2
WATER MANAGEMENT*

Features

- Water in the Australian economy
- The National Water Initiative
- Trading water access entitlements
- The Murray-Darling Basin Cap
- Droughts and floods

* The present chapter reviews progress in the last ten years, and particularly since the previous OECD Environmental Performance Review of 1998. It also reviews progress with respect to the objectives of the 2001 OECD Environmental Strategy.

Recommendations

The following recommendations are part of the overall conclusions and recommendations of the environmental performance review of Australia:

- steadfastly *implement all aspects of the National Water Initiative* (in particular: *full cost recovery* of water services and irrigation water delivery; *rationalisation of water allocation* in stressed water basins, allocation of adequate share of water savings to environmental flows; removal of remaining administrative barriers to *interstate trading*; strengthening of the *integrated management* of ground and surface waters; wide application of "*water sensitive*" urban design practices);
- ensure that all new investment in *water conservation infrastructure* is subject to prior economic analysis, and that landholders in the Murray-Darling Basin face consistent rules for obtaining water for irrigation purposes;
- expand the capacity of *regional natural resource management bodies* to manage river health, and to assure minimum environmental flows;
- further develop national strategies for responding to the likely *long-term effects of climate change* on available water resources, using optimisation analysis and exploring different scenarios;
- promote *public awareness and understanding* of the economic and environmental importance of improving the efficiency of water allocation and consumption.

Conclusions

The 2004 adoption of the *National Water Initiative* (henceforth "the NWI") reinvigorated the reform of the water management framework that Australia launched in 1994. With the deployment of very large government funds, real progress was made towards implementing the reforms; in particular, land property rights and *water access entitlements* were separated in all states and territories, and the institutional arrangements for water trading were put in place. The new arrangements integrate the environmental constraints imposed by the continent's predominantly dry and variable climate, by setting *environmental flow regimes* at levels deemed to protect aquatic ecosystems, and by defining water use rights as shares of the "consumptive pool" rather than as absolute amounts. The country-wide application of *catchment management bodies* by state and territory governments is helping to better integrate land and water management. Accountability has been improved by separating the responsibility for water service delivery from that of regulatory oversight. Implementation of a cap on water abstractions from the *Murray-Darling river system*

has progressed, even as severe drought has gripped the country since 2000. Water salinity in the Murray River has been kept in check thanks to careful management. Progress has been made towards a nationally consistent pricing structure for drinking and irrigation water, and water utilities in some major urban areas are close to achieving full cost recovery.

However, there remain a number of considerable water management challenges, particularly as overall water consumption is still increasing. Important river systems and groundwater aquifers remain *over-allocated* and the incidence of blue-green algae blooms has not diminished. Many larger estuaries suffer chronic algal blooms, leading to *anoxic areas* where aquatic ecosystems are disturbed. Poor coastal water quality threatens some nearshore parts of the Great Barrier Reef. Old irrigation schemes, and to a lesser extent urban water supply systems, continue to suffer *large water losses* due to leakages and evaporation. Much work still needs to be done for the NWI to take full effect at the *grass roots level*. *Full cost recovery* of irrigation water delivery has not yet been achieved. Some barriers to water trading (e.g. among states/territories, between urban and water user) still exist. *Water prices* for urban consumers remain low and thus do not encourage conservation or investment in new sources of supply. The potential for water re-use and recycling has yet to be fully exploited. Despite good progress in improving monitoring and reporting through *water accounting* and the National Land and Water Resources Audit, there is still some distance to go before policy makers and water managers dispose of nationally coherent information for decision-making.

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1. Reforming the Water Management Framework

Among OECD countries, Australia faces unique challenges for the sustainable development of its water resources and the related *sustainability of its agriculture* (Chapter 6) *and urban development*. As part of a fundamental reform of its water management system, Australia adopted a series of ambitious goals and allocated substantial resources to achieve them during the review period. Much work was also carried out to set up a comprehensive framework of institutions, strategies and management rules ahead of the actual implementation of a new water management regime. This entailed, among other things, much negotiation among jurisdictions and the adoption of rules, the creation of registers of water rights, salinity values and transfers, and the development of mathematical models.

1.1 Institutions and legislation

Institutional reforms

Significant *changes in the institutional arrangements* for water management occurred during the review period. Water management remains *primarily the responsibility of the States and Territories*, which establish their own water legislation. All the States and Territories except Western Australia updated their water legislation during the review period. Over the past 15 years or so, however, it has become increasingly clear that many water problems cannot be solved solely on a State-by-State basis, and that a basin-wide or even national approach would be more effective.

As a result, the Australian *Government has assumed a far more active role* in trying to resolve these problems, including through funding support, provision of research and dissemination of information (e.g. using the National Land & Water Resources Audit and the National Water Quality Management Strategy). In January 2007, the Australian Government took a further step in this direction by proposing to reconstitute the Murray-Darling Basin Commission (MDBC), a federal agency with direct responsibility for water management in the Murray-Darling Basin. At the same time, the Australian Government proposed a National Plan for Water Security and AUD 10 billion in federal funding under the National Plan for Water Security to improve water efficiency and address water overallocation in rural Australia. The Department of the Environment and Heritage became the *Department of the Environment and Water Resources in January 2007.*

Co-operation arrangements among Australian governments on natural resource management, including water management, were also reformed during the review period. The Natural Resource Management Ministerial Council (NRMMC) and the Primary Industries Ministerial Council (PIMC)[1] were established in 2001 and have subsumed all or part of the work of three previous bodies. Two further ministerial bodies exist for the two largest catchments on the Australian continent. The Murray-Darling Ministerial Council[2] is the main decision-making body (together with its executive arm, the Murray-Darling Basin Commission) for the management of the Murray-Darling Basin, which covers more than 1 million km^2 (14% of Australian territory) and contains 72% of all irrigated land.

The *National Water Commission* (NWC) was created in 2004 as an independent statutory body in the Prime Minister's portfolio. It is now part of the Environment and Water Resources portfolio, which also reports to the NRMMC. The NWC has seven members appointed in recognition of their expertise in water resource policies and management, relevant scientific disciplines, public sector governance and administration of natural resource programmes; it also has a small staff. The NWC

was given the mandate of helping to drive national water reform and advising the Prime Minister and State/Territory governments on water issues. The Commission is also overseeing implementing the National Water Initiative (see below) and two programmes of the Australian Government Water Fund.

Regionalisation of natural resource management

The review period saw the establishment of 56 *regional natural resource management bodies*[3] (Chapters 3 and 5), which are statutory bodies in some jurisdictions (e.g. Victoria, New South Wales, Tasmania), but not in others (e.g. Queensland, Western Australia, the Northern Territory). One function of the regional bodies,[4] which span the entire country, is to develop regional natural resource management (NRM) plans and investment strategies for their areas in close association with local stakeholders (e.g. land managers, conservation groups). The landscape scale plans deal with issues such as sustainable land management, native vegetation, erosion control, water quality, wetlands and biodiversity. Both Australian Government and relevant State governments must approve NRM plans before projects proposed in them are eligible for co-funding by the Australian Government (through the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality) and the State (Chapter 3). By mid-2006, all but two NRM plans had been approved although their quality was quite variable.

It is not yet clear how the *regional "bottom-up" model* will fit in the existing "top-down" institutional landscape, and it will probably take time to deliver the results expected from NRM plans. Some intermediate results are already being reported by regional NRM bodies. At one end of the spectrum there is a risk that they may become an additional layer of government; at the other they could be ineffective if they fail to engage local stakeholders in the long term. In particular, the consistent role of the NRM plans in relation to the existing statutory water management role of the States and Territories has yet to be settled. It seems likely that they will become responsible for managing river health and "environmental water",[5] as is already the case in some jurisdictions.

For *catchment authorities and stakeholder communities* to play the role expected of them, they should have recourse to adequate know-how and stable long-term funding. As they will probably always be too small to cover all the required fields of expertise in-house, the effectiveness of an agency like Land & Water Australia will be a crucial ingredient in the success of the regional model. Land & Water Australia is an Australian Government agency with a brief to act as a "knowledge broker", i.e. investing in research and working with researchers and practitioners to identify and implement solutions to natural resource management problems. For example, one programme focuses on developing methods for setting environmental flows in rivers. The Natural Heritage Trust is a significant source of funding (Chapter 3).

1.2 National and Australian Government objectives

The *recommendations of the 1998 OECD Environmental Performance Review* of Australia have mostly been implemented (Table 2.1). This chapter considers progress with selected federal water management approaches, as the specific water plans and objectives of individual States and Territories are beyond its scope (Table 2.2). Progress with several *multilateral basin or aquifer-based programmes* is also considered, namely the Murray-Darling Basin Initiative, the Lake Eyre Basin Intergovernmental Agreement and the Great Artesian Basin Sustainability Initiative.

The 1994 Water Reform Framework promoted by the Council of Australian Governments (COAG)[6] was given *fresh impetus* by the more detailed 2004 *National Water Initiative* (NWI). By 2006, all Australian governments had signed up to the NWI, whose overall objectives are to achieve a nationally efficient market and consistent regulatory and planning-based systems for managing surface and groundwater resources (Box 2.1). The States and Territories and the Australian Government, through the Natural Resource Management Ministerial Council and the National Water Commission, periodically report to COAG on progress towards implementing the NWI.

The 2000 *National Action Plan for Salinity and Water Quality* targeted 21 regions most affected by salinity and water quality problems, with the aim of getting all levels of government, community groups, individual land managers and local businesses to work together to manage water quality and address salinity problems. To promote best management practices, as well as repair and rehabilitation activities, AUD 1.4 billion has been committed over seven years, with half coming from the Australian Government and the other half from the States and Territories (Chapters 3 and 5).

1.3 Implementing the Water Management Reform

The need for reform

Over the past 15 years or so, the *sustainability of water resource management practices has become a growing concern*; in 2000, 11% of surface water management areas had been overallocated and 15% approached sustainable extraction limits, while 11% of groundwater management units were overdeveloped and 19% approached sustainable extraction limits (ABS, 2004a). This concern became even more acute over the latter part of the review period, when much of the country suffered below average rainfall, further reducing stream flows and the recharge of groundwater aquifers. In addition, the risk to Australia's water resources is increasing, especially in the form of reduced reliability due to *long-term changes in climate* and *growing demand* from agricultural, mining, industrial and residential consumption (NWC, 2006b).

Table 2.1 **Performance against the recommendations of the 1998 OECD Environmental Performance Review**

Recommendations	Performance
– Continue to implement the water reform agenda; focus on: i) pricing water resources at true cost through removal of subsidies and cross-subsidies, and ii) making institutional changes leading to the separation of service delivery and regulatory functions.	Reform was given new impetus given in 2004. i) mostly achieved in urban areas, but more progress to be made in rural areas, ii) achieved.
– Encourage integrated, river-catchment-based management programmes.	Catchment management bodies were established throughout Australia.
– Pursue initiatives to further reduce point source contamination of watercourses from industrial activities and urban storm water disposal, as well as nutrient and saline inflows from diffuse sources.	Industrial discharges of some substances diminished, but those of some others increased. Salinity issues tackled under the National Action Plan for Salinity and Water Quality. Nutrients remain a problem, but NRM plans address this issue.
– Give greater priority to: ensuring environmentally optimal flows in rivers under stress; making water management more sensitive to the needs of aquatic ecosystems; developing biological indicators of river health; ensuring that flow regimes are based on the principle of mimicking natural flow regimes, within reasonable economic and social constraints.	All these issues are being addressed under the National Water Initiative.
– Increase, through appropriate incentives, community participation in landcare programmes and ensure that the programmes are achieving environmental results in addressing sustainable development issues.	Landcare programmes are now subsumed in NRM plans, which involve extensive public consultation.
– Monitor closely the benefits of operation of the Natural Heritage Trust, and be prepared to increase its funding if necessary.	NHT programmes are reviewed and funding was extended.
– Where existing land use is unsustainable, promote retirement of land from use, particularly as concerns extensive pastoralism.	NRM plans may address this issue (Chapters 3 and 5).

Source: OECD, Environment Directorate.

By adopting the 1994 Water Reform Framework and the 2004 NWI, Australian governments recognised that a *national approach was needed to make more efficient use of water and protect the environment*. Translating the broad principles and objectives of the reform framework and NWI into the legal and administrative

Table 2.2 **Selected national water management approaches**

	Title	Purpose
1992	National Water Quality Management Strategy	Produce policy guidelines to help managers achieve sustainable use of the nation's water resources by protecting and enhancing their quality, while maintaining economic and social development
1992	Murray-Darling Initiative, including: – Integrated Catchment Management Policy – Murray-Darling Basin Cap – Living Murray Initiative	Promote and co-ordinate effective planning and management for equitable, efficient and sustainable use of the water, land and other environmental resources of the Murray-Darling Basin
1993	National River Health Program	Provide a sound information base on which to establish environmental flows and undertake a comprehensive assessment of the health of inland waters, identify key areas for the maintenance of aquatic and riparian health and biodiversity, and identify stressed inland waters
1994/2004	Water Reform Framework/National Water Initiative	Box 2.1 and Table 2.3
1995	National Eutrophication Management Program	Research ways to reduce the frequency and intensity of harmful or undesirable algal blooms in Australian waterways
1997	Great Artesian Basin Sustainability Initiative	Promote co-ordinated groundwater and related natural resource management in an area covering 22% of Australia's territory
1998	Oceans Policy	Integrated and ecosystem-based planning and management for all of Australia's marine jurisdictions
2000	National Action Plan (NAP) for Salinity and Water Quality	Prevent, stabilise and reverse trends in dryland salinity affecting the sustainability of production and the conservation of biological diversity Improve water quality and secure reliable allocations for human uses, industry and the environment
2000	Lake Eyre Basin Intergovernmental Agreement	Promote water and related natural resources management to avoid adverse cross-border impacts in an area covering 17% of Australia's territory
2001	Coastal Catchments Initiative	Deliver significant reductions in the discharge of pollutants to agreed hotspots, where those hotspots have been identified through agreement with the relevant jurisdictions
2003	National Market-based Instruments (MBIs) Pilot Program (part of NAP)	Increase Australia's capacity to use MBIs in managing natural resource issues, in particular to address the problems of salinity and water quality

Source: OECD, Environment Directorate.

Box 2.1 **The National Water Initiative**

Despite the 1994 Water Reform Framework and other water management and institutional arrangements, the *sustainability of water resource management practices* became a growing concern across the continent. This led to the 2004 National Water Initiative (NWI).

The NWI comprises *eight key elements*: i) water access entitlements and planning framework; ii) water markets and trading; iii) best practice water pricing; iv) integrated management of water for environmental and other public benefit outcomes; v) water resource accounting; vi) urban water reform; vii) knowledge and capacity building; and viii) community partnerships and adjustment.

A joint effort by all Australian governments

The 2004 Intergovernmental Agreement on the NWI is a joint effort by all Australian governments to create a *nationally compatible water management framework*. The aim of the NWI is to:

- increase the *productivity and efficiency* of water use, including through i) expansion of water trading, which is expected to allow more cost-effective and flexible recovery of water to achieve environmental outcomes; ii) more secure water access entitlements, better registry arrangements, monitoring, reporting and accounting of water use, and improved public access to information;
- serve the needs of *rural and urban communities*, including through i) transparent and comprehensive water planning based on good science; ii) more efficient management of water in urban environments, e.g. through increased use of recycled water and storm water; and
- safeguard the *health of river and groundwater systems*, including by returning all water systems to environmentally sustainable levels of extraction.

Towards more economically efficient and environmentally effective allocation of water resources

The NWI identifies some 70 actions, of which about half require extensive co-operation among governments to establish common methods and rules for measuring, planning, pricing and trading water. Some of the key elements of the NWI are:

- NWI *implementation plans by all Australian governments*, setting out actions and deadlines required to implement the NWI. The implementation plans need to be accredited by the National Water Commission (NWC).
- *Harmonisation* of the legal and administrative framework in all jurisdictions to conform to the principles of the NWI, including separation of water access entitlements from land titles, establishment of nationally compatible registers of water entitlements and trades, setting of trading rules, and water pricing structures.
- *Statutory water plans concerning all water management* units for which water access entitlements are issued. The plans must define: environmental and other public benefit outcomes (e.g. environmental flows required to maintain the ecological health of rivers) and the management arrangements to achieve those outcomes; volumes of water available for consumptive use in wet and dry periods, by determining shares of the consumptive pool (i.e. water available for consumptive use after ecological needs have been met); and rules for allocating water during the life of the plan.

Source: NWC.

frameworks of the States and Territories, and then making the whole reform work in practice across the country, is a considerable task since the natural water endowment, water laws, management practices and history of water development are different in each jurisdiction. Hence, the challenge is to craft a coherent national framework while allowing sufficient flexibility to take account of the variability among jurisdictions.

A fundamental and far-reaching reform

The NWI is a *fundamental and far-reaching reform* (Box 2.1). Its components concerning water trading are unparalleled in the OECD area. While it derives mainly from a concern for *joining the forces of all Australian* governments, and for *moving towards more economically efficient allocation of water resources* (hence the emphasis on defining clear water access entitlements and removing trading barriers), it recognises the need to sustain the health of aquatic ecosystems. Under the NWI, the *States and Territories operate statutory water plans* that must define the environmental and other public benefit outcomes to be achieved or safeguarded.

Individual water access entitlements are then defined as "shares of the consumptive pool", i.e. as a share of the water available for consumption, rather than as a fixed quantity. In its attempt to provide greater security to investors, the NWI also *allocates the risk* of any future changes in the size of the consumptive pool. Should water availability be reduced due to natural factors or climate change, water users may share in those reductions. If, on the other hand, water availability changes due to an increase in environmental allocation by governments, compensation would be payable.[7] Apart from this, there are no specific mechanisms to ensure access to water as a human right in the reform, or to achieve within Australia the UN Millennium Development Goals concerning water (e.g. through explicit pricing mechanisms for the poor).

The NWI also requires the States and Territories to separate the policy and delivery functions for water supply and wastewater services and to implement *full recovery of the costs of water services, including those of environmental externalities*, in both urban and rural areas (including for water used in agriculture).

The NWI represents a *non-statutory decision* by the relevant Ministerial Councils involving the Australian and State/Territory governments, while States and Territories have the capacity to adopt the statutory documents under State/Territorial laws. There is a specific timeframe, to 2014, set up for implementation of the full reform by the States and Territories.

Recent progress with the NWI

Australia has made steady progress with the nation-wide reforms (1994 Water Reform Framework and 2004 National Water Initiative) of its water management

framework, although delays have arisen concerning several aspects (e.g. on the formulation of interstate trading rules). Under the 2004 NWI, all States and Territories are required to put in place nationally consistent measures (i.e. laws, plans, rules) that will allow the NWI's outcomes to be achieved (Table 2.3). The NWC's most recent assessment (NWC, 2006a) showed good progress overall: most jurisdictions had already passed laws incorporating the principles of the NWI, including the separation of water access entitlements from land titles,[8] and established rules for trading of water within State boundaries.[9] The NWC has formally accrediting the NWI implementation plans for almost all jurisdictions. The conversion of individual titles to the new system, necessary for trading to actually occur, was making progress, albeit rather slowly in some jurisdictions (e.g. Queensland, ACT) (NWC, 2006b). Registers of water access entitlements and trades, also essential for water trading, were established or nearing completion, and jurisdictions were working towards making these compatible on a national scale. Progress was made in most jurisdictions towards making it possible for indigenous water issues to be incorporated in water planning processes.

Water service delivery functions were separated from policy and regulatory roles in all jurisdictions. Steady progress was also made in *changing water price structures* in metropolitan areas, although the price signal in favour of water conservation often remains weak. Most jurisdictions identify the cost of planning and management and factor these into water prices, while some (Victoria, Queensland) already include the cost of environmental externalities as well. The NWI also requires the States and Territories to draw up *water accounts*,[10] and good progress was made on this score.

Progress with other parts of the reform was more uneven across jurisdictions. The NWC expressed concern not only about the pace of progress in formulating the *statutory water plans* in some States, but also about facets such as the quality of the science used and the transparency and quality of *public participation*. More particularly, the Commission raised questions about the adequacy of the *flows reserved for the environment* and the rate at which States are planning to eliminate the *overallocation of water resources*. Progress was also patchy concerning the *recovery of the full cost* of providing water services for agriculture and small towns. In several cases, States continue to fund utilities for what is called community service obligations, but these payments are not always transparent nor is it clear how they will be phased out.

While, in principle, *groundwater* is fully part of the NWI, thus far less attention has been paid to groundwater in practice. This is partly because there is often insufficient knowledge about the connectivity between groundwater and surface water bodies, as became evident in the Murray-Darling Basin when increased groundwater

Table 2.3 **Progress with the implementation of the National Water Initiative**

(as of mid-2006)

Desired outcome	Progress
Clear and nationally compatible characteristics for secure water access entitlements	Legislative framework mostly in place
Transparent, statutory-based water planning	Legislative framework for statutory plans in place
Statutory provision for environmental and other public benefit outcomes, and improved environmental management practices	Good progress in meeting agreed deadlines for finalising water plans in some jurisdictions, but delays in others
Complete the return of all currently overallocated or overused systems to environmentally sustainable levels of extraction	Generally slow progress
Progressive removal of barriers to trade in water and meeting other requirements to facilitate the broadening and deepening of the water market, with an open trading market to be in place	Progress on intrastate trading but barriers remain for interstate trading
Clarity around the assignment of risk arising from future changes in the availability of water for the consumptive pool	Good progress in New South Wales, Victoria and Queensland, but less in other jurisdictions
Water accounting which is able to meet the information needs of different water systems in respect to planning, monitoring, trading, environmental management and on-farm management	Good progress overall
Policy settings which facilitate water use efficiency and innovation in urban and rural areas	Uneven adoption of national water efficiency labelling and standards scheme, and generally good progress on adopting water-sensitive urban design
Addressing future adjustment issues that may impact water users and communities	The impact of climate change is beginning to be addressed; water-sensitive urban design is gaining momentum
Recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource	Generally good progress

Source: OECD, Environment Directorate.

abstraction began affecting surface waters. On the other hand, groundwater abstractions in the Great Artesian Basin (GAB) are being brought under control under the 1997 Great Artesian Basin Sustainability Initiative: a 15-year works programme of bore rehabilitation and bore drain replacement aimed at reducing wastage and

restoring bore pressures. The programme is on track. In early 2005, moratoria were put in place in most GAB aquifers pending the introduction of State water sharing plans. Queensland and South Australia have completed this process.

The challenge ahead

Both the *Australian economy and environment stand to benefit greatly* as the reform progresses. Thus far, implementation has largely focussed on putting in place the new legislative and administrative structures required to effect change in water management practices. As the reform starts to "bite" and directly affect various stakeholder groups, however, implementation can be expected to become harder, e.g. concerning water sharing plans, the allocation of water for environmental needs, changes in water prices, distributional aspects, social externalities and third-party interests, or the *competition between agricultural and urban uses*. The transition from the earlier situation to the new regime therefore needs to be carefully managed, in terms of making sure that all stakeholders stay "on board" and that any arrangements among stakeholders or the modification of local objectives do not compromise the environment. The development of *biofuel crop production* will increase the competition between agricultural and urban uses of water resources.

While the concept of environmental flows is simple, the actual determination of sustainable flow regimes is not (e.g. taking account of seasonality, or the needs of a great variety of aquatic and floodplain species), and there will always be *different views from various stakeholder groups* on how to strike the balance. This is linked to the question of what share of the water secured through the NWI should be allocated to environmental flows. While in some cases water has been returned to the environment relatively easily, stiff resistance can be expected from consumptive users in many cases.

The shift from a predominantly regulatory to a more balanced approach using market-based mechanisms should not be expected to entail any reduction in *transaction costs*, especially in terms of the information requirements (e.g. measuring water flows and diversions, water accounts, administering registers, enforcement) of the new management regime. Indeed, the establishment of *legally enforceable property rights for access to water* increases rather than diminishes the need for a thorough understanding of the hydrology and ecology of aquatic habitats. The *risk sharing arrangements* agreed to under the NWI mentioned above accommodate this concern, at least until 2014, after which a share of the risk will be borne by governments. This may mean that the risk of gradual, longer-term changes in the hydrological regime due to *climate change*, which may not be quantifiable before 2014, will largely fall on the community at large.

2. Restoring the Murray-Darling Basin System

The Murray-Darling Basin (MDB) *covers most of inland south-eastern Australia* in four States (New South Wales, Victoria, Queensland and South Australia) and the Australian Capital Territory (ACT); it comprises 14% of the country's land area.[11] The MDB includes much of the country's best farmland, including three-quarters of all irrigated land, and over 2 million people. It is the source of around two-fifths of all consumptive water use in Australia. Use of the MDB's water resources[12] continues to have large economic benefits, but the median annual outflow to the sea is now much less than it would have been in the absence of development (Table 2.4). The lower reaches of the Murray River experience severe drought-like flows in over 60% of years, compared with 5% of years under natural conditions. The ecology of the river's wetlands and floodplains is also affected by the presence of weirs and diversion structures, as well as by the changed flooding regime (Box 2.2).

In the face of these problems, the governments involved have, since the early 1990s, taken action and committed significant resources towards restoring the Murray-Darling Basin. The 1992 Murray-Darling Basin Agreement heralded the beginning of a more comprehensive approach that widened the initial concerns over water volumes to water quality, salinity and ecological aspects. An important step was agreement on limiting the volume of water that can be abstracted for consumptive uses to 1993/94 levels,[13] called the Murray-Darling Basin Cap. The Living Murray Initiative, aimed at restoring the Murray River to good ecological health, followed.

Table 2.4 **Average annual water balance for Murray-Darling Basin rivers**

(GL/year)

	Natural conditions	Current conditions
Runoff	23 850	23 850
Interbasin transfers	0	1 200
Diverted	0	11 580
Evaporated from reservoirs	0	1 430
Consumed by wetlands, floodplains, etc.	10 960	6 970
Outflow to sea[a]	12 890	5 070
Outflow to sea as a % of runoff	*54*	*21*

a) The mean annual outflow at the mouth of the Murray River is 12 890 GL under natural conditions, while the mean annual runoff is 23 850 GL, indicating that nearly 50% of water is lost through natural processes before reaching the sea.

Source: Murray-Darling Basin Commission.

Box 2.2 **Saving floodplain vegetation in a Murray River drought**

In July 2006 the Murray River system was entering its *sixth consecutive year of drought*, which promised to be the worst since that observed between 1895 and 1903. This drought is not only causing financial and social hardship in many communities, but also puts the river's floodplain under severe environmental stress.

The drought, combined with high utilisation of the river system, poses a *major threat to the health of large parts of the floodplain*. A 2004 survey of the health of river red gum (Eucalyptus camaldulensis Dehnh.) and black box (Eucalyptus largiflorens F. Muell.) in the lower Murray showed that 75% of all trees surveyed were stressed, nearly dead or dead. Only 25% of trees surveyed were considered to be in healthy condition. Should the drought continue, and in the absence of human intervention, many more trees may die or become severely stressed.

During the past few years, water from the river was pumped as an *emergency measure* to relieve pressure on the floodplain vegetation at *six* "*icon sites*" designated for priority action under the Living Murray Initiative. The Hattah Lakes, one of the icon sites, are located in the Murray River floodplain (not far from the town of Mildura in western Victoria) and are among the 17 freshwater lakes in the 48 000 ha Hattah-Kulkyne National Park. The Hattah Lakes are Ramsar listed and part of a UNESCO Biosphere Reserve. Migratory birds listed under JAMBA and CAMBA (agreements on migratory birds between Australia, Japan and China), as well as the Bonn Convention, use the lakes. The site has a diverse range of wetlands and can support a wide array of flora and fauna. Of the water pumped into the lakes in 2005, private irrigators donated 1.3 GL.

At another icon site further upstream, the Barmah-Millewa Forest and parts of the Edward/Wakool system were comparatively better off. The Barmah-Millewa Forest received a *vital watering* in the spring of 2005 (for the first time in five years), enhanced considerably by using an environmental water allocation that had accumulated over time. The additional river flow resulting from the spring rain presented several opportunities to provide water for the environment. Localised benefits were achieved across the system using surplus flows in excess of South Australia's entitlement, as well as existing environmental water allocations. Water was delivered to sites by various means, including weir pool manipulation, pumping/siphoning, management by forest regulators and management of the Murray Mouth Barrages.

Overall, 36 000 ha of the Murray floodplain was watered, resulting in the recovery of many trees. However, this area represents *less than 1% of the total floodplain area*, with large areas remaining in desperate need of water. During 2005-06, over 700 GL of water was released from barrages and fishways were open continuously. These conditions enhanced fish spawning and recruitment. In the Coorong National Park, a Ramsar site near the river mouth, localised improvements in estuarine conditions were also achieved. Nevertheless, the total release remained well below the long-term median flow of 3 090 GL and the ecological health of the Coorong continued to decline.

Source: MDBC.

2.1 Murray-Darling Basin Cap

The Murray-Darling Basin Cap was introduced in 1997 and is being *implemented in accordance with a set of formal rules* incorporated in the Murray-Darling Basin Agreement and subordinate texts in 2000; these rules are quite complex and allow scope for greater water use in certain years and lower use in others. Water used by any new development should be sourced from the trading of water entitlements. Allowable abstractions are determined on a valley-by-valley basis by comparing the annual diversions in 22 designated valleys (i.e. sub-basins) against an annual diversion target. An independent audit group (IAG) evaluates compliance with the cap by the MDB States and the ACT.

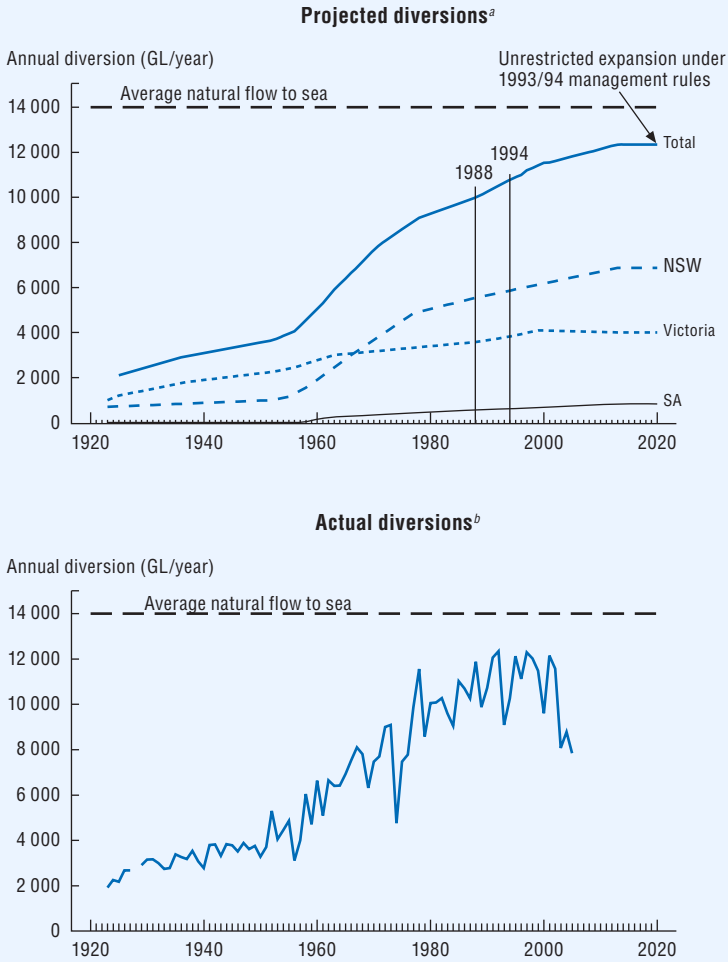
The MDB is a highly regulated (i.e. incorporating many flow-regulating structures) system in which, with the help of computer models,[14] water is stored in and released from reservoirs in accordance with the needs of water users and to maintain the health of the river and its wetlands and floodplains (Box 2.2). The Cap is *already having an effect in preventing the growth in abstractions* that would have occurred in its absence (Figure 2.1). Nevertheless, implementation of the Cap is not straightforward; in New South Wales (which uses about half of all water in the MDB), for example, the Cap was exceeded in 2003/04 and again in 2004/05.

Indeed, the *Cap will not be fully operational until some time in 2007*. The most recent audit (IAG, 2006) found that Cap figures had yet to be determined for some valleys (e.g. in Queensland, ACT) and that river abstraction simulation models had not been finalised. An earlier review (Marsden Jacob Associates, 2005a) identified the need to improve reporting and data management systems used for the Cap implementation; it also suggested that in view of the rising value of water, abstractions need to be measured more accurately.[15] None of these problems is insurmountable, especially since there appears to be no lack of political will to resolve these and other issues identified by the audits. Full implementation of the Cap, however, will in itself not achieve the sustainability of the Murray-Darling system since the current water allocation in the Basin, at about 11 600 GL/year, still exceeds the estimated sustainable yield of about 9 000 GL/year.

2.2 Salinity management

A 1999 audit of the Murray-Darling Basin Commission *1988 Salinity and Drainage Strategy* found that the reduction in lower River Murray salinity achieved by the strategy would be cancelled out within 20 to 30 years and that i) average river salinities in key tributary rivers would rise significantly, compromising their use for irrigation and urban purposes within 20 to 50 years; ii) about 3.4 million ha of land would be salt-affected within 50 years; iii) river salinities are having serious impacts

Figure 2.1 **Growth in water use in Murray-Darling Basin**



a) Average modelled values. Diversions from Queensland and ACT are smaller than those from South Australia.
b) The decrease in diversions in recent years reflects mainly drought conditions.
Source: Murray-Darling Basin Commission.

on floodplain wetlands of national and international importance; and iv) impact costs of dryland salinity in eight tributary valleys are estimated to be AUD 247 million per year. The audit also concluded that dryland farming and grazing will generate the most increases in salinity (Chapters 3 and 5).

In response, the MDBC adopted a new *Basin Salinity Management Strategy 2001-15*. As with the implementation of the Cap, an independent audit group (IAG – salinity) was established to evaluate progress. The new strategy addresses both dryland[16] and irrigation salinity[17] and proposes to: i) maintain water quality in the Murray and Darling rivers, as measured by river salinity at Morgan, South Australia, at less than 800 EC[18] 95% of the time; ii) control salt loads in all tributary rivers of the Murray-Darling Basin at agreed end-of-valley targets, to be achieved by 2015; iii) control land degradation and protect important terrestrial ecosystems, productive farm land, cultural heritage and built infrastructure at agreed levels.

Considerable *practical experience has already been gained with salinity management since 1988*, but the 2001 strategy represents a more sophisticated approach involving tighter control and accounting (e.g. salinity registers, models). Progress has been made since 2001 in setting up administrative arrangements (e.g. end-of-valley targets were set for all valleys by 2005), but as of mid-2006 these arrangements had not yet been completed. As for results on the ground, in 2003-04 salinity at Morgan was below 573 EC 95% of the time, a good result achieved through salt interception schemes[19] as well as other factors, such as the drought, which reduced higher salinity drainage and tributary flows. Implementation of land-based measures is largely through the NRM plans of catchment management bodies; AUD 100 million was allocated in 2003-04 for a range of projects (MDBC, 2004).

2.3 Living Murray Initiative

Under the 2004 Living Murray Initiative[20] AUD 500 million[21] was committed over five years to *address water overallocation in the Murray-Darling Basin* to achieve the MDB's environmental objectives. The initial focus was on achieving specific environmental outcomes for six significant ecological assets[22] along the Murray River (Box 2.2). The objective is to return, as a first step, 500 GL of water per year to the river through a range of infrastructure improvement aimed at reducing losses from evaporation and seepage (e.g. pipelines, lining of irrigation channels, installation of metering systems). The first four proposals from New South Wales and Victoria are expected to recover 240 GL at a cost of AUD 179 million, i.e. nearly half the water under the First Step decision costing about 35% of the allocated budget. Approved projects are entered in a register (the Eligible Measures Register) that keeps track of implementation. The 500 GL is only a beginning, however, as much more water is needed to restore the river to good health.

3. Making Better Use of Water Resources

Australia's water supply industry consists of *479 rural/irrigation and urban water providers*.[23] They supplied a total of 12 784 GL in 2000-01 (up 11% from 1996-97). The 80 or so irrigation/rural providers supplied 63% of total production. Most States have one or two major water companies (e.g. Sydney Water, Murray Water) with more than 50 000 connections each. The great majority of providers are non-major urban, with up to 50 000 connections each.

Consumptive use of water increased by almost half in the period 1983-84 to 2000-01, but then fell as a result of the multi-year drought (Box 2.3). Although the overall pressure on Australia's water resources statistically is well below the OECD mean (Figure 2.2), this national average does not reflect regional differences and the fact that Australia is the driest permanently inhabited continent, receiving less than 600 mm of rain per year over 80% of its area and less than 300 mm over 50%. Reported combined systems losses by all providers amounted to 18% of total supply or 2 022 GL in 2004-05. Irrigation/rural water providers reported losses of 23%, metropolitan providers 11% and non-major providers 15% (ABS, 2004).

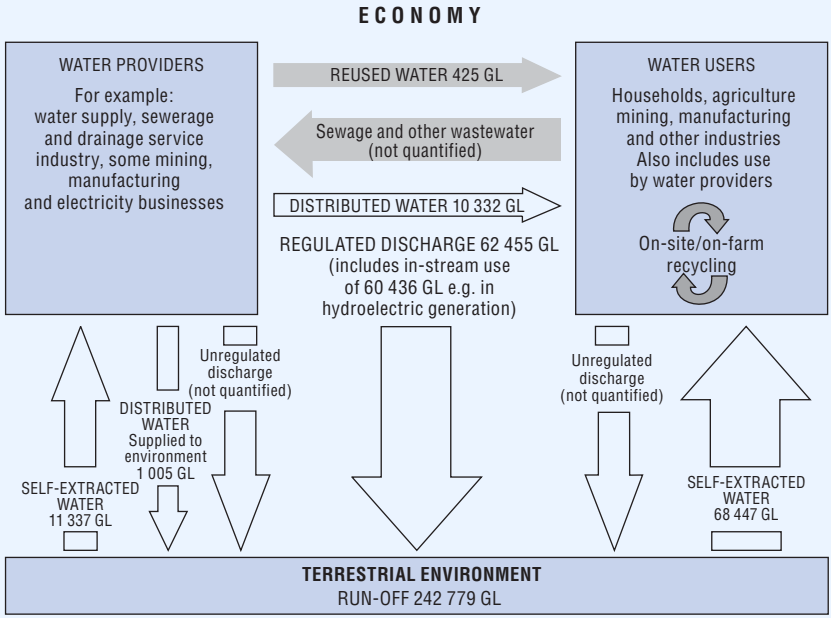
Hence, *water conservation and water use efficiency*[24] *must feature high on the water management agenda*. Efforts to improve the economic efficiency of water use under the NWI through trading (Box 2.4) and water pricing and financial incentives have an important role to play.

3.1 Water use in agriculture

In 2004-05, diversions for agriculture represented two-thirds of all water diversions (Box 2.3). The total *irrigated area accounted for 0.5% of total agricultural land* (2.4 million ha in 2003-04), but irrigated farm revenue (AUD 9.6 billion) represented 23% of total agricultural production and *51% of total agricultural profit* at the turn of century. The value of production is heavily dependent on the type of irrigation system used, with the more controlled systems yielding greater value. In the Murray and Murrumbidgee basins,[25] for instance, an estimated 40% of total production value comes from the 17% of the irrigated area using sprinkler and microspray systems, mainly for horticulture and vegetables (the remaining 83% of the area uses surface methods, i.e. flood and furrow, irrigation, mainly for pastures and annual crops).[26]

Between 1990 and 2000 the *area of irrigated land increased by 30%*, or more than half a million hectares; growth was strongest in Queensland, where an additional 236 000 ha were put under irrigation. At the same time, there was a move towards

Box 2.3 **Water in the Australian economy,** 2004-05



About 79 784 GL of *water was extracted* from Australian rivers and aquifers in 2004-05. About 75% of this volume was used to generate hydroelectricity and the remaining 25% was consumptive use. Consumptive use increased from 14 600 GL in 1983-84 to 21 703 GL in 2000-01 and then, as a result of the prevailing drought, fell again to18 767 GL in 2004-05.

The *agriculture sector* accounted for 12 191 GL or 65% of total consumptive use in 2004-05 (down from 14 989 GL in 2000-01). The largest volume of water within the sector is used by livestock, pasture, grains and other agriculture (4 374 GL), cotton (1 822 GL), dairy farming (2 276 GL) and grapes (717 GL).

In the same year, *manufacturing industry* used 589 GL or 3% and mining accounted for 413 GL or 2%. The remaining industries used 1 059 GL or 6%. The electricity and gas sector (excluding in-stream use for hydropower) accounted for 271 GL or 1% of total consumption in 2004-05, whereas the water supply, sewerage and drainage services sector used 2 083 GL or 11%, for internal use, including losses in reticulation (channels and pipes) systems.

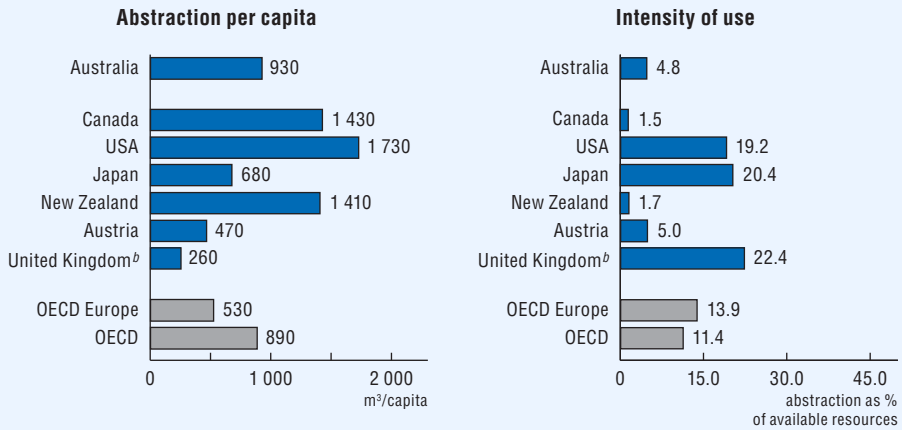
Overall water consumption by *households* accounted for 11% of total consumption. At 2 108 GL in 2004-05, household consumption was 7% lower than in 2000-01, but 15% greater than in 1996-97 (1 829 GL) and 24% higher than in 1993-94 (1 704 GL). The average domestic water use of 103 kL (kilolitres)/person/day – ranging from 84 kL/person/day in New South Wales to 153 kL/person in the Northern Territory – is high compared to that in other OECD countries; between 25 and 50%, depending on location, of domestic water is used for outdoor purposes (e.g. gardening, car washing).

Box 2.3 **Water in the Australian economy,** 2004-05 *(cont.)*

Re-use of water increased greatly, from 134 GL in 1996-97 to 507 GL in 2000-01, but then fell to 425 GL in 2004-05, largely as a result of reduced availability of water in the agriculture sector. Re-used water represents about 4% of the total volume supplied by water providers. Households experienced a ten-fold increase in the use of re-used water in the five years to 2004-05, although the volumes involved remained small (167 to 1 767 ML).

Source: ABS, 2006.

Figure 2.2 **Freshwater use,** 2004[a]



a) Or latest available year.
b) England and Wales only.
Source: OECD, Environment Directorate.

more efficient irrigation methods: around 30% of irrigators reported using spray, microspray or drip irrigation methods in 2000, compared to 23% in 1990. In many parts of the country, the water required for further growth in irrigated areas needs to be found through efficiency gains in existing systems.

The *delivery efficiency* of water supply systems (i.e. from diversion to the farm gate) appears to have improved during the review period. A 2003/04 benchmarking

Box 2.4 **Experience and experimentation in trading**

The legal and regulatory context

Current efforts under the National Water initiative (NWI) to facilitate water trading build on a *history of temporary and permanent trading* dating back to 1983, when South Australia became the first State to introduce temporary water entitlements. Since then, State/Territory laws have made trading possible in all jurisdictions, but various restrictions on trading (other than those intended to protect the environment) remain mainly aimed at shielding existing uses and third-party interests.

Most trading occurs in *regulated water systems*, i.e. systems with engineered infrastructure such as dams, which allow water to be diverted and stored when stream flow is plentiful and then released later according to the needs of water users and ecological requirements. Australia has more than 500 large dams, mostly built since the 1970s, with a total storage capacity of about 85 000 GL (to be compared to a total annual water use of about 25 000 GL). In addition, there are many smaller dams (i.e. with a retaining height of less than 15 metres). Trading varies from one year to the next, depending on weather conditions.

Significant trading in the agriculture sector

Most trading has occurred *in the agriculture sector*. In the case of temporary trades (i.e. on a yearly basis), this often involves trade between farmers in the same irrigation system; in the case of permanent trades, a typical case may entail a shift from sheep and cattle farming to a dairy or horticultural venture in a different location. In the Murray basin, for example, 120 GL "moved" from pasture irrigation to horticultural uses further downstream. So far, most trading has taken place in New South Wales, Victoria, Queensland and South Australia.

Trading is a significant element of water use practice. Across Australia, a volume in the order of 1 300 GL was traded in 2004-05 (i.e. about 7% of total water consumption), of which 1 053 GL was temporary trade and the remainder permanent trade. According to one estimate concerning Victoria, about 6% of water entitlements was traded permanently to a new location during the 1990s; between 3 and 8% of annual water use was traded temporarily in the second half of the same decade. As can be expected, in any one year temporary trading typically exceeds permanent trading by a large margin. In Victoria in the 2004-05 season, total trade amounted to about 500 GL, of which 11% was permanent trade. In the 2000-01 season, the volume traded in the ten irrigation areas of New South Wales amounted to about 624 GL, of which about 7% was permanent transfers. In South Australia in the same year, permanent trade actually exceeded temporary transfers, representing 51% of a total volume of 105 GL.

Although most salinity trading has so far occurred within individual States, some *interstate trading*, often under pilot schemes ahead of formal general arrangements, has occurred in the Murray-Darling Basin since 1998 (up to a total of about 15 GL in the first three years). Most of the water traded was "sleeper water", i.e. water not being used by the current licence holder. Pending efforts under the NWI to simplify interstate trading, trading remains quite complex owing to the different trading rules applying in each State.

Box 2.4 **Experience and experimentation in trading** *(cont.)*

The *price of water* obtained through temporary trading fluctuates from year to year, depending on weather patterns. For instance, in the Greater Goulburn Zone (Northern Victoria) average temporary trading prices ranged between AUD 40-80 per ML (thousand cubic metres) during the period 1998-2001. In South Australia, prices for permanent trade amounted to approximately AUD 1 000 per ML during the same period.

Water quality trading

Finally, some water quality trading is also occurring. One particular example of "water trading" is the Hunter River Salinity Trading Scheme in New South Wales, which is a "cap and trade" scheme to regulate *salt discharges* from 20 mines and two electricity generators along the river. "Opportunities to discharge" or credits can be traded. One credit gives the holder the ability to discharge as saline water 0.1% of the daily total allowable discharge of salt to a "block" of water in the Hunter River during days of high flow. There are 1 000 credits, and a "block" is the body of water that passes a particular point on the river (Singleton) each day. Examples of experimentation in *nutrient trading* exist in Western Australia (Busselton), New South Wales (South Creek) and Queensland.

Source: ABS, 2004b.

survey (ANCID, 2005) of 32 irrigation water supply enterprises responsible for a total irrigation diversion of 7 802 GL (i.e. about half of all irrigation diversion in Australia) indicated an improvement between the 1999/2000 and 2003/04 seasons of 87 to 90% for predominantly piped systems, and of 69 to 77% for mainly open channel systems, i.e. close to what is technically achievable. Significant progress was also made among the same group of companies with the use of water meters: the share of metered supply points grew from 93 to 97% for surface water points, that of groundwater points used for irrigation from 46 to 86%, and that of those used for stock and domestic supply from 76 to 82%.[27]

A delivery efficiency of 78% (i.e. consistent with the results of the ANCID survey) was found in a large study of ten irrigation areas in the Murray and Murrumbidgee basins, which also considered *water losses within the farm gate* (CRCIF, 2005). The amount of water applied to crops amounted to 60% of diversion, and the amount beneficially used through crop transpiration was 42% of diversion. These latter two components of water use efficiency, both actual and potential, are

strongly dependent on the type of irrigation system. In any case, there is still plenty of potential for water savings, and for obtaining more value out of irrigation water, without increasing diversions from the environment. Indeed, given the current overallocation in many water systems, some of the water savings achieved through technical and engineering measures should be returned to the environment, as is already happening under the Living Murray Initiative.

3.2 Urban water use

Overall *household water consumption grew to 2 278 GL* (of which about 1 200 GL was consumed by the more than 12 million inhabitants of the major cities) in 2000-01, then fell to 2 108 GL in 2004-05, representing 11% of total water consumption in that year (Box 2.3); annual average per capita use fell from 120 kL to 103 kL over five years to 2004-05 mainly as a result of the water restrictions that prevailed in many areas. Difficulties are being experienced in supplying major urban areas, and more progress needs to be made in constraining urban water use and accessing new sources of supply (including through trading). The Australian population is expected to grow by 25% over the next 25 years, and forecasts by the Water Services Association of Australia suggest that at present consumption levels all major cities except Canberra would exceed the sustainable yield of their supply systems by 2030.

More recent figures collected on 29 *major urban water utilities* indicate a fall in water consumption of 2.1% in 2004/05 compared to the previous year in the country's major cities, despite a population growth of 1.55% in the same year (WSAA, 2006). The same figures suggest a drop in per capita consumption of 15% to 230 litre/head/day in the four years since 2000/01. The decrease can at least partly be explained by the water restrictions imposed in major cities. In the Australian experience, public compliance with drought restrictions on water use is generally good and restrictions are much more readily accepted than pricing measures. However, increased awareness of water scarcity may facilitate the acceptability of the price signals, prompting citizens to change their water use habits[28] and install dual-flush toilets, water-efficient shower heads and washing machines, and water tanks for watering gardens.[29] The urban water industry itself has made progress in recent years in reducing leakage and water loss from its water distribution networks. Measured in terms of the industry's Infrastructure Leakage Index, the median score for the urban water industry fell from 1.9 in 2002-03 to 1.3 in 2004-05 (WSAA, 2006).

3.3 Water re-use

Re-use of water is becoming an integral part of overall water supply in Australia. The share of re-used water is still modest, but it grew rapidly during the review period, making up 4% of total water supplied by water providers in 2000-01 compared to 1% in 1996-97. Agriculture, with 82% of all re-used water, was the largest reusing sector, followed by the services and administrative sectors with 7%, the water supply industry with 4%, manufacturing with 3%, and mining with 1%. In 2001-02 a total of 166 GL of effluent (9% of total effluent) was re-used. In the capital cities, the share of recycled water use (from sewage effluent) ranged from 0.1% in Hobart to 11% in Adelaide. Victoria aims to recycle 20% of sewage effluent by 2010. *Industrial (manufacturing plus mining) water use*, at about 6% of total use, is falling as industries become more water efficient through increased water recycling and efforts to reduce energy use.

The NWI also aims to encourage more comprehensive management of the *urban water cycle*, taking account of water supply, wastewater and storm water drainage in an integrated way and trying to close loops, as much as possible, in favour of the current linear approach of capture-purification-use-treatment-disposal. The water cycle approach was strongly recommended by the Australian Senate following an inquiry in 2002, and is beginning to gain some momentum among local bodies. Such water-sensitive urban design should be further encouraged.

3.4 Droughts, floods and coastal storms

The 1992 National Drought Policy is aimed at assisting farmers to be more self-reliant (Table 2.2). While *droughts are generally accepted as a normal aspect of the Australian climate* which must be factored into normal agricultural risk management decisions, rather than as natural disaster crises, financial assistance is available in exceptional circumstances. As the current drought continued into the southern spring of 2006, the Australian Government allocated AUD 2.1 billion for drought relief in 64 areas representing 38% of all agricultural land in Australia, at the same time sparking a *debate about the future sustainability of farming* on the continent in the face of ever more frequent droughts. The Australian Government also finances research aimed at improving long-range weather forecasting, drought monitoring, simulation modelling of changes in soil moisture and vegetation growth, and the development of decision support systems for farmers and regional managers.

Australia also is subject to *flood hazard*, which is primarily the responsibility of the State/Territory and local governments. In addition to traditional engineering measures to contain floods, measures such as designating flood hazard zones, setting

building line restrictions, and raising or flood-proofing houses have been practised since the early 1980s although it is not clear how effective the latter have been. In addition, the federal Department of Transport and Regional Services operates the Natural Disaster Mitigation Program, which provides financial assistance (up to about one-third of project costs) for both structural works and planning measures. The effects of climate change are amongst the issues addressed by coastal hazard studies used to identify areas exposed to coastline retreat and inundation.

With water resources and agricultural systems already heavily stressed by natural extremes of climate in many parts of the country, Australia appears *very vulnerable to all the predicted effects of climate change*.[30] Australian governments are already considering how to adapt to climate change, and water-related factors are clearly a pivotal element of the adjustments likely to be required (Allen Consulting Group, 2005). The potential impact of climate change on water resources has also been considered in several cases (e.g. the MDB, Great Barrier Reef) and is a variable in the risk sharing arrangement agreed to under the NWI.

4. Water Quality

4.1 Freshwaters

State

The need for reliable sources of water for agriculture and urban supplies in Australia's dry and highly variable climate has led to the construction of many dams and weirs. As a result, the *natural flow regime of many of the country's rivers has been strongly modified*, which together with changes in catchment condition has had a great impact on water quality and aquatic habitats. According to one measure, the River Environment Index, which takes account of catchment disturbance, habitat, hydrological disturbance, and nutrient and suspended sediment load, only 14% of river length (out of the 90% of total river length for which data are available) can be characterised as largely unmodified, while 66% was moderately modified and 19% substantially modified (NLWRA, 2002; Table 2.5).

The most recent data (from 2001) show that high *turbidity* is a worsening water quality issue for Australia. This partially natural phenomenon (due to the country's highly erodible soils and stream banks) is a major water quality issue in three-fifths of 73 assessed basins. The areas most affected include most inland and lower rainfall basins in the northeast, most of the Murray-Darling Basin and the more intensively developed coastal basins of the southeast coast. Turbidity is generally a lesser issue in relatively well forested, less developed and higher rainfall coastal basins.

As for *nutrients*, widespread exceedances of water quality guidelines continued to occur across Australia, mostly in the more intensively developed basins on the

northeast, southeast and southwest coasts and the Murray-Darling Basin. Freshwater algal blooms alone were estimated to cost between AUD 180 and 240 million each year (LWRRDC, 2000). Nutrients are a major water quality issue in about 60% of 78 assessed basins. Both positive and negative trends were observed during the review period. For instance, decreasing concentrations were recorded in six basins with exceedances in the Murray-Darling catchment, while two basins had increasing nutrient concentration trends. In the coastal basins of southern Victoria six basins showed increasing nutrient concentrations while three showed a decreasing trend.

Notwithstanding the above findings, an evaluation of the *biotic condition of Australia's rivers*, as measured by the Aquatic Biota Index (macro-invertebrates), suggests that the state of more than two-thirds of assessed rivers (48 793 km) is good while one-third (21 909 km) of the river length assessed has lost between 20 and 100% of the various kinds of aquatic invertebrates that should be present (Table 2.6). There could be several reasons why the biota index does not show the same degree of degradation as the environment index; for instance, macro-invertebrates may be insensitive to some environmental changes, including large-scale changes (e.g. in connectivity and catchment disturbance), and to changes in some riverine habitat components (e.g. in salinity). The inclusion of other biota (e.g. streamside and aquatic plants, algae, fish or water birds) in the index would provide a more comprehensive assessment of the cumulative effects of environmental change.

Table 2.5 **River environment index,** States and Territories

(km)

	Total length of reach (km) in each category and (%)				% of total length with data
	Largely unmodified	Moderately modified	Substantially modified	Extensively modified	
New South Wales	1 619 (*3*)	39 232 (*68*)	17 089 (*29*)	18 (*0*)	*97*
Victoria	3 085 (*20*)	9 042 (*60*)	3 099 (*20*)	0 (*0*)	*97*
Queensland	8 743 (*13*)	48 214 (*71*)	10 599 (*16*)	0 (*0*)	*93*
South Australia	299 (*4*)	4 666 (*61*)	2 635 (*35*)	0 (*0*)	*79*
Western Australia	1 487 (*7*)	15 927 (*78*)	2 929 (*14*)	12 (*1*)	*80*
Tasmania	2 028 (*37*)	3 250 (*59*)	194 (*4*)	0 (*0*)	*98*
Northern Territory	9 165 (*66*)	4 630 (*34*)	0 (*0*)	0 (*0*)	*67*
ACT	43 (*16*)	191 (*71*)	36 (*13*)	0 (*0*)	*100*
Total	26 468 (*14*)	125 152 (*66*)	36 581 (*19*)	31 (*1*)	*90*

Source: National Land and Water Resources Audit, Assessment of River Condition 2001 Database.

Table 2.6 **Aquatic biota index,**[a] States and Territories

(km)

	Total length of reach (km) in each category and (%)				% of total length with data
	Reference	Significantly impaired	Severely impaired	Extremely impaired	
New South Wales	11 366 (*50*)	7 551 (*34*)	2 801 (*13*)	690 (*3*)	*38*
Victoria	9 347 (*76*)	2 447 (*20*)	344 (*3*)	49 (*1*)	*77*
Queensland	9 334 (*80*)	1 997 (*17*)	250 (*2*)	16 (*1*)	*16*
South Australia	7 866 (*83*)	1 098 (*12*)	124 (*1*)	389 (*4*)	*98*
Western Australia	4 401 (*64*)	1 977 (*29*)	419 (*6*)	31 (*1*)	*27*
Tasmania	4 248 (*75*)	1 097 (*20*)	142 (*3*)	100 (*2*)	*100*
Northern Territory	2 063 (*88*)	247 (*10*)	47 (*2*)	0 (*0*)	*11*
ACT	169 (*64*)	76 (*29*)	17 (*7*)	0 (*0*)	*97*
Total	48 793 (*69*)	16 490 (*23*)	4 144 (*6*)	1 275 (*2*)	*34*

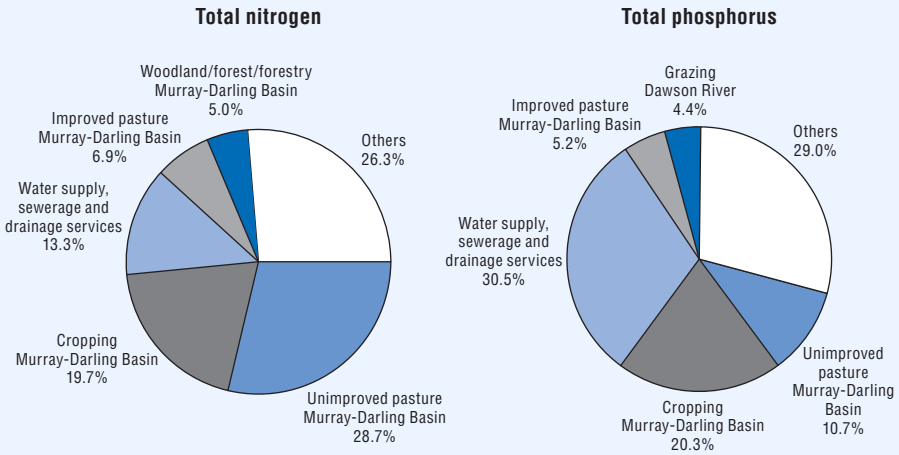
a) Macroinvertebrates.
Source: National Land and Water Resources Audit, Assessment of River Condition 2001 Database.

Pressures

The main pressures on Australian inland waters emanate from diffuse agricultural discharges of nutrients, sediments and pesticides. Nationwide, *discharges to water of nutrients* were heavily concentrated in the Murray-Darling Basin. Total nitrogen discharges were dominated by diffuse emissions from unimproved and improved pastures, cropping and woodland in the MDB, but point discharges from wastewater treatment stations were a significant source in 2004-05 (Figures 2.3 and 6.3). Point-source discharges from wastewater treatment stations represent almost one-third of total phosphorus. Monitoring of pesticides in the environment is lacking (Chapter 6).

Concerning *other water pollutants*, between 2001 and 2004 an increase in point-source discharges to inland waters have been reported to the National Pollutant Inventory for several substances (e.g. sulphuric acid, manganese, copper, ethanol, zinc) while reported discharges from facilities have declined for ammonia, total phosphorus, fluoride and chlorine. The apparent increase in emissions during this period may, in some cases, be more indicative of more facilities coming on board with reporting than of actual increases in emissions (Table 2.7).

Figure 2.3 **Australia's emissions of nitrogen and phosphorus,** by source, 2004-05



Source: National Pollution Inventory.

Table 2.7 **Point source discharges to water,** 2001-04

Substance	Total for facilities[a] (kg)		% change 2001-04	No. of facilities[a] reporting	
	2001	2004		2001	2004
Total nitrogen	38 412 997	4 137 056	*–89*	127	98
Sulphuric acid	41 540	1 335 691	*3 115*	26	23
Ammonia (total)	15 575 670	1 233 189	*–92*	74	106
Manganese and compounds	44 917	1 148 659	*2 457*	37	121
Total phosphorus	18 000 000	9 000 000	*–50*	247	219
Oxides of nitrogen	0	677 582	*0*	12	61
Total VOCs	169 324	295 811	*75*	80	205
Ethanol	59 224	290 431	*390*	5	16
Zinc and compounds	152 386	285 994	*88*	62	124
Chlorine	396 212	211 563	*–47*	48	60

a) All figures for facilities located at more than 10 km from the coast.
Source: State of the Environment Report 2006.

4.2 Estuaries and coastal waters

Many parts of Australia's coastline (which is as long as the earth's circumference) are little inhabited or developed, and the *state of coastal waters* in these areas can be expected to be good, although little nationwide information is available to confirm this. Where development has taken place, however, coastal water quality is often impaired to some degree.[31] In 2002, 50% of Australian *estuaries* were assessed as being near pristine (these were mostly estuaries with small catchments) and 22% as largely unmodified; 19% were modified and 9% extensively modified (NLWRA, 2002). The more modified estuaries, which are often also larger ones near population centres, suffer chronic algal blooms.

Most Australians live in towns and cities and about 85% of the population resides within 50 km of the coast, thereby exerting *pollution pressures* on estuarine and coastal waters at some locations. Rivers discharging nutrients and sediments from inland areas into coastal waters add to this pressure. For example, the amounts of total phosphorus and total nitrogen transported each year from areas of intensive agriculture to the coastal waters of the far North, northern Queensland, Moreton Bay (near Brisbane) and coastal New South Wales are estimated to be nearly three and two times, respectively, higher than would have occurred before European settlement. Pressures on Australia's inshore coral reefs continue unabated from the downstream effects of land use and other human activities (Box 2.5).

5. Economic and Financing

Trading water access entitlements is innovative and brings significant efficiency benefits in the agriculture sector (as it covers some 7% of total annual water use) (Box 2.4). This is higher than experienced in other parts of the world (e.g. Chile). Nevertheless, water prices and charges, as well as government interventions, remain the key instruments shaping the overall efficiency performance of water management in Australia.

5.1 Water prices

Under the NWI, Australian governments have committed themselves to implementing *nationally consistent water pricing policies* for all types of water services[32] in both urban and rural areas. The intention is to achieve full-cost pricing, which is comprehensively defined as operational, maintenance and administrative costs, externalities (defined as the environmental and natural resource management costs attributable to and incurred by the water business), taxes or tax equivalents (not

Box 2.5 **The Great Barrier Reef Water Quality Protection Plan**

The *Great Barrier Reef World Heritage Area* has outstanding natural values. It makes a major contribution to the local, regional and national economy, as well as being of major social significance to Australians. Along with the largest system of coral reefs in the world, the reef is home to extensive seagrass beds, mangrove forests and sponge gardens. Many of the reef's marine species rely on coastal freshwater wetlands and estuaries as breeding and nursery areas.

The majority of the 2 900 reefs of the Great Barrier Reef are in good condition, but some of the *450 inshore reefs face an increasing threat from a decline in the water quality* in the reef lagoon. Extensive land development for urban development, agriculture, tourism and mining in the catchments adjacent to the reef has led to increased pollution loads being carried by rivers to the lagoon.

In response, the Australian and Queensland governments adopted the *Reef Water Quality Protection Plan* (Reef Plan) in December 2003 with the ten-year goal of halting and reversing the decline in the quality of the water entering the Great Barrier Reef. The Plan, which builds on earlier efforts by the two governments, particularly focuses on diffuse sources of catchment pollution, since point sources such as mines and sewage treatment plants are already regulated.

Catchment management bodies with catchments opposite the reef play a key role in the implementation of the Reef Plan, as they are the main drivers of the *regional natural resource management (NRM) plans* and regional investment strategies. The NRM plans identify targets for the regions' natural resource management and detail catchment-wide activity in land and water management, biodiversity and agricultural practices. State-level programmes such as the Queensland Wetlands Program will also contribute. The Queensland Wetland Program is an NHT joint State/Australian Government programme. Other mechanisms include Australian Government funding of water quality improvement plans under its Coastal Catchment Initiative, and some actions approved under the National Action Plan for Salinity and Water Quality.

The success of the Reef Plan will also greatly depend on the *efforts of private landholders*. The Farm Management Systems promoted by the Queensland Farmers' Federation are voluntary, farm-level management tools that identify and manage risks, particularly environmental ones, associated with farming operations.

Other factors that affect the health of the reef include climate change, shipping accidents, tourism, fishing, and natural threats such as infestation by the crown-of-thorns starfish. These issues are covered under separate regulatory and planning processes managed by the Australian and Queensland governments and are not addressed by the Reef Plan.

Source: Reef Water Quality Protection Plan.

including income tax), the interest on debt, dividends (if any) and provision for future asset refurbishment/replacement. If a dividend is paid, it should be set at a level that reflects commercial realities and stimulates a competitive market outcome.[33] Where service deliverers are required to provide water services to classes of customer at less than full cost, the amount should be fully disclosed and ideally paid to the service deliverer as a community service obligation.

Administrative arrangements for full cost pricing are now largely in place and jurisdictions are moving towards implementation. *Urban areas* have made the greatest progress, and all jurisdictions (except Tasmania and the Northern Territory) have introduced rising block tariffs (two or three steps) for drinking water supply. Nevertheless, in many cases the volumetric component of utility invoices received by households remains small compared to fixed charges for water connection, sewerage and solid waste services. Moreover, given the low average price of water (about AUD 1/m^3, putting Australia in the lowest one-third of OECD countries), the total water supply bill represents just 0.5-0.7% of average household expenditure and about 15% of the combined water, sewerage and solid waste management bill. Overall, the new pricing structure has not had much effect on water use in urban areas.

Achieving full cost pricing of irrigation water is still some distance away and the price of irrigation water often only covers operating expenditure, with no return on capital and no provision for infrastructure renewals (Barton Group, 2005). Prices of irrigation water delivered to the farm gate may range from AUD 10 to 400 per ML,[34] depending on location. Irrigation water prices for traded water have risen in recent years, but do not seem to have caused a significant shift towards higher-value crops (Box 2.4). Some State/Territory governments still supplement the shortfalls of water authorities, and it is not always clear whether these payments are subsidies or a genuine community service obligation allowed under NWI principles.

5.2 Pollution charges

Among the State/Territory jurisdictions, New South Wales, Victoria and South Australia are operating some kind of pollution charging system. These systems were initially set up to recover the administrative costs of licensing, monitoring and enforcement, but in recent years *including incentives for license holders to continuously reduce their discharges to water* has become more important.

In *New South Wales*, a load-based licensing (LBL) scheme was introduced in 1999 to link licence fees to pollutant emissions to water (and air); the fees are designed to provide incentives to drive down pollution. The scheme also permits emissions trading (a 2003 voluntary "green offset" pilot scheme allowed license

holders and developers to offset nutrient loads by reducing pollution at a different location within the catchment). In *Victoria*, the fee structure for pollution licenses under the Environment Protection (Fees) Regulations 2001 is also designed to provide incentives for licence holders to reduce their discharges and emissions. In *South Australia*, a load-based fee structure is being investigated under the Environment Protection (Fees and Levy) Regulations 1994 for discharges to the marine environment. The fee system for discharges to all waters was under review as of mid-2006.

5.3 Government funding programmes

Substantial funding from Australian governments supports the implementation of the NWI. In 2004, it set up the Australian Government Water Fund with a total commitment of AUD 2 billion over 2006-10. The National Water Security Plan expects to allocate AUD 10 billion in federal funding to address overallocation and invest in water saving infrastructure works over 10 years after agreement by all States and Territories. The total of AUD 12 billion (in volume close to 2% of the GDP of a single year) would make the direct Australian Government financial contribution a new and influential factor in the implementation of the NWI. It would also bring significant financial assistance to the agriculture sector. Separately, the Australian Government allocated AUD 2 billion in 2006 for drought relief (concerning 38% of agricultural land area).

A typical contribution from the *Australian Government Water Fund* is one-third of project costs, with State/Territory and local governments and private or community beneficiaries taking responsibility for the remaining two-thirds (including in-kind contributions, such as labour). The fund contains three separate programmes: Water Smart Australia (AUD 1.6 billion, administered by NWC); the Community Water Grants Program (AUD 200 million, administered by the Departments of the Environment and Water Resources and of Agriculture, Fisheries and Forestry); the Raising National Water Standards Program (AUD 200 million, administered by NWC).

The *Water Smart Australia Program* provides support for *large-scale projects*[35] (minimum of AUD 1 million) aimed at any of the following: improving river flows for better environmental outcomes; returning groundwater aquifers to sustainable levels; bringing about water savings through improvements in irrigation infrastructure; encouraging or advancing efficiency improvements in on-farm water use; desalinating water for use in cities and towns; recycling and re-using storm water, "grey" water and wastewater from sewage; providing more efficient storage facilities, such as underground aquifers; providing alternatives to ocean outfalls and

better management of sewage in coastal cities; development of water-efficient housing design. The *Community Water Grants Program*, on the other hand, supports *small-scale community projects* with grants of up to AUD 50 000 to communities to promote wise use of water. In the first round of the programme, 1 750 projects[36] were funded with total grants amounting to AUD 61.5 million. The second round opened in July 2006. The *Raising National Water Standards Program* supports capacity building in monitoring, evaluation and reporting on water resources at the national, regional and catchment level.

Notes

1. The aim of the NRMMC is to "promote the conservation and sustainable use of Australia's natural resources". The PIMC aims to "develop and promote sustainable, innovative and profitable agriculture, forestry, fisheries/aquaculture and food industries".
2. Established under the federal Murray-Darling Basin Act 1993 and related legislation passed by each of the five basin governments (New South Wales, Victoria, Queensland, South Australia and the Australian Capital Territory).
3. These bodies, which have slightly different names in each jurisdiction, evolved from the earlier landcare groups (Chapter 6).
4. The catchment management bodies are also key players in the delivery of the National Action Plan for Salinity and Water Quality (see below) and national and State/Territory biodiversity strategies.
5. Refers to water allocated for the maintenance of aquatic and terrestrial ecosystems.
6. The water reform was launched as part of a wider COAG reform agenda (including micro-economic and regulatory reform) to improve the efficiency of the Australian economy, and was until 2004 the purview of the National Competition Council.
7. Reductions arising from improvements in knowledge about water systems' capacity to sustain particular abstraction levels are to be borne by water users up to 2014; after that year, water users are to bear this risk for the first 3% reduction in allocation, while the risk of reductions between 3 and 6% would be shared between the Australian and State/Territory governments (one-third and two-thirds, respectively). For reductions above 6%, the risk would be shared equally between the Australian and State/Territory governments.
8. Victorian legislation, however, stipulates that no more than 10% of water rights in each supply system can be untied from land or owned by a non-user of water (i.e. speculators with an interest in manipulating the price of water). This requirement effectively retains the link between water and land title for 90% of water entitlements. Nevertheless, in practice the 10% limit has thus far not proved a constraint.
9. Out of concern about stranded infrastructure assets in irrigation areas due to outward trade of water, COAG allows an interim limit on trade of water from irrigation areas of 4% of a scheme's total licence allocation.
10. That is, accounts of physical flows and stocks including a description of the flow of water through the economy.
11. For comparison, the Danube Basin is three-quarters the size of the MDB, while the river's mean annual flow near the mouth is 25 times that of the Murray River.
12. More than half of the total diversions in the MDB occur at approximately 20 bulk intakes and the largest 10-15% of licences account for 90% of licensed entitlements or allocations.
13. Formally, the agreement aims to limit abstraction to the "level of water resource development for rivers within the Murray-Darling Basin as determined, on 30 June 1994, by reference to: a) the infrastructure supplying water; b) the rules for allocating water and for operating water management systems applying; c) the operating efficiency of water management systems; d) existing entitlements to take and use water and the extent to which those entitlements were

used; and e) the trend in the level of demand for water within and from the Murray-Darling Basin at that date".

14. These models must also take account of the salinity of the flows released from the reservoirs located at various points along the length of the river.

15. For the largest single licensee in the MDB, a level of accuracy of ± 5% represents a volume of ± 75 GL with a capital value of ± AUD 105 million and an annual lease value of ± AUD 10 million. Concurrent with the rise in the value of water, the cost of accurate metering has fallen.

16. Dryland salinisation is caused by the removal of deep-rooted native vegetation and its replacement by shallow-rooted annual crops and pastures, which results in a reduction in water use and a consequent rise in groundwater levels. Naturally occurring salts (principally NaCl) are then dissolved and brought towards the surface.

17. In irrigation salinity, the effect of the removal of native vegetation is compounded by the application of large additional quantities of water, very often without any drainage facilities to remove excess water.

18. The EC unit is a measure of electrical conductivity, commonly used to indicate the salinity of water. 1 EC = 1 micro-Siemen per centimetre measured at 25 °C.

19. Salt interception schemes in operation during 2003-04, most of which were constructed under the Basin's 1988 Salinity and Drainage Strategy, prevented over 389 000 tonnes of salt from entering the Murray River.

20. Formally the Intergovernmental Agreement on Addressing Water Overallocation and Achieving Environmental Objectives in the Murray-Darling Basin, signed in June 2004.

21. Made up of AUD 200 million from the Australian Government, AUD 115 million each from NSW and Victoria, AUD 65 million from South Australia and AUD 5 million from ACT.

22. Barmah-Millewa Forest; Gunbower and Koondrook-Perricoota Forest; Hattah Lakes; Chowilla Floodplain; the mouth of the Murray, Coorong and lower Lakes; the channel of the Murray.

23. The services offered by these providers include reticulated water supply, sewerage, irrigation water, drainage and bulk water supply.

24. Defined here as the ratio between the amount of water taken up by crops and the amount diverted from the environment.

25. Located in the MDB with a total diversion in 2001/02 of 8 608 GL, i.e. more than half of all agricultural diversions in Australia.

26. Other factors, such as geology and soils, also contribute to the differences in productivity.

27. The accuracy of these efficiency figures is not known, since an Australian water metering standard was still in preparation as of 2006.

28. In 2000-01, this included turning off or repairing dripping taps (20% of households), doing full loads when washing (16%) and taking shorter showers (14%). Just over 90% of households with gardens conserved water in them. The most common water conservation method was watering in the early morning or late evening (one-quarter of households with gardens). Other methods included watering the gardens less frequently but longer (12%) or using recycled water (11%). Smaller proportions did not water their lawns or did not water at all (both 6%). In addition, half of households with gardens used mulch in order to save water.

29. In 2004, 74% of households had a dual-flush toilet, up from 39% in 1994; 44% had a reduced-flow shower head, up from 22%. As from 1 July 2006, water-using products must be registered

and labelled under the Australian Government's Water Efficiency Labelling and Standards Scheme. Toilet equipment is subject to minimum water efficiency requirements.

30. These include: i) an increase in annual national average temperatures of between 0.4 and 2.0 °C by 2030; ii) more heat waves and fewer frosts; an increase in severe weather events, including storms and high bushfire propensity days; iii) a more pronounced cycle of prolonged drought and heavy rains; and iv) possible reductions in average rainfall and runoff in Southern and much of Eastern Australia, up to a 20% reduction in runoff in the Murray-Darling Basin, and as much as a further 20% reduction in rainfall in Southwest Australia by 2030; rainfall increases across much of the tropical North.
31. In Queensland, for example, three out of six assessed coastal regions (in the Burdekin, Mackay-Whitsunday and southeast Queensland regions) most commonly experienced poor water quality. Phosphorus and nitrogen were the two indicators contributing to this rating. Levels of metals in shellfish and other marine fauna were highest in southeast Queensland waterways, particularly canals, and occasionally exceeded Australian food quality standards. In central and northern Queensland the persistence of pesticides and herbicides, including a number of banned substances, in sediment, seagrass and some marine mammals is an issue.
32. Including water, wastewater, re-used water, storm water, trade wastes and water storage.
33. In Australian terminology, this is called "lower bound" pricing. Independent economic regulators in each state/territory must make sure that prices do not exceed "upper bound" levels, which are calculated differently.
34. 1 ML = 1 million litres or 1 000 m^3.
35. For example, the AUD 501 million Wimmera Mallee Pipeline Project, which will supply stock and domestic water to a region covering 10% of Victoria. The current system of 16 000 km of open channels, which loses 85% or 120 GL of its water, is to be replaced by 8 000 km of pipeline. In effect, this means the water saved by the scheme comes at a capital cost of AUD 4.85 million/GL, or almost five times the average capital cost of water currently traded. Nevertheless, the economic analysis of the project shows a cost-benefit ratio of 1.19 on the basis of a wider range of benefits.
36. For example, one AUD 45 000 project is aimed at re-using treated wastewater to irrigate the bowling greens at a local club. A water recycling system will be installed to provide a constant source of treated water. The project is expected to save 1 220 m^3 of water each year.

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REFERENCES

I.A Selected environmental data

I.B Selected economic data

I.C Selected social data

II.A Selected multilateral agreements (worldwide)

II.B Selected multilateral agreements (regional)

III. Abbreviations

IV. Physical context

V. Selected environmental websites

I.A: SELECTED ENVIRONMENTAL DATA (1)

		CAN	MEX	USA	JPN	KOR	**AUS**	NZL	AUT	BEL	CZE	DNK	FIN
LAND													
Total area (1000 km^2)		9971	1958	9629	378	100	**7713**	270	84	31	79	43	338
Major protected areas (% of total area)	*2*	8.7	9.2	25.1	17.0	9.6	**18.5**	32.4	28.0	3.4	15.8	11.1	9.1
Nitrogenous fertiliser use (t/km^2 of agricultural land)		2.5	1.2	2.7	9.0	20.1	**0.2**	2.6	2.9	10.7	6.9	7.8	5.9
Pesticide use (t/km^2 of agricultural land)		0.06	0.04	0.08	1.24	1.20	**-**	0.02	0.09	0.69	0.10	0.11	0.06
Livestock densities (head of sheep eq./km^2 of agr. land)		192	256	191	1011	1560	**62**	685	492	1790	287	912	290
FOREST													
Forest area (% of land area)		45.3	33.9	32.6	68.9	63.8	**21.4**	34.7	41.6	22.4	34.1	12.7	75.5
Use of forest resources (harvest/growth)		0.4	0.2	0.6	0.4	0.1	**0.6**	..	0.7	0.9	0.7	0.7	0.7
Tropical wood imports (USD/cap.)	*3*	1.6	0.2	2.1	10.7	6.1	**4.0**	3.4	0.4	24.2	0.3	3.8	1.4
THREATENED SPECIES													
Mammals (% of species known)		31.6	34.0	18.8	24.0	17.9	**24.7**	18.0	22.0	30.5	18.9	22.0	11.9
Birds (% of species known)		12.9	17.0	11.6	12.9	13.3	**12.5**	21.0	27.3	28.1	49.5	13.2	13.3
Fish (% of species known)		7.3	34.4	14.4	25.3	9.2	**0.8**	10.0	41.7	23.8	40.0	15.8	11.8
WATER													
Water withdrawal (% of gross annual availability)		1.5	15.9	19.2	20.4	36.2	**4.8**	1.7	5.0	32.5	12.7	4.1	2.1
Public waste water treatment (% of population served)		72	35	71	67	79	**..**	80	86	46	71	88	81
Fish catches (% of world catches)		1.2	1.4	5.3	4.7	1.7	**0.2**	0.6	-	-	-	1.1	0.1
AIR													
Emissions of sulphur oxides (kg/cap.)		76.3	12.2	49.4	6.7	10.4	**123.6**	18.6	4.4	14.5	22.2	4.0	16.4
(kg/1000 USD GDP)	*4*	2.6	1.4	1.4	0.3	0.6	**4.2**	0.8	0.2	0.5	1.4	0.1	0.6
% change (1990-2005)		-27	..	-31	-14	-46	**58**	39	-55	-58	-88	-88	-64
Emissions of nitrogen oxides (kg/cap.)		78.4	12.0	63.9	15.8	24.4	**78.0**	39.0	24.7	26.3	32.3	34.3	40.5
(kg/1000 USD GDP)	*4*	2.7	1.4	1.8	0.6	1.3	**2.7**	1.7	0.9	0.9	2.0	1.1	1.5
% change (1990-2005)		-6	18	-19	-2	47	**25**	16	-3	-24	-40	-32	-32
Emissions of carbon dioxide (t./cap.)	*5*	17.2	3.6	19.8	9.5	9.6	**17.6**	8.1	9.2	11.1	11.6	9.4	13.2
(t./1000 USD GDP)	*4*	0.57	0.39	0.54	0.36	0.50	**0.61**	0.36	0.31	0.40	0.69	0.32	0.47
% change (1990-2004)		29	27	20	15	105	**36**	49	31	7	-23	1	25
WASTE GENERATED													
Industrial waste (kg/1000 USD GDP)	*4, 6*	..	..	..	40	40	**20**	10	..	50	30	10	110
Municipal waste (kg/cap.)	*7*	420	340	750	400	380	**690**	400	560	460	290	740	470
Nuclear waste (t./Mtoe of TPES)	*8*	6.2	0.1	1.0	1.5	3.2	**-**	-	-	2.2	1.7	-	1.9

.. not available. - nil or negligible.

1) Data refer to the latest available year. They include provisional figures and Secretariat estimates.
Partial totals are underlined. Varying definitions can limit comparability across countries.

2) IUCN management categories I-VI and protected areas without IUCN category assignment; national classifications may differ.

3) Total imports of cork and wood from non-OECD tropical countries.

4) GDP at 2000 prices and purchasing power parities.

Source: OECD Environmental Data Compendium.

OECD EPR / SECOND CYCLE

FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD*	OECD*
549	357	132	93	103	70	301	3	42	324	313	92	49	506	450	41	779	245	35042
13.3	31.5	5.2	8.9	9.5	1.2	19.0	17.1	18.9	6.4	29.0	8.5	25.2	9.5	9.5	28.7	4.3	30.1	16.4
7.6	10.4	2.9	5.8	0.7	7.9	5.2	-	13.8	10.1	4.8	2.3	3.7	3.5	5.2	3.6	3.6	6.3	2.2
0.27	0.17	0.14	0.17	-	0.05	0.58	0.33	0.41	0.08	0.06	0.40	0.16	0.14	0.05	0.10	0.06	*0.21*	*0.07*
514	689	245	207	65	1139	488	4351	2142	845	315	498	226	339	409	794	290	*674*	208
31.6	30.2	22.8	19.5	1.3	9.4	23.3	34.5	9.5	39.2	30.0	36.9	41.6	33.3	73.5	30.8	27.0	11.6	34.4
0.6	0.5	0.6	0.5	-	0.7	0.5	0.5	0.6	0.5	0.6	0.8	0.5	0.5	0.7	0.8	0.5	0.6	0.6
6.8	1.8	2.7	0.1	2.8	11.2	7.2	-	15.6	3.6	0.3	17.6	0.1	6.2	2.2	0.6	0.5	2.7	4.0
19.0	41.8	37.8	71.1	-	1.8	40.7	51.6	18.6	3.4	14.1	17.7	22.2	26.3	22.4	32.9	22.2	*6.3*	..
19.2	27.3	1.9	18.8	44.0	5.4	18.4	50.0	21.5	7.7	8.6	13.7	14.4	25.5	19.1	36.4	30.8	*15.4*	..
31.9	68.2	26.2	32.1	-	23.1	29.0	27.9	48.9	-	7.0	22.9	24.1	52.9	16.4	38.9	9.9	*11.1*	..
17.5	18.9	12.1	4.7	0.1	2.3	44.0	3.3	10.0	0.9	18.3	12.0	1.3	33.3	1.5	4.7	17.0	*22.4*	*11.4*
79	93	56	57	50	70	69	95	99	76	59	60	52	55	85	97	35	*98*	*68*
0.7	0.3	0.1	-	1.9	0.3	0.3	-	0.6	2.7	0.2	0.2	-	0.9	0.3	-	0.5	0.7	26.2
9.0	7.4	46.3	24.5	35.0	24.5	11.6	6.7	5.3	4.9	38.1	28.4	19.0	37.3	6.5	2.3	25.2	16.9	27.5
0.3	0.3	2.6	1.7	1.2	0.8	0.4	0.1	0.2	0.1	3.5	1.5	1.6	1.7	0.2	0.1	3.4	0.6	1.1
-60	-89	4	-76	22	-48	-63	-80	-58	-58	-55	-9	-81	-29	-45	-60	18	-73	-41
22.6	17.2	28.9	17.9	90.4	31.0	22.2	38.1	26.6	46.9	20.8	27.8	19.0	34.7	27.1	11.4	13.1	26.8	34.2
0.8	0.7	1.6	1.2	3.1	1.0	0.8	0.7	0.9	1.3	1.9	1.5	1.6	1.6	1.0	0.4	1.8	1.0	1.4
-29	-48	11	-24	-2	5	-34	-27	-28	-5	-38	13	-53	14	-25	-46	35	-43	-18
6.4	10.3	8.5	5.6	7.7	10.2	7.9	24.9	11.4	7.9	7.8	5.7	7.0	7.7	5.8	6.0	2.9	9.0	11.1
0.23	0.40	0.43	0.38	0.24	0.31	0.30	0.45	0.39	0.21	0.65	0.31	0.55	0.34	0.20	0.20	0.40	0.32	0.44
9	-12	33	-19	19	37	16	7	18	26	-15	52	-34	59	1	8	63	-4	17
50	20	..	30	10	40	20	30	40	20	120	50	130	30	110	-	30	30	50
540	600	440	460	520	740	540	710	620	760	250	470	270	650	480	650	440	580	560
4.2	1.2	-	1.7	-	-	-	-	0.1	-	-	-	3.0	1.2	4.1	1.9	-	1.0	1.5

UKD: pesticides and threatened species: Great Britain; water withdrawal and public waste water treatment plants: England and Wales.

5) CO_2 from energy use only; sectoral approach; international marine and aviation bunkers are excluded.

6) Waste from manufacturing industries.

7) CAN, NZL: household waste only.

8) Waste from spent fuel arising in nuclear power plants, in tonnes of heavy metal, per million tonnes of oil equivalent of total primary energy supply.

I.B: SELECTED ECONOMIC DATA (1)

		CAN	MEX	USA	JPN	KOR	**AUS**	NZL	AUT	BEL	CZE	DNK
GROSS DOMESTIC PRODUCT												
GDP, 2005 (billion USD at 2000 prices and PPPs)		990	983	11049	3477	958	**596**	94	246	294	182	164
% change (1990-2005)		51.3	53.8	55.3	21.6	125.0	**64.5**	58.2	38.2	33.2	22.7	38.1
per capita, 2005 (1000 USD/cap.)		30.6	9.3	37.3	27.2	19.9	**29.3**	22.9	29.9	28.2	17.8	30.3
Exports, 2005 (% of GDP)		37.9	29.9	10.5	14.3	42.5	**19.1**	27.9	54.4	86.3	71.6	48.5
INDUSTRY	*2*											
Value added in industry (% of GDP)		32	27	23	31	43	**26**	25	32	27	40	27
Industrial production: % change (1990-2005)		46.7	51.3	55.9	3.2	210.9	**30.5**	29.5	70.1	21.0	11.8	38.3
AGRICULTURE												
Value added in agriculture (% of GDP)	*3*	3	4	2	1	4	**4**	7	2	1	4	3
Agricultural production: % change (1990-2005)		25.6	41.5	27.6	-12.3	19.3	**25.4**	47.9	9.9	13.0	..	0.7
Livestock population, 2005 (million head of sheep eq.)		118	275	787	53	30	**283**	99	17	25	12	24
ENERGY												
Total supply, 2005 (Mtoe)		272	177	2340	530	214	**122**	17	34	57	45	20
% change (1990-2005)		29.9	42.0	21.4	19.3	128.9	**39.3**	22.9	37.1	15.2	-7.7	9.6
Energy intensity, 2005 (toe/1000 USD GDP)		0.27	0.18	0.21	0.15	0.22	**0.20**	0.18	0.14	0.19	0.25	0.12
% change (1990-2005)		-14.2	-7.7	-21.8	-1.8	1.7	**-15.3**	-22.3	-0.8	-13.5	-24.8	-20.6
Structure of energy supply, 2005 (%)	*4*											
Solid fuels		10.2	4.9	23.8	21.1	23.1	**44.5**	11.9	11.9	9.1	43.6	19.1
Oil		35.5	58.8	40.8	47.4	45.0	**31.1**	40.4	42.5	40.7	21.6	42.1
Gas		29.4	25.0	21.8	13.3	12.8	**18.9**	18.9	24.2	25.2	16.6	22.6
Nuclear		8.8	1.6	9.0	15.0	17.9	**-**	-	-	22.1	14.0	-
Hydro, etc.		16.1	9.7	4.7	3.2	1.2	**5.5**	28.9	21.4	2.9	4.2	16.3
ROAD TRANSPORT	*5*											
Road traffic volumes per capita, 2004 (1000 veh.-km/cap.)		9.8	0.7	16.2	6.5	3.2	**9.8**	12.3	9.3	9.0	4.6	7.8
Road vehicle stock, 2005 (10 000 vehicles)		1883	2205	24119	7404	1540	**1348**	271	502	559	439	245
% change (1990-2005)		13.8	129.3	27.8	31.1	353.5	**37.9**	47.0	36.0	31.2	69.4	29.5
per capita (veh./100 inh.)		58	21	81	58	32	**66**	66	61	54	43	45

.. not available. - nil or negligible.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Value added: includes mining and quarrying, manufacturing, gas, electricity and water and construction; production: excludes construction.

Source: OECD Environmental Data Compendium.

OECD EPR / SECOND CYCLE

FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD	OECD
153	1693	2165	225	156	10	141	1521	26	478	180	475	194	73	995	269	231	568	1699	30283
37.4	29.5	26.6	56.3	33.3	57.2	156.5	20.9	90.8	40.4	59.6	68.2	37.2	35.9	54.5	35.2	17.1	75.6	43.3	44.3
29.1	27.8	26.2	20.3	15.4	33.8	34.2	26.0	56.8	29.3	39.0	12.4	18.4	13.6	22.9	29.7	31.0	7.9	28.3	25.9
41.8	26.0	40.7	20.8	66.4	32.0	81.2	26.3	159.3	69.9	45.3	37.2	28.6	77.3	25.5	48.6	47.9	27.4	26.4	24.3
32	25	30	23	31	27	42	29	20	26	38	30	29	32	30	28	27	31	26	29
75.6	18.2	16.9	19.5	92.2	..	312.8	10.5	57.6	20.8	35.5	113.0	15.1	19.5	27.0	55.3	27.6	78.3	8.6	34.6
4	3	1	7	4	9	3	3	1	3	2	3	4	5	3	2	1	12	1	3
-3.9	0.9	-4.7	10.1	-10.5	5.4	2.6	10.7	13	-9.2	-9.4	-15.8	1.1	..	7.4	-10.2	-4.3	18.2	-8.0	..
8	156	117	21	12	1	50	64	6	42	9	58	19	6	100	13	12	111	113	2639
35	276	345	31	28	4	15	185	5	82	32	93	27	19	145	52	27	85	234	5548
19.8	21.1	-3.2	39.7	-2.8	66.9	47.5	25.2	33.7	22.6	49.3	-6.9	53.1	-11.7	59.4	9.7	8.6	60.9	10.3	22.6
0.23	0.16	0.16	0.14	0.18	0.36	0.11	0.12	0.18	0.17	0.18	0.20	0.14	0.26	0.15	0.19	0.12	0.15	0.14	0.18
-12.8	-6.5	-23.6	-10.7	-27.1	6.2	-42.5	3.5	-29.9	-12.7	-6.4	-44.7	11.5	-35.0	3.2	-18.9	-7.2	-8.4	-23.1	-15.1
14.8	5.1	23.7	29.2	11.3	2.7	17.8	9.1	1.8	10.2	2.3	58.1	12.6	22.2	14.1	5.0	0.6	26.3	16.2	20.4
32.0	32.5	35.8	57.7	26.5	24.5	56.7	45.2	70.3	41.0	42.8	23.6	59.8	18.1	49.1	28.3	48.1	35.0	36.3	40.6
10.8	14.6	23.4	7.7	44.4	-	23.0	39.0	26.2	44.0	15.6	13.0	14.1	30.8	20.5	1.6	10.5	26.7	36.4	21.8
18.1	41.9	12.3	-	13.3	-	-	-	-	1.3	-	-	-	24.4	10.3	35.9	23.0	-	9.1	11.0
24.3	5.9	4.8	5.4	4.5	72.7	2.6	6.7	1.7	3.6	39.3	5.3	13.5	4.5	6.0	29.2	17.9	11.9	2.0	6.2
9.7	8.6	7.1	8.7	2.3	10.2	9.5	8.9	8.9	8.0	7.8	3.9	7.4	2.7	4.8	8.2	8.0	0.8	8.2	8.4
282	3617	4803	552	333	21	198	3894	34	806	252	1472	552	150	2516	463	419	843	3217	64939
26.2	27.1	28.8	118.7	49.4	59.8	108.5	30.2	68.0	40.7	29.9	126.8	151.3	44.4	74.2	17.9	28.9	257.1	35.0	38.7
54	59	58	50	33	72	48	66	74	49	55	39	52	28	58	51	56	12	54	56

3) Agriculture, forestry, hunting, fishery, etc.

4) Breakdown excludes electricity trade.

5) Refers to motor vehicles with four or more wheels, except for Italy, which include three-wheeled goods vehicles.

I.C: SELECTED SOCIAL DATA (1)

		CAN	MEX	USA	JPN	KOR	**AUS**	NZL	AUT	BEL	CZE	DNK
POPULATION												
Total population, 2005 (100 000 inh.)		323	1053	2965	1278	481	**203**	41	82	104	102	54
% change (1990-2005)		16.6	25.4	18.8	3.5	12.3	**19.2**	21.9	6.7	4.7	-1.4	5.3
Population density, 2005 (inh./km^2)		3.2	53.8	30.8	338.2	483.3	**2.6**	15.2	98.2	341.9	129.6	125.7
Ageing index, 2004 (over 64/under 15)		72.3	18.6	59.7	140.3	44.4	**65.4**	54.9	97.1	97.2	91.6	79.5
HEALTH												
Women life expectancy at birth, 2004 (years)		82.4	77.6	80.1	85.6	80.8	**83.0**	81.3	82.1	82.4	79.0	79.9
Infant mortality, 2004 (deaths /1 000 live births)		5.3	19.7	6.9	2.8	5.3	**4.7**	6.2	4.5	4.3	3.7	4.4
Expenditure, 2004 (% of GDP)		9.9	6.5	15.3	8.0	5.6	**9.6**	8.4	9.6	10.1	7.3	8.9
INCOME AND POVERTY												
GDP per capita, 2005 (1000 USD/cap.)		30.6	9.3	37.3	27.2	19.9	**29.3**	22.9	29.9	28.2	17.8	30.3
Poverty (% pop. < 50% median income)		10.3	20.3	17.0	15.3	..	**11.2**	10.4	9.3	7.8	4.4	4.3
Inequality (Gini levels)	*2*	30.1	48.0	35.7	31.4	..	**30.5**	33.7	26.0	26.0	25.0	24.0
Minimum to median wages, 2000	*3*	42.5	21.1	36.4	32.7	25.2	**57.7**	46.3	x	49.2	32.3	x
EMPLOYMENT												
Unemployment rate, 2005 (% of civilian labour force)	*4*	6.8	3.5	5.1	4.4	3.7	**5.1**	3.7	5.2	8.4	7.9	4.8
Labour force participation rate, 2005 (% 15-64 years)		79.2	58.6	66.0	78.0	68.5	**77.1**	67.8	78.4	67.7	71.1	81.0
Employment in agriculture, 2004 (%)	*5*	2.6	15.9	1.6	4.5	8.1	**3.7**	7.5	5.0	2.0	4.3	3.1
EDUCATION												
Education, 2004 (% 25-64 years)	*6*	84.3	22.6	87.9	84.0	74.4	**64.1**	77.6	80.2	63.6	89.1	81.4
Expenditure, 2003 (% of GDP)	*7*	6.1	6.8	7.5	4.8	7.5	**5.8**	6.8	5.5	6.1	4.7	7.0
OFFICIAL DEVELOPMENT ASSISTANCE	*8*											
ODA, 2006 (% of GNI)		0.30	..	0.17	0.25	..	**0.30**	0.27	0.48	0.50	..	0.80
ODA, 2006 (USD/cap.)		114	..	76	91	..	**103**	62	183	187	..	411

.. not available. - nil or negligible. x not applicable.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (including all incomes, taxes and benefits) for the entire population.

3) Minimum wage as a percentage of median earnings including overtime pay and bonuses.

Source: OECD.

OECD EPR / SECOND CYCLE

FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD	OECD
52	609	825	111	101	3	41	586	5	163	46	382	106	54	434	90	74	721	600	11690
5.2	7.3	3.9	10.0	-2.8	16.1	17.9	3.3	18.5	9.2	9.0	0.3	7.0	1.7	11.7	5.5	10.8	28.3	4.8	12.0
15.5	110.8	231.0	84.1	108.4	2.9	58.8	194.5	175.9	393.0	14.3	122.0	114.8	109.9	85.8	20.1	180.2	92.5	245.0	33.4
89.6	88.5	134.5	121.5	98.7	52.2	53.5	133.1	75.3	74.2	74.3	76.9	107.8	66.8	116.0	97.3	100.8	19.4	87.1	70.2
82.3	83.8	81.4	81.4	76.9	82.7	80.7	82.5	81.0	81.4	82.3	79.4	80.5	77.8	83.8	82.7	83.7	73.8	80.7	..
3.3	3.9	4.1	4.1	6.6	2.8	4.9	4.1	3.9	4.1	3.2	6.8	4.0	6.8	3.5	3.1	4.2	23.6	5.1	..
7.5	10.5	10.6	10.0	8.0	10.2	7.1	8.8	8.0	9.2	9.2	6.5	10.1	5.9	8.1	9.1	11.6	7.7	8.4	..
29.1	27.8	26.2	20.3	15.4	33.8	34.2	26.0	56.8	29.3	39.0	12.4	18.4	13.6	22.9	29.7	31.0	7.9	28.3	25.9
6.4	7.0	9.8	13.5	8.2	..	15.4	12.9	5.5	6.0	6.3	9.8	13.7	..	11.5	5.3	6.7	15.9	11.4	10.2
25.0	28.0	28.0	33.0	27.0	35.0	32.0	33.0	26.0	27.0	25.0	31.0	38.0	33.0	31.0	23.0	26.7	45.0	34.0	30.7
x	60.8	x	51.3	37.2	x	55.8	x	48.9	47.1	x	35.5	38.2	..	31.8	x	x	..	41.7	..
8.4	9.9	9.6	9.8	7.2	2.6	4.4	7.7	4.5	4.7	4.6	17.7	7.6	16.3	9.2	6.4	4.5	10.0	4.8	6.6
74.6	69.3	78.2	64.9	60.0	84.6	72.5	62.6	69.1	77.9	79.1	63.9	77.5	68.7	71.3	78.3	86.3	53.0	76.0	68.7
4.9	3.5	2.4	12.6	5.3	6.3	6.4	4.5	1.3	3.0	3.5	18.0	12.1	5.1	5.5	2.1	3.7	34.0	1.3	6.1
77.6	65.3	83.9	56.2	75.4	60.0	62.9	48.2	62.3	70.7	88.3	50.1	25.2	84.7	45.0	82.9	84.5	26.1	65.1	67.5
6.1	6.3	5.3	4.2	6.1	8.0	4.4	5.1	3.6	5.0	6.6	6.4	5.9	4.7	4.7	6.7	6.5	3.7	6.1	5.8
0.39	0.47	0.36	0.16	..	..	0.53	0.20	0.89	0.81	0.89	..	0.21	..	0.32	1.03	0.39	..	0.52	0.30
157	171	126	35	..	..	235	62	633	334	631	..	37	..	86	437	220	..	209	63

4) Standardised unemployment rates; MEX, ISL, TUR: commonly used definitions.

5) Civil employment in agriculture, forestry and fishing.

6) Upper secondary or higher education; OECD: average of rates.

7) Public and private expenditure on educational institutions; OECD: average of rates.

8) Official Development Assistance by Member countries of the OECD Development Assistance Committee.

II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE)

Y = in force S = signed R = ratified D = denounced

			CAN	MEX	USA
1946	Washington	Conv. - Regulation of whaling	Y D	R	R
1956	Washington	Protocol	Y D	R	R
1949	Geneva	Conv. - Road traffic	Y R		R
1957	Brussels	Conv. - Limitation of the liability of owners of sea-going ships	Y S		
1979	Brussels	Protocol	Y		
1958	Geneva	Conv. - Fishing and conservation of the living resources of the high seas	Y S	R	R
1959	Washington	Treaty - Antarctic	Y R		R
1991	Madrid	Protocol to the Antarctic treaty (environmental protection)	Y R		R
1960	Geneva	Conv. - Protection of workers against ionising radiations (ILO 115)	Y	R	
1962	Brussels	Conv. - Liability of operators of nuclear ships			
1963	Vienna	Conv. - Civil liability for nuclear damage	Y	R	
1988	Vienna	Joint protocol relating to the application of the Vienna Convention and the Paris Convention	Y		
1997	Vienna	Protocol to amend the Vienna convention	Y		
1963	Moscow	Treaty - Banning nuclear weapon tests in the atmosphere, in outer space and under water	Y R	R	R
1964	Copenhagen	Conv. - International council for the exploration of the sea	Y R		R
1970	Copenhagen	Protocol	Y R		R
1969	Brussels	Conv. - Intervention on the high seas in cases of oil pollution casualties (INTERVENTION)	Y	R	R
1973	London	Protocol (pollution by substances other than oil)	Y	R	R
1969	Brussels	Conv. - Civil liability for oil pollution damage (CLC)	Y D	D	S
1976	London	Protocol	Y R	R	
1992	London	Protocol	Y R	R	
1970	Bern	Conv. - Transport of goods by rail (CIM)	Y		
1971	Brussels	Conv. - International fund for compensation for oil pollution damage (FUND)	Y D	D	S
1976	London	Protocol	Y R	R	
1992	London	Protocol (replaces the 1971 Convention)	Y R	R	
2000	London	Amendment to protocol (limits of compensation)	Y R	R	
2003	London	Protocol (supplementary fund)			
1971	Brussels	Conv. - Civil liability in maritime carriage of nuclear material	Y		
1971	London, Moscow, Washington	Conv. - Prohib. emplacement of nuclear and mass destruct. weapons on sea-bed, ocean floor and subsoil	Y R	R	R
1971	Ramsar	Conv. - Wetlands of international importance especially as waterfowl habitat	Y R	R	R
1982	Paris	Protocol	Y R	R	R
1987	Regina	Regina amendment	Y R	R	
1971	Geneva	Conv. - Protection against hazards of poisoning arising from benzene (ILO 136)	Y		
1972	London, Mexico, Moscow, Washington	Conv. - Prevention of marine pollution by dumping of wastes and other matter (LC)	Y R	R	R
1996	London	Protocol to the Conv. - Prevention of marine poll. by dumping of wastes and other matter	R		S
1972	Geneva	Conv. - Protection of new varieties of plants (revised)	Y R	R	R

OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	**AUS**	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
R	R	**R**	R	R	R	R	R	R	R	R		R	R	R	R		R	R		R	R	R	R	R		R	
R	R	**R**	R	R	R	R	R	R	R	R		R	R	R	R		R	R		R	R	R	R	R		R	
R	R	**R**	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	S	R	R	
D		**D**			D		D	D	D	D			R		S		D	D	R	R		R	D	R		D	
		R			R			S		S						R			R	R		R		R		D	
		R	S		R		R	R	R				S	S			R			R		R		R		R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R			R		R	R	R		R	R	R	R	R	R	
R	R	**R**	R	S	R	R	S	R	R	R	R	S			R		R	R	R		S	R	R	S		R	
R					R	R	R	R	R	R	R	R			R		R	R	R	R	R	R	R	R	R	R	
	S				S					S				S			R			R							
						R						R							R		R	S				S	
					S	R	R	R	S	R	R	R			R		R	R	R	S	R	S	R	S	S	S	
						S						S			S				S								
R	R	**R**	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	
					R		R	R	R	R			R	R			R	R	R	R		R	R			R	
					R		R	R	R	R			R	R			R	R	R	R		R	R			R	
R	S	**R**	R		R		R	R	R	R	S		R	R	R		R	R	R	R		R	R	R		R	
		R	S		R		R	R	R	R				R	R		R	R	R	R		R	R	R		R	
D	D	**D**	D		D		D	D	D	D	D		D	D	D	R	D	D	D	D		D	D	D			
R	R	**R**			R		R	R	R	R	R		R	D	R	R	R	R	R	R		R	R	R			
R	R	**R**	R		R		R	R	R	R	R		R	R	R	R	R	R	R	R		R	R	R	R	R	
				R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	
D	D	**D**	D		R		D	D	D	D	D		D	D	D		D	D	D	R		D	D	D		D	
R		**R**	R		R		R	R	R	R	R		R	D	R		R	R	R	R		R	R			D	
R	R	**R**	R		R		R	R	R	R	R		R	R	R	R	R	R	R	R		R	R	R	R	R	
R	R	**R**	R		R		R	R	R	R	R		R	R	R		R	R	R	R		R	R		R	R	
R			R		R		R	R	R	R				R	R		R	R		R		R	R				
					R		R	R	R	R					R		R	R		S		R	R			S	
R	R	**R**	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	**R**	R	R	R		R	R	R	R	R	R	R	R		R	R	R	R				R	R	R	R	
						R		R	R	R	R	R			R						R	R		R			
R	R	**R**	R		R		R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	R	R		R	
		R	R		R		R	S	R	R			R	R			S	R				R	R	R		R	
R	R	**R**	R	R	R	R	R	R	R	R		R		R	R		R	R	R	R	R	R	R	R		R	

II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE) (cont.)

Y = in force S = signed R = ratified D = denounced

			CAN	MEX	USA
1978 Geneva	Amendments	Y	R	R	R
1991 Geneva	Amendments	Y			R
1972 Geneva	Conv. - Safe container (CSC)	Y	R	R	R
1972 London, Moscow, Washington	Conv. - International liability for damage caused by space objects	Y	R	R	R
1972 Paris	Conv. - Protection of the world cultural and natural heritage	Y	R	R	R
1973 Washington	Conv. - International trade in endangered species of wild fauna and flora (CITES)	Y	R	R	R
1974 Geneva	Conv. - Prev. and control of occup. hazards caused by carcinog. subst. and agents (ILO 139)	Y			
1976 London	Conv. - Limitation of liability for maritime claims (LLMC)	Y		R	
1996 London	Amendment to convention	Y	S		
1977 Geneva	Conv. - Protection of workers against occupational hazards in the working environment due to air pollution, noise and vibration (ILO 148)	Y			
1978 London	Protocol - Prevention of pollution from ships (MARPOL PROT)	Y	R	R	R
1978 London	Annex III	Y	R		R
1978 London	Annex IV	Y			
1978 London	Annex V	Y		R	R
1997 London	Annex VI	Y			S
1979 Bonn	Conv. - Conservation of migratory species of wild animals	Y			
1991 London	Agreem. - Conservation of bats in Europe	Y			
1992 New York	Agreem. - Conservation of small cetaceans of the Baltic and the North Seas (ASCOBANS)	Y			
1996 Monaco	Agreem. - Conservation of cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area	Y			
1996 The Hague	Agreem. - Conservation of African-Eurasian migratory waterbirds	Y			
2001 Canberra	Agreem. - Conservation of albatrosses and petrels (ACAP)	Y			
1982 Montego Bay	Conv. - Law of the sea	Y	R	R	
1994 New York	Agreem. - relating to the implementation of part XI of the convention	Y	R	R	S
1995 New York	Agreem. - Implementation of the provisions of the convention relating to the conservation and management of straddling fish stocks and highly migratory fish stocks	Y	R		R
1983 Geneva	Agreem. - Tropical timber	Y	R		R
1994 New York	Revised agreem. - Tropical timber	Y	R	R	R
1985 Vienna	Conv. - Protection of the ozone layer	Y	R	R	R
1987 Montreal	Protocol (substances that deplete the ozone layer)	Y	R	R	R
1990 London	Amendment to protocol	Y	R	R	R
1992 Copenhagen	Amendment to protocol	Y	R	R	R
1997 Montreal	Amendment to protocol	Y	R		R
1999 Beijing	Amendment to protocol	Y	R		R
1986 Vienna	Conv. - Early notification of a nuclear accident	Y	R	R	R
1986 Vienna	Conv. - Assistance in the case of a nuclear accident or radiological emergency	Y	R	R	R
1989 Basel	Conv. - Control of transboundary movements of hazardous wastes and their disposal	Y	R	R	S

OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	**AUS**	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
R	R	**R**	R	R		R	R	R	R	R		R		R	R		R	R	R	R	R		R	R		R	
R	R	**R**		R		R	R	R		R		R					R		R		R	R	R			R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	S	R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R		R	R	R	R		R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R					R	R	R	R	R	R		R	R	R	R			R		R	R		R	R			
R		**R**	R		R		D	D	R	D	R			R		R	R	R	R			R	R	R	R	R	
		R					R	R	S	R						R	S	R				R	R	R		R	
					R	R	R	R	R	R		R			R			R		R	R	R	R			R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	
R	R	**R**		R	R	R	R	R	R	R	R	R			R	R	R	R	R	R	R	R	R	R		R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R					R		R	R	R	R	R					R		R	R			R	R			R	
		R	R	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R		R	R
				R	R	R	R	R	R	R		R		R		R	R	R	R	R	R		R			R	
					R		R	R	R	R							R		R				R			R	S
									R		R				R					R		R					
					R		R	R	R	R	S	R		R	R	R	R			R	R	R	R	R		R	R
		R	R						S													R				R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S		R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S		R	R
S	S	**R**	R	R	R		R	R	R	R	R		R	R	R	R	R	R	R	R		R	R			R	R
R	R	**R**	R	R	R		R	R	R	R	R			R	R	R	R	R		R		R	R	R		R	R
R	R	**R**	R	R	R		R	R	R	R	R			R	R	R	R	R		R		R	R	R		R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	**R**	R	R	R	R	S	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

II.A: SELECTED MULTILATERAL AGREEMENTS (WORLDWIDE) (cont.)

Y = in force S = signed R = ratified D = denounced

		CAN	MEX	USA
1995 Geneva	Amendment			
1999 Basel	Prot. - Liability and compensation for damage			
1989 London	Conv. - Salvage	Y R	R	R
1990 Geneva	Conv. - Safety in the use of chemicals at work (ILO 170)	Y	R	
1990 London	Conv. - Oil pollution preparedness, response and co-operation (OPRC)	Y R	R	R
2000 London	Protocol - Pollution incidents by hazardous and noxious substances (OPRC-HNS)			
1992 Rio de Janeiro	Conv. - Biological diversity	Y R	R	S
2000 Montreal	Prot. - Biosafety (Cartagena)	Y S	R	
1992 New York	Conv. - Framework convention on climate change	Y R	R	R
1997 Kyoto	Protocol	Y R	R	S
1993 Paris	Conv. - Prohibition of the development, production, stockpiling and use of chemical weapons and their destruction	Y R	R	R
1993 Geneva	Conv. - Prevention of major industrial accidents (ILO 174)	Y		
1993	Agreem. - Promote compliance with international conservation and management measures by fishing vessels on the high seas	Y R	R	R
1994 Vienna	Conv. - Nuclear safety	Y R	R	R
1994 Paris	Conv. - Combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa	Y R	R	R
1996 London	Conv. - Liability and compensation for damage in connection with the carriage of hazardous and noxious substances by sea (HNS)	S		
1997 Vienna	Conv. - Supplementary compensation for nuclear damage			S
1997 Vienna	Conv. - Joint convention on the safety of spent fuel management and on the safety of radioactive waste management	Y R		R
1997 New York	Conv. - Law of the non-navigational uses of international watercourses			
1998 Rotterdam	Conv. - Prior informed consent procedure for hazardous chemicals and pesticides (PIC)	Y R	R	S
2001 London	Conv. - Civil liability for bunker oil pollution damage			
2001 London	Conv. - Control of harmful anti-fouling systems on ships			S
2001 Stockholm	Conv. - Persistent organic pollutants	Y R	R	S

Source: IUCN; OECD.

OECD EPR / SECOND CYCLE

Y = in force S = signed R = ratified D = denounced

JPN	KOR	**AUS**	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
			R	R	R	R	R	R	R	R		R				R	R	R	R	R	R	R	R	R	R	R	R
							S	S	S			S				S								S	S		S	
		R	R		R		R	S	R	R	R		R	R	R		R	R	S			R	R	R		R	
	R														R			R	R				R				
R	R	**R**	R				R	R	R	R	R		R	R	R		R	R	R	R		R	R	R	R	R	
		R					S	S	S	S	R						R		R	R		R	R				
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R		R	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**S**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R		R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
					R												R						R				
R	R	**R**																R					R				R
R	R	**R**		R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R
R	R	**R**	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
							S	S		S							S	S					S			S	
		S				S									S												
R	R	**R**		R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R		R	
								R		S		R				S	R	R		R			R				
R	R	**R**	R	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R		R	R	R	R	R	R
											R				S	R						R	S				
R		**S**					R	S			R					R		R	R			R	R				
R	S	**R**	R	R	R	R	R	R	R	R	R	S	R	S	S	R	R	R	S	R	R	R	R	R	S	R	R

II.B: SELECTED MULTILATERAL AGREEMENTS (REGIONAL)

		CAN	MEX	USA
1948 Baguio	Agreem. - Establishment of the Asia-Pacific fishery commission	Y		R
1956 Rome	Agreem. - Plant protection for the Asia and Pacific region	Y		
1958 Geneva	Agreem. - Adoption of uniform conditions of approval and reciprocal recognition of approval for motor vehicle equipments and parts	Y		
1964 Brussels	Agreem. - Measures for the conservation of Antarctic Fauna and Flora	Y		R
1968 Paris	Conv. - Protection of animals during international transport	Y		
1979 Strasbourg	Protocol	Y		
1969 London	Conv. - Protection of the archaeological heritage	Y		
1972 London	Conv. - Conservation of Antarctic seals	Y	R	R
1976 Apia	Conv. - Conservation of nature in the South Pacific	Y		
1979 Honiara	Conv. - South Pacific Forum Fisheries Agency	Y		
1980 Canberra	Conv. - Conservation of Antarctic marine living resources	Y	R	R
1985 Rarotonga	Conv. - South Pacific nuclear free zone treaty	Y		
1986 Noumea	Conv. - Protection of the natural resources and environment of the South Pacific region	Y		R
1986 Noumea	Protocol (prevention of pollution by dumping)	Y		R
1986 Noumea	Protocol (co-operation in combating pollution emergencies)	Y		R
1993 Apia	Agreem. - South Pacific Regional Environment Programme (SPREP)	Y		S
1987 Port Moresby	Treaty - South Pacific fisheries	Y		R
1989 Wellington	Conv. - Prohibition of fishing with long driftnets in the South Pacific	Y		R
1990 Noumea	Protocol	Y		R
1990 Noumea	Protocol	Y	S	
1992 Honiara	Treaty - Cooperation in fisheries surveillance and law enforcement in the South Pacific region	Y		
1993 Tokyo	Memorandum of understanding on port state control in the Asia-Pacific region	Y	R	
1993 Canberra	Conv. - Conservation of Southern Pacific bluefin tuna	Y		
1993 Rome	Agreem. - Establishment of the Indian Ocean Tuna Commission	Y		
1994 Lisbon	Treaty - Energy Charter	Y		
1994 Lisbon	Protocol (energy efficiency and related environmental aspects)	Y		
1995 Port Moresby	Conv. - Regional convention on hazardous and radioactive wastes (Waigani Convention)	Y		
2000 Santiago	Agreem. - Conservation of living marine resources on the high seas of the south Pacific (the Galapagos agreement)			

Source: IUCN; OECD.

OECD EPR / SECOND CYCLE

JPN	KOR	**AUS**	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD	EU
R	R	**R**	R						R																	R	
	R	**R**	R						R								R			R						R	
R		**R**	R	R	R	R	R	R	R	R	R	R			R	R	R	R	R	R	R	R	R	R	R	R	R
R		**R**	R		R				R						R			R	R							R	
				R	R	R	R	R	R	R	R		R	R	R	R	R	D		R		R	D	R	R	R	
				R	R	R	R	R	R	R	R		R	R	R	R	R	D		R		R	D	R	R	R	
				R	R		R		D	R	R		R		R	R				D		R	D	D		D	
R		**R**	S		R				R	R					R			R	R							R	
		R	R						R																		
		R	R																								
R	R	**R**	R		R			R	R	R	R				R		R	R	R			R	R			R	R
		R	R																								
		R	R						R																	S	
		R	R						R																	R	
		R	R						R																	S	
		R	R						R																		
		R	R																								
		R	R						S																		
		R	S																								
R	R	**R**	R																								
R	R	**R**	R																								
R	R	**R**							R																	R	R
R		**S**		R	R	R	R	R	R	R	R	R	S	R	R	R	R	S	R	R	R	R	R	R	R	R	R
R		**S**		R	R	R	R	R	R	R	R	R	S	R	R	R	R	S	R	R	R	R	R	R	R	R	R
		R	R																								

Reference III
ABBREVIATIONS

AAA	Agriculture Advancing Australia
AADC	Australia Antarctic Data Centre
AAQ	Ambient air quality
ACT	Australian Capital Territory
ADRs	Australian Design Rules
AFCS	Australian Forest Certification Scheme
AGEIS	Australian Greenhouse Emissions Information System
AHC	Australian Heritage Council
ALGA	Australian Local Government Association
AMSA	Australian Maritime Safety Authority
ANCA	Australian Nature Conservation Agency
ANZECC	Australian and New Zealand Environment and Conservation Council
APEC	Asia-Pacific Economic Co-operation
AQIS	Australian Quarantine and Inspection Service
ARIES	Australian Research Institute in Education for Sustainability
AusAID	Australian Agency for International Development
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CDM	Clean development mechanism
CFCs	Chlorofluorocarbons
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNG	Compressed natural gas
CO_2	Carbon dioxide
COAG	Council of Australian Governments
CRC	Co-operative research centre
DAC	Development Assistance Committee of the OECD
DAFF	Department of Agriculture, Fisheries and Forestry
DEC	Department of Environment and Conservation (NSW)
DECC	Department of Environment and Climate Change (NSW)
EEZ	Exclusive economic zone
DEH	Department of Environment and Heritage

DEW	Department of Environment and Water Resources
DFAT	Department of Foreign Affairs and Trade
DITR	Department of Industry, Tourism and Resources
DTRS	Department of Transport and Regional Services
DVE	Diesel vehicle emissions
EEBP	Energy Efficiency Best Practice
e-ELF	Electronic Environment Licensing Form
EIA	Environmental impact assessment
EIS	Environmental impact statement
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
ESD	Ecologically sustainable development
FAO	Food and Agriculture Organization of the United Nations
FSC	Forest Stewardship Council
FSM	Federated States of Micronesia
GDP	Gross domestic product
GM	Genetically modified
GNI	Gross national income
GVG	Green Vehicle Guide
HAFC	Harmful anti-fouling compound
HBFCs	Hydrobromofluorocarbons
HC	Hydrocarbon
HCFCs	Hydrochlorofluorocarbons
HDPE	High-density polyethylene
IBRA	Interim Biogeographic Regionalisation for Australia
ICESD	Intergovernmental Committee on Ecologically Sustainable Development
ICLEI	International Council on Local Environment Initiatives
IEA	International Energy Agency
IGAE	Intergovernmental Agreement on the Environment
IMO	International Maritime Organization
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
IUU	Illegal, unregulated and unreported (fishing)
LA21	Local Agenda 21
LBL	Load-based licensing
LETDF	Low Emissions Technology Demonstration Fund
LPG	Liquefied petroleum gas
LRA	Load reduction agreement
LULUCF	Land use, land use change and forestry

MARPOL	London Convention on Prevention of Pollution from Ships
MBI	Market-based instrument
MDBC	Murray-Darling Basin Commission
MCE	Ministerial Council on Energy
MEPS	Minimum energy performance standards
MRET	Mandatory renewable energy target
N_2O	Nitrous oxide
NAP	National Action Plan for Salinity and Water Quality
NEHS	National Environmental Health Strategy
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NFEE	National Framework for Energy Efficiency
NGO	Non-governmental organisation
NHandMRC	National Health and Medical Research Council
NHT	Natural Heritage Trust
NLP	National Landcare Program
NLWRA	National Land and Water Resources Audit
NO_X	Nitrogen oxide
NRM	Natural Resources Management
NRMMC	Natural Resource Management Ministerial Council
NRS	National Reserve System
NRSMPA	National Representative System of Marine Protected Areas
NSW	New South Wales
NWI	National Water Initiative
OCPs	Organochlorine pesticides
ODA	Official development assistance
ODP	Ozone-depleting potential
ODS	Ozone-depleting substance(s)
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-operation
PAHs	Polycyclic aromatic hydrocarbons
PAN	Pollution abatement notice
PCBs	Polychlorinated biphenyls
PEFC	Program for the Endorsement of Forest Certification
PFCs	Perfluorocarbons
PIMC	Primary Industries Ministerial Council
PIN	Pollution infringement notice
PM_{10}	Particulate matter less than ten microns in diameter
PNG	Papua New Guinea
PPA	Purchasing power parity

PPP	Polluter-pays principle
PRP	Pollution reduction programme
RCD	Rabbit calicivirus disease
RFA	Regional Forest Agreement
SF_6	Sulphur hexafluoride
SO_2	Sulphur dioxide
SPP	Specific purpose payment
SPREP	(South) Pacific Regional Environmental Programme
TBT	Tributyltin
TDM	Travel demand management
TPES	Total primary energy supply
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VOCs	Volatile organic compounds
WA	Western Australia
WEEE	Waste electrical and electronic equipment

Reference IV
PHYSICAL CONTEXT

Australia occupies an entire continent and adjacent islands, covering 7.68 million km^2 between the Pacific and Indian Oceans. Its closest neighbours are New Zealand, Papua New Guinea and Indonesia. Mainland Australia extends about 3 500 kilometres from the tip of Cape York in the north to the southernmost point of the State of Tasmania, and about 4 000 kilometres from east to west. Apart from the eastern uplands, most of the country is a broad flat platform, broken by low hills and basins. Average elevation is 330 metres, and uplands rarely exceed 1 200 metres.

Australia has a tropical monsoon climate in the north, a Mediterranean climate in the south and west, a temperate climate in the south-east, and a vast arid or semi-arid interior. Nearly a third of Australia lies in the tropics and over 80% in arid or semi-arid climatic zones. Drought is a recurring feature over most of the continent. Annual rainfall averages 465 mm and is highly variable, partly because Australia lies close to the El Niño Southern Oscillation. Australia has few permanent freshwater lakes and little river water. The largest river system, the Murray-Darling in the south-east, has an average flow volume of only 0.5 million litres per second.

The dry climate, combined with shallow, often infertile soil, strongly influences Australia's land use patterns. Only 12% of the country can sustain dense vegetation or intensive agriculture. Overall, agriculture occupies about 60% of the land surface, mostly as grassland and shrublands; forests and other wooded land account for 20%, settlements 1% and other areas 19%.

Reference V
SELECTED ENVIRONMENTAL WEBSITES

Website	Host institution
Government	
www.abare.gov.au	Australian Bureau of Agriculture and Resource Economics
www.abs.gov.au	Australian Bureau of Statistics
www.daff.gov.au	Department of Agriculture, Fisheries and Forestry
www.greenhouse.gov.au	Australian Greenhouse Office
www.environment.gov.au	Department of Environment and Water Resources
www.greenvehicleguide.gov.au	Department of Transport and Regional Services
enhealth.nphp.gov.au	Environmental Health Council
www.ephc.gov.au	Environmental Protection and Heritage Council
www.gbrmpa.gov.au	Great Barrier Reef Marine Park Authority
www.ilc.gov.au	Indigenous Land Corporation
www.lwa.gov.au	Land and Water Australia
www.mdbc.gov.au	Murray-Darling Basin Commission
www.nht.gov.au/index.html	Natural Heritage Trust
www.nlwra.gov.au	National Land and Water Resources Audit
www.nwc.gov.au	National Water Commission
www.npi.gov.au/	National Pollutant Inventory

State/Territory

www.environment.nsw.gov.au	Department of Environment and Conservation (New South Wales)
www.dnr.nsw.gov.au	Department of Natural Resources (New South Wales)
www.dse.vic.gov.au/dse/index.htm	Department of Environment and Sustainability (Victoria)
www.epa.vic.gov.au	Environment Protection Authority (Victoria)
www.epa.qld.gov.au	Environmental Protection Agency/Parks and Wildlife Service (Queensland)
www.nrw.qld.gov.au	Department of Natural Resources and Water (Queensland)
www.environment.sa.gov.au	Department of Environment and Heritage (South Australia)
www.epa.sa.gov.au	Environment Protection Authority (South Australia)
www.dec.wa.gov.au	Department of Environment and Conservation (Western Australia)
www.dtae.tas.gov.au	Department of Tourism, Arts and the Environment (Tasmania)
www.dpiw.tas.gov.au	Department of Primary Industries and Water (Tasmania)
www.nt.gov.au/nreta	Department of Natural Resources, Environment and The Arts (Northern Territory)
www.environment.act.gov.au	Environment and Recreation (Australian Capital Territory)

Non-government

www.ancid.org.au	Australian National Committee on Irrigation and Drainage
www.iclei.org/index.php?id=home	ICLEI Local Governments for Sustainability Oceania

www.ittis.org	International Tropical Timber Information System
www.tai.org.au	Australia Institute
www.travelsmart.gov.au	Travel Smart Australia

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Part III

INTERNATIONAL COMMITMENTS

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Signs

The following signs are used in Figures and Tables:

. .: not available

– : nil or negligible

. : decimal point

The sign * indicates that not all countries are included.

Country Aggregates

OECD Europe: All European member countries of the OECD (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and United Kingdom).

OECD: The countries of OECD Europe plus Australia, Canada, Japan, the Republic of Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

Currency

Monetary unit: Australian dollar (AUD)

In 2006, AUD 1.332 = USD 1.

Cut-off Date

This report is based on information and data available up to May 2007.

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