

Activities and uses of the marine environment

Environmental indicators reported in this section:

Environmental Indicator	
CO 7.14	Ship visits
CO 7.15	Shipping accidents

Shipping and impacts [CO Indicator 7.14]

Commercial shipping and port activity are vital and legitimate uses of our seas and coast, but they present environmental costs and risks. The main shipping lane around the world is from Europe to Asia, with Singapore being the hub port in South East Asia. Shipping to and from Australia is a sublink into the main shipping lane. There are some 11 000 vessels from 600 overseas ports that visit Australia's 65 ports, and a coastal trade distributing goods to the other ports. As the countries with whom Australia trades change, constant vigilance is needed to reduce the chances of introduced species establishing in our tropical and temperate waters.

The main environmental issues associated with shipping and ports include:

- effects of dredging channels and disposal of the dredged material,
- effects of antifouling paints in ports and off-shore,
- risk of introduction of exotic species into ports, harbours and coastal waters (see page 81),
- ship waste in ports,
- risk of oil or hazardous cargo spills in ports and coastal waters,
- reclamation of intertidal habitats, and
- loss of public access.

Dredging channels and ports

Dredging within ports is generally undertaken for two reasons. New berths or deeper shipping channels are needed to accommodate an expansion of the port or access by larger vessels (capital dredging), or there is a loss of pre-existing depths due to a buildup of sediment (maintenance dredging). The latter can be an ongoing issue for some port companies. Channel dredging in gulfs and bays for navigation and safety reasons may also be required.

The nature and quality of the marine and estuarine sediments can vary greatly around Australia, ranging from uncontaminated sands, which are generally suitable for sea disposal, to contaminated (with heavy metals, pesticides etc.) clays and fines that require a careful environmental impact assessment of disposal options. As many Australian ports are located in relatively muddy environments, substantial short-term turbidity can result from dredging activities.

Under the *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act), a permit is required to authorise the loading for the purposes of dumping, and the dumping at sea, of wastes and other matter.

In this context, the effects of dredging and associated dumping have been widely studied in a number of Australian ports. In December 1998 the ANZECC Interim Ocean Disposal Guidelines were released for a two-year trial period. These guidelines were designed to assist applicants to assess environmental impacts from sea dumping of dredged and excavated material, in accordance with the Convention on the Prevention of Marine Pollution by the Dumping of Wastes and Other Matter 1972 (the 'London Convention'), and the 1996



Figure 27: First port of call of international shipping into Australia.

Source: Environment Australia (2000).

Protocol to that Convention. The review of these guidelines, which is currently under way, is likely to be completed in late 2001.

Amendments to the Sea Dumping Act, to reflect the Protocol, commenced to have effect on 16 August 2000. On 4 December 2000, Australia formally ratified the Protocol.

Antifouling paint

Another significant environmental issue is the use of organotins such as tributyl tin (TBT) as biocides in antifouling paints used on vessels to prevent the buildup of organisms on ship's hulls. Its use has been of critical importance to efficient commerce and to impeding the spread of marine pests, parasites and diseases into ports, harbours and coastal waters.

There is international pressure to phase out TBT-based antifouling paints because of its extreme toxicity to marine life and its persistence in the environment (see page 54).

The grounding of a Malaysian container ship on Sudbury Reef in the Great Barrier Reef Marine Park in late 2000 resulted in levels of TBT on the Reef that were 100 times the safe level. In the largest cleanup operation of its kind in the world, divers removed flakes of antifouling paint from a 1500 square metre section of the Reef in January 2001.

The International Maritime Organisation (IMO) is finalising an international convention that would ban the use of organotins in antifouling systems. Under Australia's Oceans Policy, the Commonwealth Government is committed to banning the use of TBT from 1 January 2006 on vessels being repainted in Australian docks unless the IMO sets an earlier date for such a ban.

A long-term project conducting trials of new antifouling paints commenced in Australia in 2000. The project is a cooperative effort between the maritime, paint and coatings industries, the Royal Australia Navy, the Defence Science and Technology Organisation and Environment Australia.

Ship wastes in port

The shipping industry includes shipbuilding and the repair and maintenance of vessels, which are carried out at several ports around Australia. In the course of normal operations there is a risk of spills of oil, wastes from vessel maintenance, bilge water and sewage, and these could affect port water quality. Recreational vessels can also contribute wastes to the marine environment.

There are a number of measures in place, to both systemically and practically minimise this pollution. On a systemic level, discharges from ships are subject to the various Annexes of the international MARPOL Convention, which is implemented through Commonwealth, State and Territory legislation. Up to the present time, Australia has adopted Annexes I (oil), II (noxious liquid substances), III (packaged harmful substances) and V (air pollution). Annex IV (sewage) has not yet been adopted by Australia and consequently the control of sewage discharges from ships is inconsistent between States.

On a practical level, 35 demonstration projects are under way around Australia to build facilities to capture and treat wastes from marinas (as at May 2001). Funds are being provided by industry and port authorities, matched by Commonwealth funds from the Coasts and Clean Seas Initiative.

Oil and hazardous cargo spills [CO Indicator 7.15]

Oil and hazardous cargo spills can occur either in ports and harbours or in offshore waters. Spills can happen as a result of accidents, such as collisions or groundings on off-shore reefs. Their environmental impacts depend on the nature and quantity of oil spilt and the habitat and species that are affected.

In 1998 the Australian Maritime Safety Authority (AMSA) was funded, through the Coasts and Clean Seas Initiative, to fast-track the production of a computerised Oil Spill Response Atlas for Australia. The major outcome is an Oil Spill Response Atlas for Australia in a computerised geographic information system (GIS). This will enable a more targeted response to oil spills in future by identifying marine and coastal areas of sensitivity that could be affected in the event of an incident.

AMSA also keeps a database of oil spills and since 1995 Australia has not experienced an oil spill with major environmental impacts. Significant spill incidents that have occurred since 1995 are given in Table 8.

AMSA has, since 1973, had in place a national strategy for responding to marine spills. The original oil spill strategy was extended in 1998 to deal with the response to maritime

Table 8: Significant oil spills since 1995.

Date	Situation	Location	Quantity and type	Environmental effects
April 1996	Collision between tanker and tug	Brisbane River	Heavy fuel oil Approx 15 tonnes	Cleanup of foreshore and sensitive areas required
August 1998	Tanker at berth	Brisbane River	Lube oil 8 tonnes	Several foreshore areas required remediation
June 1999	Offshore loading	2 nm offshore Port Stanvic Refinery, SA	Oman crude Approx. 230 tonnes	Light impact at shoreline
August 1999	Cargo transfer	Sydney Harbour	Light crude 250–300 tonnes	Light to medium oiling of some foreshores

Sources: AMSA annual reports.

chemical spills in Australian waters and is now known as the National Plan to Combat Pollution of the Sea by Oil and other Noxious and Hazardous Substances. The responsibility for implementing this plan is shared among the Commonwealth, States and the Northern Territory and the oil and shipping industries.

Offshore petroleum production

Offshore petroleum production has significant economic and strategic importance for Australia, with some 85% of our petroleum demands being met from offshore wells in Bass Strait, the Timor Sea and the North West Shelf.

Exploration drilling for petroleum in Australian waters has been largely focused on the Twofold Shelf (in Bass Strait) and the North West Shelf. In the North West Shelf area, petroleum exploration and production occurs over an area of great conservation value. An application has been made (in late 2000) for an exploration permit for an area west of Carnarvon, Western Australia, which takes in the northern waters of the Shark Bay World Heritage Area.

Environmental approvals for petroleum industry activities in Commonwealth waters are governed by the provisions of the *Petroleum (Submerged Lands) Act 1967* and the *Environment Protection and Biodiversity Conservation Act 1999*. Petroleum operations in coastal waters are the responsibility of individual State and Territory governments.

The petroleum industry in Australia is recognised as having a good environmental record and is strictly regulated regarding environmental protection. As a result, the risks to the offshore environment from petroleum operations are low. However, while the risk of a major incident occurring is low, there could be a potentially very significant effect if such an incident did occur.

Oil companies have drilled over 550 exploration wells in the past 10 years and with a similar trend for development wells (Figure 28).

A review of the environmental impacts of petroleum exploration in offshore Commonwealth waters, together with the implications of the EPBC Act has recently been completed for the Department of Industry, Science and Resources (DISR 2001b). The following discussion reflects some of the compilation of research relevant to SoE reporting.

An independent scientific review of research into the environmental implications of offshore petroleum exploration was conducted by Swan et al. (1994). The review found that the offshore exploration and production industry in Australia not only met statutory requirements, but had 'set an excellent example in taking all possible steps to safeguard the marine environment'. More recent research has been funded by individual petroleum companies and by the Australian Petroleum Production and Exploration Association (APPEA) with a view to further improving the industry's environmental management and continuing to reduce impacts and risks associated with industry activities.

Following the Swan review, APPEA facilitated a scientific assessment of environmental issues and identified several specific areas where knowledge of environmental impacts could be improved. These included:

- the fate and effects of oil and dispersants on mangroves in Australia: protection, clean-up and rehabilitation,

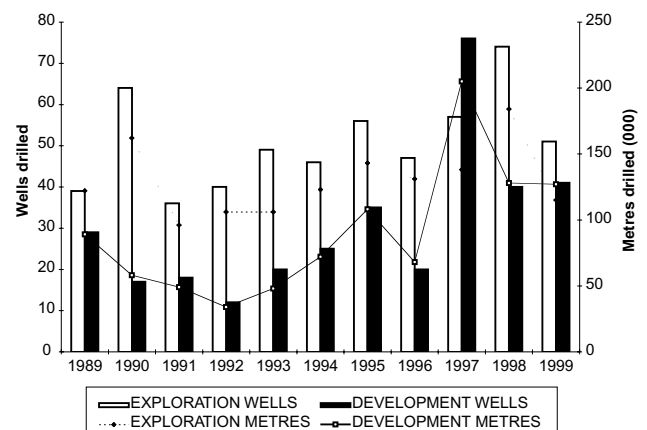


Figure 28: Exploration wells drilled, 1989–1999.

Source: Commonwealth of Australia (2001).

- dispersion and fates of produced formation water constituents, and
- investigation of the environmental effects of offshore seismic survey activities (McCauley et al 2000).

The petroleum industry has a commitment to support scientific research that furthers an understanding of the impacts of industry activities on the environment. In addition to APPEA generated initiatives, company sponsored research projects are regularly supported. Two recent projects include:

- the ecotoxicology of non-water based drilling fluid (Tsvetnenko 1999), and
- the ecotoxicology of some light Australian crudes.

In addition to these studies, a number of companies have investigated the size, chemical composition and longevity of seafloor drill cutting piles resulting from drilling activities.

The Australian Petroleum Production and Exploration Association (APPEA) has prepared its own Code of Environmental Practice (APPEA 1996). The Code outlines an environmental management framework, a management system, and a comprehensive set of environmental guidelines for the petroleum industry. Environmental guidelines for offshore petroleum activities address seismic surveys, drilling operations and development and production operations. This Code is currently being revised to reflect advances in technology, new information, and the requirements under the new EPBC Act 1999.

Effects of seismic surveys

The effects of seismic surveys continue to be investigated by independent researchers and industry because of the concern that sound waves produced by air guns could cause mortality or sublethal injury to marine organisms, or might modify the feeding or mating activity of marine mammals, fish and other organisms. The greatest risk from seismic surveys to marine animals appears to be during breeding or spawning periods. Studies have shown that noise associated with air guns can influence the behaviour of some species of mammals, fishes and squid. Further, damage to hearing organs have been reported for some species of fishes, while mortality has been reported for planktonic organisms, usually at very close range to the source of noise.

The general response to seismic surveys of migrating Humpback Whales off the north-west coast of Australia is to take avoidance action. Humpback Whale pods, consisting of cows and calves, have shown avoidance responses at a range of 7 to 12 kilometres from a large seismic source.

The Western Australian Department of Minerals and Energy has developed guidelines to minimise the effects of seismic surveys on Humpback Whales. Environment Australia, with input from the Australian Petroleum Production and Exploration Association, is currently finalising guidelines (linked to the EPBC Act) to minimise the effects of seismic surveys on Humpback, Southern Right and Blue Whales.

Sandmining

Extensive sand extraction occurs in Moreton Bay, Queensland, both for fill for major land reclamation projects associated with the airport and port and as part of a growing demand for marine sands for the construction industry.

Queensland also has substantial silica sand resources that have been mined for many years for export, mostly from Cape Flattery, in Queensland State waters. (EPA 1999a). Production increased from 670 000 tonnes in 1980 to 2.6 million tonnes in 1996–97. Mineral sands are mined for the minerals rutile, ilmenite and zircon, for use as paint pigments, and for foundry applications. Although virtually all Queensland's mineral sands are produced on North Stradbroke Island, these resources will be largely depleted in 20 years.

In Western Australia, the seagrasses of Cockburn Sound are mined for calcium-rich sand for the cement industry, despite the attendant ecological impacts.

The environmental impacts of such mining includes the effects on coastal ecosystems, the need for reinstatement of landforms, and the need for replanting with selected local species. Sandmining can also cause extensive landscape and ecosystem changes to unique and extensive features, such as North Stradbroke Island.

Biodiscovery

There is increasing interest in using the resources of the marine environment for new and novel products. There are, however, some complex issues that may need to be worked through where there is use of Indigenous knowledge as part of biodiscovery.

Some of the research in progress includes:

- the observation that reef-building corals appeared to be protected against sunburn led to research at AIMS to show this was due to specialised amino acids with simple but very efficient light-absorbing ability. These compounds are found in many organisms, including sponges and sea anemones. Synthetic analogues of the compounds are now being tested in the hope that a commercial product can be produced.
- researchers at the University of Melbourne have studied southern Australian and Antarctic marine sponges, and are targeting metabolites that inhibit specific enzyme systems to develop safer, more specific drugs and agrichemicals (Capon et al. 1999).
- work at the University of New South Wales has identified a group of natural products from marine algae which deter the settlement and growth of fouling organisms. The compounds' ability to prevent bacteria forming biofilms is significant because biofilms are responsible for approximately 65% of all human infections, as well as creating a range of industrial problems. In cooperation with multinational organisations, commercial applications are being pursued including development of an antifouling paint and contact lens cleaning solutions.
- a collaborative research project between James Cook University and AIMS to produce a novel class of natural herbicides based on marine compounds has attracted \$2 million of research and development funding from Nufarm Ltd. Several compounds have displayed selective herbicide activity that, if commercialised, would be valuable to farmers world-wide.

Once a commercial product is discovered, the molecule is either synthesised or grown in aquaculture systems.