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case study 2: gippsland lakes: cooperatively managing water quality

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introduction

The Gippsland Lakes are a series of coastal lagoons in eastern Victoria separated from the sea by sand dunes. They form the largest navigable inland waterway in Australia and are comprised of three major lakes: Lake Wellington, Lake Victoria and Lake King. The Lakes are fed by a number of river systems and are now linked to the sea by an artificial entrance constructed in 1889. The Lakes create a distinctive regional landscape of wetlands and flat coastal plains which is of considerable environmental significance in terms of landforms, vegetation and fauna and the area is protected by the Ramsar wetlands convention.

Land use within the Gippsland Region varies between river basins, with forests in the northern parts of the catchments and agricultural, urban and industrial areas in the lower catchments and floodplains. The intensity of land use or development (urban, rural, and industrial) tends to increase with proximity to Melbourne, the largest population centre bordering the region.

The *Gippsland Lakes & Coast Regional Coastal Board* was established in 1997 and is one of three regional Boards formed under the Victorian *Coastal Management Act 1995*. The Victorian Coastal Council (VCC) is a state-wide, umbrella organisation for these Boards. The Regional Boards report to the Victorian Minister for the Environment on coastal issues. The Coastal Board has provided key strategic direction and support for the improvement of the Gippsland Lakes.

The *West and East Gippsland Catchment Management Authorities* (CMAs) were established in 1997 with the aim of creating a whole-of-catchment approach to natural resource management. The primary goal of each CMA is to ensure the protection and restoration of land and water resources, the sustainable development of natural resource-based industries and the conservation of natural and cultural heritage. With the continued focus on catchment and regional scale natural resource management, the CMAs remain a key player in managing the Gippsland Lakes.

In addition, there are several *Victorian Government* agencies and statutory authorities, and four *Local Governments* who all share some responsibility in the management of Gippsland Lakes' natural resources. To coordinate the development and implementation of the diversity of initiatives relating to natural resource management for the Gippsland Lakes, several coordinating mechanisms are used – some of these are outlined below where relevant to specific initiatives.

One of largest of these coordinating mechanisms is the *Gippsland Integrated Natural Resources Forum* (GINRF), which aims to provide a whole-of-Gippsland approach to the management of the region's natural resources under the slogan Catchment Health – Gippsland's Wealth. The role of the Forum is to achieve a cooperative and strategic approach to natural resource management. The Forum has a membership of some sixty organisations including government departments, catchment management authorities, the coastal board, municipal councils, rural and urban water authorities, universities, private industry, regional development bodies, community based groups (such as Landcare), and cross agency groups (such as the Gippsland Research Coordination Group).

The key coordinating mechanism for State Government investment in the Gippsland Lakes is the *Gippsland Lakes and Catchment Taskforce*. This comprises the Regional Manager or Chair of all of the key management agencies and organisations for the Lakes.

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water quality improvement initiatives for gippsland lakes

In 1998, the Gippsland Lakes and Coast Regional Coastal Board engaged the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to conduct an environmental audit of the Gippsland Lakes and concluded that the system was approaching a level of severe environmental damage that may be difficult to reverse. Long term changes in ecological character in the Gippsland Lakes were primarily attributed to changed water and salinity regimes associated with the permanent artificial entrance to the Lakes from the sea, and reduced water quality and quantity associated with changed land and water use in the catchment.

As a result of this work the Gippsland Lakes and Coast Regional Coastal Board, in partnership with key stakeholders, commissioned the *Gippsland Lakes Environmental Study*. This study, completed in 2001, developed a water quality modelling tool that could be used to test potential engineering, technological and hydraulic solutions to the problems. The study found that catchment nutrients were the most important factor contributing to toxic blue-green algal blooms. The key findings of the study were that:

- the improved health of the Lakes would be best achieved through continued improvement in catchment management and nutrient reduction activities across public and private land; and
- increased freshwater would generally result in less improvement in water quality than similar effort in nutrient reduction.

In response to the study, the State Government appointed the high level *Gippsland Lakes and Catchment Taskforce* in 2001 to advise the Government on the response to the Gippsland Lakes Environmental Study. The Taskforce developed the *Gippsland Lakes Future Directions and Action Plan*, an overarching plan to provide a high-level and integrated approach to the management of the Gippsland Lakes and their catchments. The Action Plan aims to reduce pollution of the Lakes by 40 per cent by 2022.

The plan contains clear objectives, priorities and activity programs in five key areas.

1. *Nutrients and Sediments*: To reduce nutrient inputs to the Gippsland Lakes by 40 per cent over the next twenty years (by 2022).
2. *Water Management*: To establish a balance between freshwater and saltwater flows that will improve the overall ecological health of the Lakes and catchment streams.
3. *Capacity Building*: To improve the capacity of the catchment community to understand and participate in actions and changes necessary to reach the objectives of the *Gippsland Lakes Future Directions and Actions Plan*.
4. *Wetlands Biodiversity*: To maintain and enhance the biodiversity of the Gippsland Lakes hinterland and wetlands.
5. *Planning, Monitoring and Evaluation*: Further develop and implement the framework for the coordinated management of the whole Gippsland Lakes catchment provided in the *Gippsland Lakes Future Directions and Actions Plan* and to monitor and evaluate the effectiveness of the document and associated activities and provide tools for continual adjustment of directions and priorities.

As well as investing in natural resources through regional agencies the Victorian Government has provided specific funding to address the health of the Gippsland Lakes. Under the auspices of the *Gippsland Lakes Rescue Package* the Victorian Government has committed $21.7 million in three phases.

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phase 1

$2.9 million over 2000/01 – 2001/02 was directed to various projects including the implementation of the *Macalister River Irrigation District Nutrient Reduction Plan*. This plan aimed to reduce levels of nutrients leaving the district by 40 per cent by 2005. This was to be achieved by increasing the efficiency of water and fertiliser use on farms through measures such as reducing runoff and recharge from irrigated agriculture through improved water use efficiency, keeping nutrients and water on farms through irrigation and fertiliser best management practices, increased spray irrigation, tail-water reuse and intercepting water in irrigation drains before it entered waterways. The 40 per cent reduction was met by 2005 during a period of time with below average rainfall.

phase 2

$12.8 million over 2002/03 – 2005/06 saw the commencement of implementation of the *Gippsland lakes Future Directions and Action Plan* (see Plan's objectives above) with the following annual investment:

- 2002/03: 33 projects, $2.7 million
- 2003/04: 28 projects, $3.2 million
- 2004/05: 30 projects, $3.7 million
- 2005/06: 32 projects, $3.2 million

phase 3

In July 2006, the Victorian Government committed a further $6 million over three years, under the *Our Environment, Our Future* Action Statement for the ongoing implementation of the Gippsland Lakes Future Directions and Action Plan. In 2006/07 this will support 14 projects ranging from reducing nutrient flows into the Lakes to enhancing permanent water quality monitoring stations.

In 1999, the Gippsland Lakes & Coast Regional Coastal Board also prepared the *Gippsland Lakes Coastal Action Plan* to tackle the increasing nutrient levels within the Lakes and establish a strategic direction for the management of adjacent public and private coastal land. It encompassed seven themes including (amongst others) water quality and quantity, environmental protection and natural resource management and planning scheme controls. Phosphorus loads in the Lakes resulting from sewage are being addressed under this plan with *Gippsland Water* aiming to achieve a ten-fold decrease in phosphorus outputs from the sewerage treatment plants under its control. Other projects funded under the *Gippsland Lakes Coastal Action Plan* have included boat sewage pump-out systems and provision of composting toilets in remote locations to address water quality issues, and the preparation of several foreshore management plans.

The *Gippsland Water Quality Action Plan* (WQAP, 2005) represents the culmination of significant research into, and assessment of, water quality within the region. Led by the East and West Gippsland Catchment Management Authorities and the Gippsland Coastal Board, developed in consultation with community and other stakeholders, it includes a set of management activities to improve the water quality of the river systems across Gippsland. The WQAP complements the *Gippsland Lakes Future Directions and Action Plan*, the *Gippsland Regional Catchment Strategy* and the *Gippsland Regional River Health* strategies. It was developed using the *Victorian River Health Strategy* (2002) framework, which signifies a major turning point in the strategic approach to waterway management in Victoria; focusing on "protecting the best" – based on community identified high economic, environmental and/or social values.

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The objective of the WQAP is to provide a strategic plan for the implementation of actions and on-ground activities to improve water quality within the Gippsland Region. A key component of this is the reduction of nutrient loads to the Gippsland Lakes by 40 per cent by 2022 (see Table 1). To allow assessment of the expected nutrient and sediment reductions achieved from various land uses under a range of management scenarios, an Adaptive Environmental Assessment and Management (AEAM) model was developed for the East and Central Gippsland region. From these scenarios, management actions were developed to address the identified causes of poor water quality and the expected load reductions achievable with implementation. The AEAM model indicated that even with full execution of all management actions (focused mainly on implementation of Best Management Practices) the 40 per cent nutrient load reduction target for the Gippsland Lakes may not be achieved, with the modelled reductions in load falling short of the target – 17 per cent for phosphorus, 12 per cent for nitrogen and 18 per cent for sediment. It should be noted that the Gippsland Lakes Taskforce has now sought to verify this modelling and refine the nutrient reductions available from respective Best Management Practices (BMPs), the anticipated rate of adoption and their relative costs ($/kilogram) to maximise investment in nutrient reduction activities. The Taskforce has also commissioned further research to identify other mechanisms and activities to reduce nutrients entering the Gippsland Lakes.

Table 1: Nutrient Loads to the Gippsland Lakes (GL)[1]

Landuse	Area (km²)	TP load (t/year)			TN load (t/year)			TSS load (t/year)		
		2022 no BMP	2022 BMP	% GL load	2022 no BMP	2022 BMP	% GL load	2022 no BMP	2022 BMP	% GL load
Urban	112	21	17	0.9%	113	106	0.2%	12451	5741	2.5%
Forested	6396	97	92	1.2%	758	718	1.3%	86270	81366	1.8%
Horticulture	152	14	8	1.6%	118	66	1.7%	12614	6893	2.1%
Dryland	2952	66	56	2.5%	770	667	3.3%	61274	46072	5.6%
Dairy	1136	92	59	8.6%	412	302	3.5%	22997	16487	0.2%

Management actions have been prioritised at a range of scales – from River Management unit through to the Gippsland Lakes catchment scale. Despite the indication that management actions will not achieve the 40 per cent load reduction target, prioritisation allows the targeting of management actions to achieve the greatest load reduction at a reasonable cost. Coordination of WQAP implementation will be led by the East Gippsland and West Gippsland Catchment Management Authorities. By establishing management action and resource condition targets, progress in the implementation of the plan and the measurable effects through improved water quality can be ascertained. In addition, knowledge gaps identified will require research and investigation, and alternate methods of achieving nutrient load reduction need to be explored. This WQAP will be renewed following development of state-wide guidelines for the preparation of water quality plans within the Victorian River Health Strategy framework, expected in 2008.

1. Predicted nutrient loads to Gippsland Lakes in 2022 with and without management intervention (implementation of Best Management Practices) and expressed as percentage reduction in load to the Gippsland Lakes. The predictions are derived from the Adaptive Environmental Assessment and Management model, used in the development of the WQAP (2005).