- *Heritage Buildings Protection Act 1990*; and
- *Noise Abatement Act 1978–1988*.

In South Australia, the Department of Environment and Planning is responsible for conservation and land management, national parks, planning and environment management. Several statutory bodies such as the Coast Protection Board, Environmental Protection Council, Native Vegetation Authority and the South Australian Planning Commission report to the Minister for Environment and Planning. Relevant legislation includes:

- *Clean Air Act 1984*;
- *Noise Control Act 1976–77*;
- *Marine Environment Protection Act 1990*; and
- *Water Resources Act 1976*.

The Environment Protection Authority in Western Australia is an independent body with the dual role of providing independent advice to the Government and the public on environmental protection, and for the implementation of government powers on pollution control. Other government departments have responsibility for environmental management, but these must be exercised within the policies and advice of the EPA. Some of the relevant legislation includes:

- *Environment Protection Act 1986*;

- *Conservation and Land Management Act 1984*;
- *Country Areas Water Supply Act 1947–1982*; and
- *Land Drainage Act 1925–1983*.

Environmental management in Tasmania is the responsibility of the Department of Environment and Planning. An independent body, the Environmental Protection Advisory Council, which has a majority of members from outside government, also advises the Minister. Some of the legislation includes:

- *Environment Protection Act 1973*;
- *Pollution of Waters by Oil and Noxious Substances Act 1987*; and
- *Environmental Protection (Sea Dumping) Act 1987*.

## NATIONAL ACTIVITIES

National collaboration on environmental matters is facilitated through Commonwealth and State ministerial councils and other advisory bodies, and through a variety of nationally coordinated activities and programs.

### Australian and New Zealand Environment and Conservation Council (ANZECC)

ANZECC was formed, in 1991, by combining the Australian and New Zealand Environment Council (ANZEC) and the Council of Nature Conservation Ministers (CONCOM).

The Council provides a forum for consultation, cooperation and liaison on matters concerning environmental management and pollution control, and conservation and management of Australia's flora and fauna. These matters have included the control of emissions and noise from motor vehicles, the use and disposal of hazardous chemicals, noise control, water quality, air pollution, solid-waste management, the economics of pollution abatement policies and environmental impact assessment, coastal management, land use policy, biotechnology and climate changes induced by human activities.

### 'Our Country Our Future'

A statement on the environment entitled *Our Country Our Future* was made by the Prime

Minister on 20 July 1989. The Statement stressed the importance of achieving environmentally sustainable development.

As part of a package to support environmentally sustainable development the Government introduced many new programs, including:

- the development of a strategy comprising a coordinated research program on regional climate modelling and support for development of national and international responses to greenhouse issues;
- the One Billion Trees Program to encourage the growth of an additional billion trees by the end of the century;
- the Save the Bush Program which is aimed at ensuring the survival of remnant native vegetation;
- the Endangered Species Program which hopes to conserve the existing indigenous species in their natural habitat;
- the development of the Environmental Resources Information Network (ERIN) to draw together information on endangered species, vegetation types and heritage sites; and
- the development of a \$320 million package for Landcare which consists of the Decade of Landcare starting in 1990, a review of rural policies and taxation arrangements related to land care issues, and an expansion of the existing National Soil Conservation Program which is administered by the Department of Primary Industries and Energy.

In March 1990, the Statement was updated, and additions were made, notably:

- the establishment of a Commonwealth Environment Protection Agency;
- development of a national waste minimisation and recycling strategy; and
- development of a scheme of 'green labelling' of products on the basis of their environmental friendliness.

Progress made on the commitments contained in the Statement has included success in moves to prevent mining in Antarctica, banning driftnet fishing and the import of non-antique ivory, and preparing guidelines for new kraft eucalypt pulp mills.

New initiatives and additional expenditure by the Commonwealth Government on the environment have included:

- research on the greenhouse effect, cane toads and mimosa pigra;
- acceleration of preparation of the National Wilderness Inventory;
- tax deductibility for donations to the Landcare Australia Foundation; and
- development of a national waste minimisation and recycling strategy.

### **Ecologically sustainable development (ESD)**

The Commonwealth Government's ESD strategy reflects growing community recognition that, in pursuing material welfare, insufficient value has often been placed on the environmental factors that also contribute to quality of life. It also reflects a recognition that economic growth and a well-managed environment are fundamentally linked. ESD provides a conceptual framework for integrating economic and environmental objectives, so that products, production processes and services can be developed that are both internationally competitive and more environmentally compatible.

The Commonwealth Government established ESD working groups for each of the main industry sectors of the economy that use natural resources — agriculture, forestry, fisheries, mining — or have a significant impact on those resources — manufacturing, energy production, energy use, transport and tourism. Membership of the working groups has been drawn from Federal and State Governments, industry, unions, conservation, consumer and social welfare organisations. Some of these groups include the Australian Consumers Association (ACA), the Australian Council of Social Service (ACOSS), the Australian Conservation Foundation (ACF), and the World Wide Fund for Nature (WWF).

The task of the working groups is to identify the most important problem areas, to set some priorities for achieving the changes desired, to develop solutions to meet both environmental and economic goals, and to propose time-frames for change. There are five general principles for ESD:

- integrating economic and environmental goals in policies and activities;
- ensuring that environmental assets are appropriately valued;
- providing for equity within and between generations;
- dealing cautiously with risk and irreversibility; and
- recognising the global dimension.

Final reports were released in December 1991. Two additional reports from the chairs of the working groups, *Intersectoral Issues* and *Greenhouse*, were published early in 1992.

### Resource Assessment Commission (RAC)

The Resource Assessment Commission was established by the Commonwealth Government in 1989 to advise it on major conservation and resource development issues. The RAC investigates and reports to the Prime Minister on the environmental, economic, financial, cultural and social implications of major resource use proposals, and provides the Government with informed advice about the options available in relation to those resources and their future utilisation.

In 1991, RAC released its report on the use of the resources of the Kakadu Conservation Zone in the Northern Territory. A draft report has been released from the Forest and Timber Inquiry. The third and fourth inquiries will focus on the coastal zone and arid zone respectively.

### Australian Biological Resources Study (ABRS)

The ABRS was established in 1973 to stimulate taxonomic and ecological studies of Australian flora and fauna through the provision of grants for research and publication. Its responsibilities include provision of advice on national taxonomic collections and establishment and maintenance of a national taxonomic database. Much of the work of the study is done in State museums, botanic gardens and herbaria which were established during the last century. CSIRO also carries out important research relating to flora and fauna.

Current major projects of ABRS include preparation of a 60 volume *Flora of*

*Australia*, a 10 volume *Fauna of Australia*, compilation of a 70 volume *Zoological Catalogue of Australia* and establishment of database exchange systems for museums and herbaria for biogeographic and taxonomic information. The ABRS is managed by a small unit of professional scientists within the Australian National Parks and Wildlife Service.

The ABRS Participatory Program is a goal-directed grants program supporting the documentation of Australia's biodiversity. In summary, only 100,000 of the estimated 300,000 species of Australian animals have been collected and described. In the plants, 18,000 species of higher plants have been described out of an estimated 24,000. The number of lower plant species (fungi, mosses, algae, etc.) is unknown. To date more than 750 books and scientific papers have been published with ABRS support. The grant funds for 1991-92 are about \$2 million.

## STATUTORY AUTHORITIES

### Australian National Parks and Wildlife Service (ANPWS)

The ANPWS was established under the *National Parks and Wildlife Conservation Act 1975*. The ANPWS is the principal nature conservation agency of the Commonwealth Government. It works in close cooperation with other Commonwealth authorities and with relevant State and Territory agencies.

The ANPWS is responsible for management of parks and reserves declared under the Act. Most significant of these are Kakadu National Park and Uluru (Ayers Rock-Mount Olga) National Park in the Northern Territory. National parks are also declared on Norfolk Island and Christmas Island and four national nature reserves have been declared in Australian waters. Ningaloo Marine Park is declared jointly under the National Parks and Wildlife Conservation Act and Western Australian legislation.

Wildlife conservation and management programs include the regulation and control of trade in wildlife and wildlife products through the administration of the *Wildlife Protection (Regulation of Exports and Imports) Act 1982*; administration of the *Whale Protection Act 1980*; administration of certain international agreements; and cooperative programs with the

States with an emphasis on rare and endangered species. The Endangered Species Program and the Save the Bush Program are now managed by the ANPWS.

The ANPWS is also charged with the delivery of programs to enhance Aboriginal employment and development opportunities in nature conservation and land management related fields.

In addition the ANPWS carries out and supports research relevant to its charter and delivers public information and education programs on nature conservation issues.

The Australian National Botanic Gardens, the Australian Biological Resources Study and the Environmental Resources Information Network were integrated into the ANPWS in 1990.

### **Great Barrier Reef Marine Park Authority**

This Authority was established by the *Great Barrier Reef Marine Park Act 1975*. The Authority's goal is to provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef in perpetuity through the development and care of the Great Barrier Reef Marine Park.

The Marine Park covers an area of 344,000 square kilometres representing 98.5 per cent of the region inscribed on the World Heritage List. The value of economic activity in the Marine Park has been estimated at \$1,000 million per annum.

Management of the Marine Park is a cooperative venture with Queensland Government agencies. The main strategy used in management of the Park is 'zoning'. Zoning provides for separate, potentially conflicting activities while allowing all reasonable uses and ensuring the long-term conservation of the Reef's ecosystem.

The Authority ensures that it achieves competence and fairness in the care and development of the Marine Park by obtaining and interpreting information relevant to the understanding of the Great Barrier Reef. Most of this research is contracted to agencies such as universities although Authority staff may also undertake some research.

A major objective of the Authority is to enhance community understanding, appreciation,

experience of and support for the Great Barrier Reef and the Marine Park.

The Authority also operates the Great Barrier Reef Aquarium which features a living coral reef system. The Aquarium aims to enhance community understanding of the Great Barrier Reef and support for management of the Marine Park by providing a readily accessible coral reef and environment onshore.

## **WORLD HERITAGE AREAS**

The World Heritage Convention was adopted by the UNESCO General Conference at its 17th session in Paris on 16 November 1972 and came into force in 1975. Australia was one of the first countries to ratify the Convention in August 1974. As at 1 January 1992 there were nine Australian properties on the World Heritage List. The Australian Government has recently been involved in a process to identify geological, including fossil, sites of potential World Heritage value. Twenty-eight sites in Australia and its territories have been identified.

Australia's nine listed World Heritage sites are described below.

### **Willandra Lakes Region of New South Wales**

The site was inscribed on the World Heritage List in 1981. The approximate area of the site is 600,000 hectares. The semi-arid environment holds outstanding evidence of the antiquity of the human race, of the life and culture of early Aboriginal societies, and an unrivalled record of past environments and landscapes. The region is one of the earliest known sites for *Homo sapiens* in the world and contains the earliest known cremation site.

### **Great Barrier Reef**

This site is situated on the north-east coast of Queensland and covers 34.8 million hectares. It became part of the World Heritage List in 1981. The Great Barrier Reef is the world's most extensive coral reef and one of the richest in terms of faunal diversity. The area is also of cultural importance, containing many middens (i.e., refuse from a prehistoric dwelling place or cooking area), and other archaeological sites of Aboriginal or Torres Strait Islander origin.

### Lord Howe Island Group

This site is situated off the east coast of New South Wales and was entered into the heritage list in 1982. The island group of approximately 145,000 hectares, was inscribed on the List for its unique landforms and biota, its diverse and largely intact ecosystems, natural beauty and habitats for rare and endangered species. The waters surrounding Lord Howe Island provide an unusual mixture of temperate and tropical organisms. The area includes the most southerly coral reef in the world, which provides a rare example of the transition between coral and algal reefs.

### Australian East Coast Temperate and Sub-Tropical Rainforest Parks

This site in New South Wales covers an area of approximately 204,000 hectares and was entered on the World Heritage List in 1986. The area includes the largest stand of littoral rainforest (a type of rainforest found next to and influenced by the sea) in NSW, one of the largest erosion calderas in the world (Mt Warning), and a range of primitive plant species.

### Kakadu National Park (Stages 1 and 2)

The park was placed on the list in 1981 and added to in 1987. It is situated in the Northern Territory and is approximately 1.31 million hectares in size. The area consists of tidal flats, flood plains, lagoons, major river systems, and the sandstone escarpments of the Arnhem Land plateau. Great cultural significance lies in the ancient Aboriginal sites and the large galleries, with some art sites dating back to the Ice Age.

### Uluru National Park

Also in the Northern Territory, this park of about 133,000 hectares was placed on the list in 1987. Uluru, which contains Ayers Rock and the Olgas, has been the focus for religious, cultural, territorial and economic inter-relations amongst Aboriginal peoples of the western desert for many thousands of years.

### Wet Tropics of Queensland

Entered on the World List in 1988, this area of approximately 900,000 hectares includes

very old and also relatively recent geological elements. It is a region of spectacular scenery and includes one of the largest rainforest wilderness areas in Australia. The association of fringing coral reefs and rainforest coastline in the Cape Tribulation region is found nowhere else in Australia and is a rare combination anywhere. The area also contains primitive flowering plants.

### Tasmanian Wilderness

This area became a World Heritage site in 1982, and was added to in 1989. The approximate size is 1.38 million hectares. The Tasmanian Wilderness includes a range of ecosystems, some of the last wild rivers in the world and is Australia's most glaciated area. Archaeological sites, including painted caves, provide evidence of human occupation during the last Ice Age.

### Shark Bay

This area was entered on the list in December 1991. It includes 1,500 kilometres of the Western Australian coast, about 800 kilometres north of Perth, and includes a series of peninsulas and islands. The marine areas include the world's largest area of sea grass. Shark Bay was only the eleventh place in the world to satisfy all criteria for World Heritage listing, namely, being an example of earth's evolutionary history and biological evolution, superlative in its natural phenomena, and having natural habitats where threatened species live. Shark Bay is home to marine fauna such as dolphins, dugongs, manta rays, whales and sharks.

## INTERNATIONAL COOPERATION

In the statement, *Our Country Our Future*, the Prime Minister, announced that the Federal Government would appoint a special Ambassador for the Environment to help give Australia a strong and effective voice in the many international environment debates. The Right Honourable Sir Ninian Stephen, a previous Governor-General, was appointed and since then has actively represented Australia's position on environmental and development issues.

In June 1992, a major international event, the United Nations Conference on Environment

and Development (UNCED), will take place in Brazil. 'The Earth Summit' will consider international responses to environment and development issues and the integration of environment and economic decision making on a global scale. The Preparatory Committee for UNCED concluded in August 1990 that the following environmental issues are among those of major concern in maintaining the quality of the Earth's environment and in achieving sustainable development in all countries:

- protection of the atmosphere by combating climate change, depletion of the ozone layer and transboundary air pollution;
- protection of the quality and supply of freshwater resources;
- protection of the oceans and coastal areas;
- protection and management of land resources by combating deforestation, desertification and drought;
- conservation of biological diversity;
- environmentally sound management of biotechnology;
- environmentally sound management of wastes, particularly hazardous wastes and toxic chemicals, as well as prevention of illegal international traffic in toxic and dangerous products and wastes;
- improvement of the living and working environment of the poor in urban slums and rural areas; and
- protection of human health conditions and improvement of the quality of life.

Australia recognises that the development of new or improved legal instruments such as treaties and other legal mechanisms which cover dispute resolution and compliance will be necessary to address many global environmental problems. The following list identifies some of the international treaties and conventions relating to the environment that Australia has signed and/or ratified:

#### General Environmental

- Antarctic Treaty;
- Convention for the Protection of the World Cultural and Natural Heritage; and
- Convention on the Conservation of Nature in the South Pacific.

#### Coastal/Marine Resources

- Indo-Pacific Fishery Commission Convention;
- International Convention for the Regulation of Whaling;
- UN Convention on the Law of the Sea; and
- Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific.

#### Toxic and Hazardous Wastes

- South Pacific Nuclear Free Zone Treaty;
- Convention on Early Notification of a Nuclear Accident;
- Treaty Banning Nuclear Weapons Testing in the Atmosphere, in Outer Space and Under Water;
- International Convention for the Prevention of Pollution from Ships; and
- International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention).

#### Biological Diversity

- Convention on Wetlands of International Importance;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora; and
- International Plant Protection Convention.

#### Air Quality

- Vienna Convention for the Protection of the Ozone Layer; and
- Montreal Protocol on Substances that Deplete the Ozone Layer.

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*Proposed Commonwealth Environment Protection Agency Position Paper for Public Comment, July 1991*

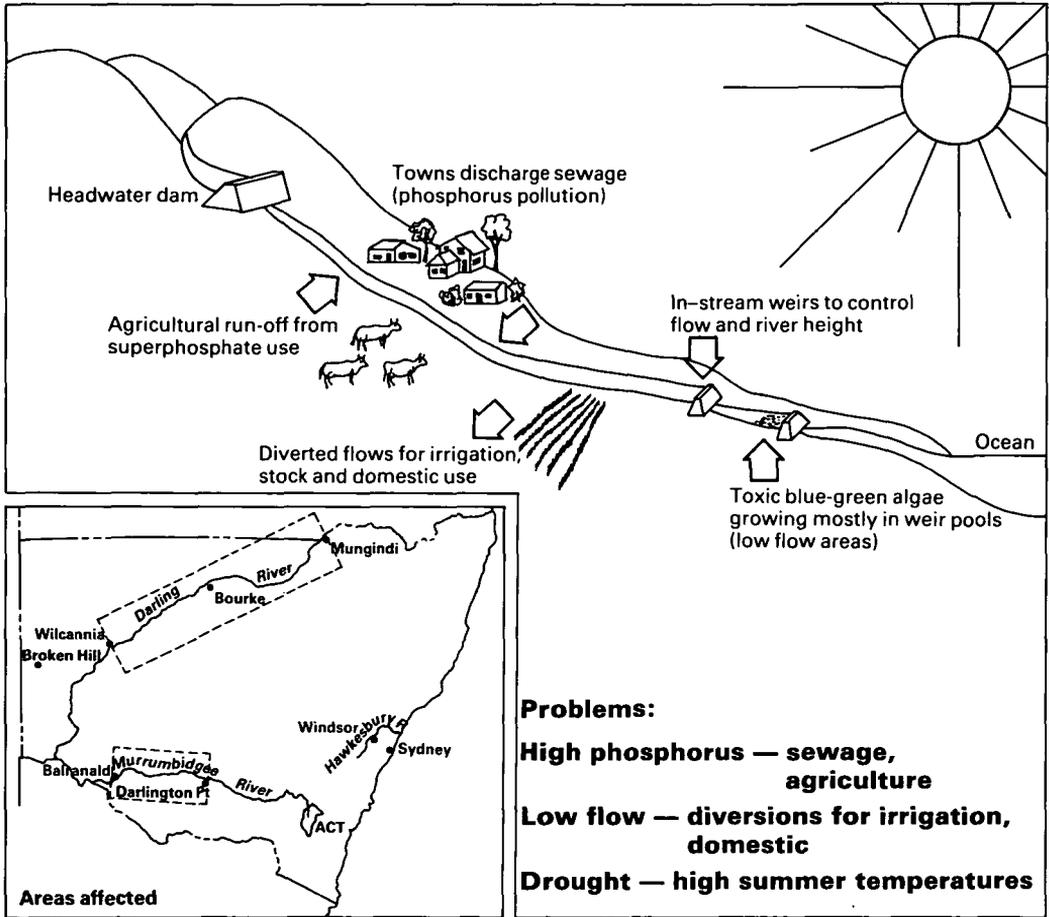
### FOR MORE INFORMATION

The ABS has a far wider range of information on Australia than that contained in the *Year Book*. Information is available in the form of regular publications, electronic data services, special tables and from investigations of published and unpublished data.

For further information contact ABS Information Services at one of the addresses listed on the page facing the Introduction to the *Year Book*.

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### TOXIC ALGAE IN RIVERS



Source: Institute of Natural Resources and Environment, Division of Water Resources, Griffith Laboratory, CSIRO.

## Blue-green Algae

*(This special article has been contributed by the Institute of Natural Resources and Environment, Division of Water Resources, Griffith Laboratory, CSIRO.)*

New found fame has escalated toxic blue-green algae from a naturally occurring phenomenon, to one of the nation's most critical water quality issues.

The presence of blue-green algae in Australian rivers, lakes, dams and estuaries is widespread. Every mainland State has recorded outbreaks and the threat they pose has been well publicised by the media.

Blue-green algae, known within the scientific community as Cyanobacteria, grow naturally in most bodies of water.

Microscopic plants, algae thrive on a combination of nutrients, light, warmth and calm conditions.

Blue-green algae can be found at various depths within a body of water. However, when conditions are favourable a bloom is triggered and the algae will appear in abundance at the surface.

Algal blooms often take on the appearance of bright green sawdust before forming a mat or scum on water surfaces. Their smell ranges from musty and earthy odours to a putrid stench, which is most noticeable when decomposition begins.

### **A concern to health and the environment**

There are many species of blue-green algae but only a few are toxin producing. In the non-toxic form, the algae make drinking water unattractive and smelly. The toxic variety are a major health and ecological concern.

There are three main genera of toxin producing algae in Australia. *Anabaena* produces an alkaloid nerve toxin, which can cause muscular and respiratory disorders; *Microcystis* and *Nodularia* produce peptide toxins which can kill liver cells.

No human deaths have been recorded following consumption of water infected by toxic algae. However, several ailments are associated with human consumption or skin contact. These include gastroenteritis, liver damage and dermatitis. There is also concern that the toxins promote liver cancer.

Stock deaths are widespread and occur when stock consume algal scum which has accumulated on the banks of water supplies.

Inland water ecosystems also face an enormous threat from the presence of blue-green algae. As the surface scum begins to die and decompose, the toxins are released and the oxygen supplies on which vegetation, fish and other water life depend, are depleted.

### **Why blooms occur**

While it is recognised that enrichment with nutrients, light, warmth and still or calm waters encourage the growth of blue-green algae, the occurrence of these factors alone does not necessarily precipitate a bloom. The combination of factors required to trigger algal blooms remains poorly understood.

Calm waters, maximum light penetration, and warm surface temperatures are common to lakes, reservoirs and farm dams during the summer months when most major blooms are recorded. Rivers are also left vulnerable at this time due to restricted water flow from irrigation offtake.

One major cause of deteriorating water quality is overloading of Australian inland waters with nutrient pollutants, particularly phosphates. Development, industrialisation and farming have resulted in poorly treated sewerage and agricultural and urban run-off entering our river systems.

Eutrophication (nutrient enrichment) is recognised as a critical factor in creating an algal bloom and a key to their prevention through effective catchment management.

### **How blooms and their toxins are treated**

At present, there are only three commonly used methods for removing blue-green algae and their toxins from water; algicides, dissolved air flotation and activated carbon.

Algicides, such as copper sulphate, are effective in killing algal blooms, however, there are distinct disadvantages in their use — they kill indiscriminately. The algicides are toxic to many aquatic life forms, not only algae, can kill fish and damage the delicate ecosystem of inland waters.

While an algicide will kill an algal bloom, this itself creates a problem. Once the treatment has been applied the algal cells rupture, releasing toxins into the water supply.

A second treatment for use in large-scale water facilities involves the bubbling of air into a holding tank where the algae are floated to the surface and are then removed. This method is expensive and fails to remove any toxins already released into the water supply.

A third method, the use of activated carbon, has been found to be the most effective method to date for the safe removal of algal toxins and associated odours from water. The carbon can be applied in a granular or powdered form to filtration units to absorb the contaminants, although it is essential that correct dosing rates and contact times are employed.

### **How Australia has reacted to the problem**

The severity and frequency of algal outbreaks during the period between October 1991 and January 1992, has resulted in public outcry. Government, industry, scientific and community recognition of the nature of the problem has created a foundation for national commitment.

Already, special task forces have been initiated, research dollars have been bolstered and public concern for the future of Australian inland waters has given a new priority to water quality issues.

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