The Framework for Marine and Estuarine Water Quality Protection

Australia's Marine and Estuarine Environment

All catchments in Australia, with the exception of the Lake Eyre Basin, ultimately discharge to estuarine or marine ecosystems. This, along with the fact that:

- a quarter of Australia's population lives within three kilometres of the sea, and
- two thirds reside in our coastal towns and cities;

means that significant sections of coastline have been affected by urban, industrial and agricultural development, and recreational activity.

The health of marine and estuarine ecosystems is inextricably linked to the catchments with which they interact. Consequently, many land-based activities can have a significant effect on our coastal environments. It is estimated that some 80 percent of water quality impairment in Australia is caused by broadscale landuse activities (SoMER 1995). The two major problems facing our marine and estuarine ecosystems are increasing nutrient and sediment loads.

Pollutants affecting Australia's coastal waters

The main pollutants, listed in approximate order of significance, that affect marine and estuarine water quality in Australia are:

- Nutrients;
- Sediments;
- Acid sulfate soils;
- Organochlorines;
- Heavy metals;
- Oil and hydrocarbons; and
- Pathogens.

Nutrients

Agricultural and urban runoff, wastewater treatment plants and septic tanks, are the major sources of nutrients to Australia's rivers, estuaries and coastal waters.

Elevated loads of nutrients - nitrogen and phosphorus - can result in algal blooms, which in turn may adversely impact coastal waters by preventing light reaching benthic plants, and by producing toxins detrimental to animal and human health.
Further, the death and decay of algal blooms can reduce the amount of dissolved oxygen available to aquatic life, sometimes causing extensive fish kills.

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Sediments

The discharge of sediments to coastal waters is significantly increased through land clearing, poor cultivation practices and urban development. Soil erosion is considered the major common contributing factor.

Excessive sediment loads have many undesirable effects on receiving waters, such as siltation and smothering of aquatic ecosystems, turbidity, and reduced light penetration causing changes to primary production.

In many instances, sediments may also transport significant loads of nutrients, heavy metals and organochlorines, as these materials are commonly attached to sediment particles.

> Of the total yield of suspended sediment from six north Queensland catchments it is estimated 26% is attributable to natural processes, 66% to grazing practices and 8% to cropping.
>
> Source: State of the Environment Queensland 1999

Acid Sulfate Soils

Acid sulfate soils (ASS) are found in low-lying coastal areas and contain high concentrations of sulfide minerals (mainly iron pyrite, FeS_2).

ASS are relatively harmless in their undisturbed (submerged) state but may generate large quantities of sulfuric acid when exposed to the atmosphere through

excavation, dredging or lowering of the water table. In addition, iron and aluminium metals may become soluble under acid conditions (Al^{3+}, Fe^{2+} and Fe^{3+}) and enter rivers and estuaries where they may have detrimental effects on aquatic organisms. Major fish and crustacean kills, outbreaks of red-spot disease in fish and increased incidence of disease-carrying acid tolerant mosquitoes have been linked to the disturbance of these soils.

Organochlorines
These are synthetic compounds developed for agricultural and industrial use and are often found in urban and agricultural run-off. Whilst these compounds are usually not detectable or only present in extremely low concentrations in seawater, they can bioaccumulate to toxic levels.

Pesticides such as diuron and dieldrin are present in marine sediments of the Great Barrier Reef, and significant levels of residues have been found in the Reef's dugongs and dolphins.

Little is known about the levels of organochlorines in Australia's marine environment although it is thought that pesticides such as DDT are widely present in marine life around Australia. There is little information available about the effect of organochlorines in Australia's coastal waters, however, these compounds are suspected of causing kidney damage in Arctic birds and mammals.

Heavy metals
Heavy metals enter marine and estuarine ecosystems through the discharge of industrial waste, treated sewage, stormwater run-off, mining operations and other diffuse sources (such as from vehicles). The most common heavy metal pollutants are arsenic, cadmium, chromium, copper, nickel, lead and mercury.

Heavy metals persist in the environment and so tend to accumulate in soils, sediments and living organisms. Organisms accumulate heavy metals in their tissues and this contamination is concentrated in organisms higher up the food chain ('bioaccumulation'). Heavy metal contamination can affect marine biota, fisheries and other aquacultural operations and human consumers of seafood.

"Economists have estimated the value of goods and services provided by the ocean in regulating atmospheric gases, nutrient cycling, biological control, food production, raw materials and recreation at US$21 500 billion annually"

Source: Pollution from the land: the threat to our seas.

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Oil and hydrocarbons
Oil and hydrocarbon pollution of coastal waterways is largely linked to industrial and stormwater discharges. Many of the compounds in crude oil and other petroleum products have been known to smother organisms, lower fertility and cause disease in aquatic organisms.

Pathogens
Pathogens such as faecal coliforms and enterococci enter the marine environment through the discharge of sewage via ocean outfalls and from stormwater system overflows to rivers and streams. These pathogens pose threats to human health through gastro-enteritis, hepatitis and other diseases.

Unacceptable faecal discharges to coastal waters may arise from aging sewage and stormwater infrastructure, combined system overflows after heavy rains or inadequate wastewater treatment. Human health may therefore be at risk from direct contact with contaminated waters (eg swimming) or from consumption of contaminated seafood (eg. oysters).

United Nations Global Programme of Action

Land-based sources of marine pollution are recognised internationally as a major environmental issue. The international community, through the United Nations Environment Programme, has initiated

action to address this issue, specifically through the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (the GPA).

In response to the widespread pollution of the marine environment, 108 governments (including Australia) and the European Commission have declared their commitment to protecting and preserving the marine environment from the adverse environmental impacts of land-based activities. As a result, the GPA was adopted in 1995.

The 20th Session of the United Nations Environment Program Governing Council resolved (in 1999) to undertake the First Intergovernmental Review (IGR) of the GPA, which was held in Montreal, Canada from 26 to 30 November 2001.

The IGR meeting reviewed progress on implementation of the GPA at the global, regional and national levels. Australia's national report was coordinated by Environment Australia, in collaboration with State and Territory governments. This report considered national coordination of efforts to address land-based sources of marine pollution, including the application of the following National policies and programs.

National Policies and Programs

Australia meets its obligations under the GPA through implementation of the policies, principles and industry guidelines of the National Water Quality Management Strategy and the following actions and programs:

National Water Quality Management Strategy
The National Water Quality Management Strategy (NWQMS) was introduced by the Commonwealth, State and Territory Governments in 1992 as a response to growing community concern about the condition of the nation's water bodies and the need to manage them in an ecologically sustainable way.

In 1994 the NWQMS was included in the Council of Australian Governments (COAG) Water Reform Framework.

The NWQMS is comprised of 21 guideline papers, the most significant and recent paper to be released being the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000), which outlines a framework for water resource protection and management. The Commonwealth will now be seeking to implement this framework through its policy and funding programs.

The Framework for Marine and Estuarine Water Quality Protection
The Framework for Marine and Estuarine Water Quality Protection was developed as a nationally consistent approach to protecting the marine environment from the effects of land based pollution, therefore contributing to meeting Australia's obligations under the GPA. Identification and achievement of reductions in pollutant loads and establishment of end of river targets are central components of the Framework and the development of coastal water quality improvement plans.

The Framework builds upon the Council of Australian Government's Water Reform Framework, including key elements of the NWQMS as it applies to coastal waters and wetlands and the National Principles for the Provision of Water for Ecosystems.

The Framework is based upon the identification and protection of the environmental values of water (as detailed under the NWQMS). Water quality improvement plans developed using the Framework will identify management actions that would protect these values.

Key features of the Framework include identification of:

- the environmental values of the coastal water;
- the catchment that discharges to that coastal water;
- the water quality issues (eg algal blooms, sedimentation, high coliform concentrations causing beach closures) and subsequent water quality objectives;
- the total maximum load of pollutant/s to be achieved to attain and maintain the water quality objectives;
- the allocation of the total maximum load of pollutant/s to diffuse and point sources of pollution;
- the river flow objectives to protect identified environmental values, having regard for matters such as natural low flows, flow variability, floodplain

inundation, interactions with water quality and the maintenance of estuarine processes and habitats;
- ♦ management measures, timelines and costs in implementing the plan; and
- ♦ the grounds for a "reasonable assurance" from jurisdictions to provide security for investments to achieve the specified pollutant load reduction and environmental flow targets .

Priority coastal areas will be targeted for planning and subsequent funding. In the absence of an accredited water quality protection plan, interim water quality targets and pollution reduction strategies may be established to guide Commonwealth funding during plan development.

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) should be consulted in the application of this Framework. Terms used in the Framework, such as environmental value, water quality objective and monitoring and reporting have the same meaning as those in the NWQMS documents.

CONTACTS

Vaughn Cox
Water Quality Section
Environment Australia
(02) 6274 2005
vaughn.cox@ea.gov.au

Nerida Davies
Water Quality Section
Environment Australia
(02) 6274 1962
nerida.davies@ea.gov.au

PHOTOGRAPHS

Jade Ballantine
Environmental Project Officer
City of Port Adelaide Enfield

The Framework for Marine and Estuarine Water Quality Protection

1. A water quality improvement plan will as a minimum:

   (a) delineate the marine and estuarine waters to which the plan applies and the catchment which contributes pollutants to those waters;

   (b) identify the environmental values of those marine and estuarine waters;

   (c) set out the water quality issues, pollutants of concern, and water quality objectives for those waters, and:

   - the estimated total maximum pollutant loads to achieve and maintain the water quality objectives, and how this differs from the current estimated pollutant loads (assumptions used for the basis of these estimates shall be detailed);

   - the estimated constituent point and diffuse source allocations of the total maximum pollutant loads (including from marine activities eg. aquaculture);

   - the estimated point source allocations to each licensed point source, and the allocations to non-point sources of contaminants, including atmospheric deposition or natural background sources;

   - the margin of safety used in establishing the total maximum pollutant load which accounts for uncertainty, including that associated with estimating pollutant loads, water quality monitoring, ecosystem processes and modelling;

   - how decision support systems will be developed and applied to appraise the likelihood of success of the plan, and the degree and timeliness of reductions in pollutant loads, including provision for future growth which accounts for reasonably foreseeable increases in pollutant loads (eg. approved industrial point sources, urban expansion); and

   - seasonal variation in pollutant load inputs, such that the water quality objectives will be met all year round.

   (d) set out the river flow objectives for those waters, having regard for ecological and geomorphic processes relating to, but not limited to:

   -protecting natural low flows;
   -protecting important rises in water levels;
   -maintaining wetland and floodplain inundation;
   -maintaining natural flow variability; and
   -maintaining or rehabilitating estuarine processes and habitats.

   (e) estimate the time required to attain and maintain water quality and river flow objectives, and the basis to those estimates;

   (f) describe the control actions and/or management measures which will be implemented to ensure:

   - discharges of pollutants to coastal waters are less than the total maximum pollutant loads, for all sources irrespective of category or land use activity; and

   - environmental flow provisions will achieve the identified river flow objectives.

   (g) set out a timeline, including interim targets and milestones, for implementing the control actions and/or management measures and attainment of water quality and

river flow objectives, including a schedule for revising the regulatory and management arrangements, as appropriate;

(h) identify accountabilities for implementing the various source control measures, as well as strategies for the maintenance of effort over time;

(i) identify strategies for adaptive environmental management, recognising the implications to environmental monitoring programs of management interventions over time;

(j) set out the processes for monitoring and/or modelling and reporting on the effectiveness of the control actions and/or management measures, and whether pollutant loads and environmental water provisions are being met;

(k) provide time lines and costs for plan implementation;

(l) identify opportunities for market based approaches to implement the plan;

(m) provide for the periodic review of water quality objectives, total maximum pollutant loads, river flow objectives and environmental water provisions;

(n) set out the means for public involvement and public reporting; and

(o) identify the process and timing for revising the plan.

2. As an Appendix to the water quality improvement plan, the plan will also contain:

(a) legal advice stating and describing the jurisdiction's statutory capacity to implement the plan and commitments for legislative reform, as appropriate;

(b) the programs and funding committed by the jurisdiction to implementing the plan; and

(c) a “reasonable assurance” ie. a high degree of confidence that projected reductions in the total pollutant load and attainment of environmental water provisions will be achieved. The grounds to the "reasonable assurance" should be substantiated.