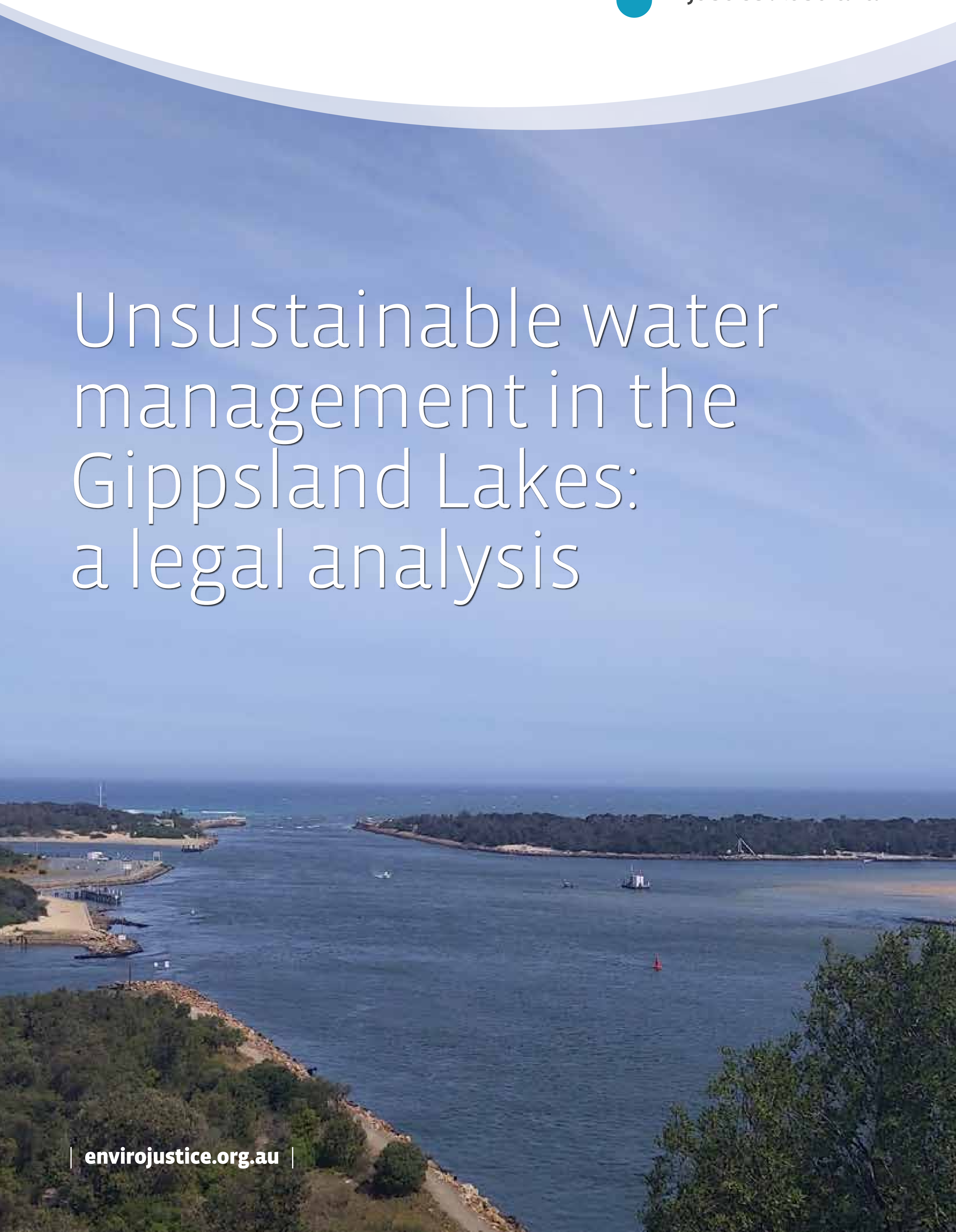
Environmental Justice Australia

Unsustainable water management in the Gippsland Lakes: a legal analysis



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We act as advisers and legal representatives to the environment movement, pursuing court cases to protect our shared environment. We work with community-based environment groups, regional and state environmental organisations, and larger environmental NGOs. We also provide strategic and legal support to their campaigns to address climate change, protect nature and defend the rights of communities to a healthy environment.

While we seek to give the community a powerful voice in court, we also recognise that court cases alone will not be enough. That's why we campaign to improve our legal system. We defend existing, hard-won environmental protections from attack. At the same time, we pursue new and innovative solutions to fill the gaps and fix the failures in our legal system to clear a path for a more just and sustainable world.

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For further information on this report, please contact:

Dr Bruce Lindsay, Lawyer, Environmental Justice Australia
T: 03 8341 3100
E: admin@envirojustice.org.au

Produced & published by Environmental Justice Australia
ABN 74 052 124 375

Telephone:	03 8341 3100 (Melbourne metropolitan area)
	1300 336 842 (Outside Melbourne metropolitan area)
Facsimile:	03 8341 3111
Email:	admin@envirojustice.org.au
Website:	www.envirojustice.org.au
Post:	PO Box 12123, A'Beckett Street VIC 8006
Address:	Level 3, the 60L Green Building, 60 Leicester Street, Carlton

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Image page 31: Lake Coleman by Damien Cook

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Contents

Purpose

1. This report provides a legal analysis of hydrological management of the Gippsland Lakes and catchment. The analysis considers application of Ecologically Sustainable Development (ESD) principles to water management in that ecosystem. The term ESD is used interchangeably with the term 'sustainability' in this report.

2. The Central and Gippsland Sustainable Water Strategies (SWSs) is in preparation by the Department of Environment, Land, Water and Planning (DEWLP). We understand that discussions and preparation of the draft SWS are underway internally.

3. This report is intended to inform preparation of the Central and Gippsland SWSs. Its focus is on sustainability of hydrological management within the broader, cumulative effects of management of the Gippsland Lakes hydro-ecological system (including the Lakes system, the inflowing rivers and the wider catchment). This task involves setting out the relevant ESD principles and applying these principles to key scientific knowledge (facts and opinions) on hydrological and environmental conditions of this system. We rely on governmental and scientific information publicly available regarding the Gippsland Lakes and catchment as at 1 February 2021 (these documents are listed in Appendix 1). This document is intended to complement law reform approaches arising from Environmental Justice Australia's Participatory Design Process.[1]

In preparing and publishing this report, Environmental Justice Australia recognises that the land and waters to which it relates are, and always will be, the Country of the Gunnai Kurnai Nation who never ceded sovereignty. We acknowledge the work they have done over tens of thousands of years caring for Country and the extensive disruption and violence of colonisation.

This report does not reference in detail the significance of the Gippsland Lakes to the Gunnai Kurnai Nation or the issues and solution in that context. This is in no way intended to diminish the sacred and cultural nature of this land and waterscape. We did not feel we could do it justice in this particular report nor that it was appropriate without permission or direction from the Gunnai Kurnai people. It is our hope that this work assists in the struggle for its protection and recovery under Gunnai Kurnai Custodianship.

1 For more information about EJA's Gippsland Lakes participatory design project, see: Environmental Justice Australia, *Gippsland Lakes* <https://www.envirojustice.org.au/our-work/nature/rivers/gippsland-lakes/>.

Summary

4. This document assesses the hydrology and ecology of the Gippsland Lakes, its rivers and catchment, based on available scientific information, through the legal frame of ESD.

5. Hydrological management in the Gippsland Lakes catchment is fundamental to the character and integrity of the Gippsland Lakes ecosystem. These characteristics may be understood in terms of ecosystem benefits and services,[2] although this description arguably only partially sets out ecosystem properties, structure, function and processes recognised in ecological theory.[3] The significance of freshwater resources reflects evolution and functioning of the Lakes as a freshwater-influenced system – albeit to a retreating degree since the 1880s when permanent marine influence was established by the cutting of a permanent entrance to the ocean. Substantial increase in water diversions and extraction since the 1960s and 1970s has progressively accelerated this retreat, in so doing jeopardising freshwater-dependent wetlands and estuarine communities. Climate change is, and will continue to be, exacerbating these trends.

6. Our analysis concludes there is an arguable case that current and previous management of the Gippsland Lakes and catchment area fails to implement ESD principles, including in relation to management of water resources. The management of water resources influencing the Gippsland Lakes is not sustainable as measured against key constituent principles of ESD.

7. Relevant ESD principles considered in this report include the precautionary principle, the principle of conservation of biodiversity and ecological integrity, and the principle of intergenerational equity.

8. The current state of environmental conditions indicates water resources influencing the Gippsland Lakes are not being managed in a precautionary manner, nor in a manner capable of conserving the biological diversity and ecological integrity of the Lakes (notably freshwater-influenced components), nor in a manner directed to handing them on to the next generation in a state better or no worse than they presently are.

9. To the extent genuine consideration of sustainability principles are not reflected in water management in the Gippsland Lakes system there is the risk not only of ongoing trajectories of deterioration in environmental conditions but to the lawfulness of water planning and management as applied to this aquatic system.

2 Finlayson et al 'The Ramsar Convention and ecosystem-based approaches to the wise use and sustainable development of wetlands' (2011) 14 *Journal of International Wildlife Law and Policy* 3-4 176.

3 See e.g. Boon and Prahalad 'Ecologists, economics and politics: problems and contradictions in applying neoliberal ideology to nature conservation in Australia' (2017) 23 *Pacific Conservation Biology* 115; Lake et al 'Linking ecological theory with stream restoration' (2007) 52 *Freshwater Biology* 597

10. A new Central and Gippsland SWS should recognise that management of water in the Gippsland Lakes catchment is unsustainable and respond accordingly. In our view, this response should include, but not necessarily be limited to:

a. implementation of the precautionary principle, including:

   i. a moratorium on new water allocations within the Lakes catchment and major inflowing rivers (Latrobe; Thomson; Macalister; Mitchell) for consumptive uses or reallocation from existing to new consumptive uses.[4]

   ii. establishment of strategic ecosystem integrity targets and seasonal passing flow limits, connected to freshwater flow regimes, such as pathways maintaining fringing freshwater or brackish water wetlands, recovery of freshwater influenced vegetation communities (such as swamp gum and reed beds), recovery of Black Bream populations in the lakes proper and the estuarine sections of the inflowing rivers, and growth in waterbird and shorebird populations.

   iii. allocation of rehabilitated mine operators' entitlements to flows contributing to ecosystem integrity, such as environmental flows.[5]

   iv. assessing the hydrological needs of the main rivers and the Gippsland Lakes, particularly the Ramsar site, in the course of allocating appropriate environmental water to meet ecosystem integrity and biological diversity in freshwater-influenced wetlands and communities.

b. implementation of the principle of conservation of biological diversity and ecological integrity including:

   i. assessing the hydrological needs of the Gippsland Lakes, particularly but not limited to the Ramsar site, on the basis of appropriate freshwater inflows (hydrological targets) required to meet ecological integrity in this ecosystem, with specific regard to the integrity of freshwater and freshwater-influenced components.

   ii. implementing an ecological sustainable flow regime on the basis of ecosystem integrity and biological diversity, whether expressed in terms of Ramsar criteria (Ecological Character Description) and/or alternative tools (such as an appropriate reference model for recovery), and including water planning pathways contributing to ecosystem recovery. The latter should be implemented through the SWS process. The prominent risk to ecological integrity of further incursion of saline conditions into freshwater-influenced ecosystems drives this need for strong ecosystem-based inflows, adjusted over time having regard to climate change risks and principles of accommodation, mitigation and adaptation to those risks.[6]

c. implementation of the principle of intergenerational equity, including appropriate measures to address the arguably inequitable distribution of environmental benefits across generations. In our view, these measures are similar to those set out above concerning ecological integrity and the application of precaution to decision-making and water management.

4 Redistributive allocations in such a manner enable long-term justice outcomes, with the additional prospect of allocations (water rights) being used either in aid of protection and restoration of Country (including ecosystem health) or for consumptive purposes (such as water market trade) or both, as the Traditional Owner holding entity see fit or is consistent with its own legal obligations. Generally, on the redistributive agenda, see Macpherson, *Indigenous Water Rights in Law and Regulation: Lessons from Comparative Experience* (Cambridge University Press, 2019) 3.

5 Hale et al, *Latrobe Valley Regional Water Study – Ecological Effects Assessment. A report to the Department of Environment, Land, Water and Planning* (2020).

6 Finlayson et al 'Policy considerations for managing wetlands under a changing climate' (2017) 68 *Marine and Freshwater Research* 1803.

Ecologically Sustainable Development (ESD)

11. Sustainable development, or ecologically sustainable development (ESD) as it is known in Australia, is a cornerstone of environmental law and policy and a leading normative framework at international, national and local levels. At an international level, sustainable development was defined by the Report of the World Commission on Environment and Development, *Our Common Future* (Brundtland) report, as '*development that meets the needs of present generations while not compromising the ability of future generations to also meet their own needs*.'[7] The process of integrating sustainable development into Australian law and policy began in 1990 with the release of Commonwealth government discussion papers that resulted in the *National Strategy for Ecologically Sustainable Development* (1992). Notwithstanding varying precise formulae for expressing ESD principles, most are based on definitions in these documents.

12. ESD is the most important legislated criteria for environmental management, not just as an object of legislation, but as a mandated factor in environmental decision-making.[8] It is both a process and an outcome. ESD functions as a body of constituent norms and principles, interpreted in the context of the legislation in which they are situated.[9] These principles relate to each other.[10] Where ESD is a consideration in decision-making, it is generally open to the decision-maker to weigh or 'balance' the priorities so as to achieve an optimal result that accords with the intention of the legislation under which the power is exercised.[11] Some ESD principles, such as the precautionary principle, operate robustly as rules of law[12] and have been the subject of comprehensive case law. Others, such as conservation and ecological integrity as fundamental considerations, are important core norms less tested in the courts.

ESD and the *Water Act 1989* (Vic)

13. The principle of an environmentally sustainable use of water resources is foundational to Australian water law and policy.[13] The Victorian government, like other State and Federal Governments in Australia, has enacted water legislation which explicitly aims to ensure that water resources are used sustainably.[14]

14. The concept of sustainability is contained in the purposes of the *Water Act,* one of which is to 'make sure that water resources are conserved and properly managed for *sustainable use* for the benefit of present and future Victorians'.[15] The exercise of decision-making powers under other provisions of the legislation may be constrained by, and broadly referrable back to, these purposes.

15. Sustainability principles are also contained in other provisions of the *Water Act,* including:

    a. in the sustainable management principles for water corporations: each water corporation, in performing its functions, exercising its powers and carrying out its duties must have regard to sustainability principles, including:[16]

        i. the need to ensure that water resources are conserved and properly managed for sustainable use and for the benefit of present and future generations;[17]

        ii. the need to encourage and facilitate community involvement in the making and implementation of arrangements relating to the use, conservation and management of water resources;[18]

        iii. the need to integrate both long term and short term economic, environmental and equitable considerations; and Aboriginal and cultural considerations; and social and recreational considerations;[19]

        iv. the need for the conservation of biological diversity and ecological integrity to be a fundamental consideration;[20]

        v. if there are threats of serious or irreversible environmental damage, lack of full scientific certainty as to measures to address the threat

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7 Gro Brundtland, *Report of the World Commission on Environment and Development: Our Common Future. United Nations General Assembly document* UN Doc A/42/427 (1987).

8 Gerry Bates *Environmental Law in Australia* (LexisNexis Butterworths 2019 10th ed) 179.

9 The Judicial Development of Ecologically Sustainable Development (PDF , 512.9 KB), paper presented by Justice Brian J Preston to the 'Environment in Court', IUCNAEL Colloquium 2016, 20-25 June, University of Oslo, Norway, published in Douglas Fisher (ed), Research Handbook on Fundamental Concepts of Environmental Law (Edward Elgar, 2016) 5.

10 Ibid.

11 Bates (n 8) 179.

12 E.g. *Friends of Leadbeater's Possum Inc v VicForests (No 4)* [2020] FCA 704.

13 See e.g. *Intergovernmental Agreement on a National Water Initiative* (2004), [5]: 'The Parties agree to implement this National Water Initiative (NWI) in recognition of the continuing national imperative to increase the productivity and efficiency of Australia's water use, the need to service rural and urban communities, and to ensure the health of river and groundwater systems by establishing clear pathways to return all systems to environmentally sustainable levels of extraction.' See also *Water Act 2007* (Cth), subs d(i).

14 *Alanvale Pty Ltd v Southern Rural Water (Red Dot)* [2010] VCAT 480, [24]: 'Sustainability is the key message permeating all aspects of the *Water Act 1989*.'

15 *Water Act 1989* (Vic) s 1(d).

16 *Water Act 1989* (Vic) s 93.

17 *Water Act 1989* (Vic) 93(a).

18 *Water Act 1989* (Vic) s 93(b).

19 *Water Act 1989* (Vic) s 93 (c).

20 *Water Act 1989* (Vic) s 93(d).

should not be used as a reason for postponing such measures.[21]

b. Water Supply Protection Areas Management Plans:[22] the object of a management plan is to make sure that the water resources of the relevant water supply protection area are managed in an equitable manner and so as to ensure the long-term sustainability of those resources.

c. The water register: the purpose of the water register is to facilitate the responsible, transparent and *sustainable* use of the State's water resources.[23]

16. SWSs, the main regional level water planning instrument in Victoria, were introduced as part of the Victorian Government's *Our Water, Our Future* (2004) reform package, and provide a mechanism to ensure long-term water resource planning to ensure Victoria's water security over time.[24] This was part of a suite of reforms for which sustainability was an overarching objective.[25] As such, ESD principles are central to the preparation of an SWS.[26] An SWS must take into account ESD principles,[27] including the precautionary principle;[28] the principle of intergenerational equity;[29] and the principle of conservation of biological diversity and ecological integrity.[30]

17. Minimally, the accounting for ESD principles in the preparation of an SWS requires what might be said, variously, to be 'proper, genuine and realistic consideration',[31] application of an 'active intellectual process'[32] to the task, or 'meaningful'[33] consideration. In our view, an SWS must be responsive to and reflect these considerations. The weight to be accorded each consideration in SWS preparation is generally a matter for the relevant decision-maker, policy-maker, and/or (in relation to carrying out functions and exercising powers) statutory actor.

18. Required content in SWSs is indicative of the manner in which sustainability is intended to be implemented through this planning device. A SWS must identify threats to consumptive and environmental uses of water[34] and contend with issues of (consumptive) water supply.[35] Relevantly to environmental sustainability, a SWS must identify ways to improve and set priorities for improving the environmental water reserve[36] and identify ways to improve and set priorities for improving the volume of water in the environmental water reserve.[37] The framework set out for SWS content gives weight to the proposition that a SWS is to enable enhancement of the environmental water reserve and its purposes, which include the objective of preservation of environmental values and health of water ecosystems.[38]

19. The nexus between a SWS and the environmental water reserve means an SWS is intended, among other things, to establish means for enhancing the environmental water reserve. The environmental water reserve is itself a construction of two legal devices for linking water to environmental management: water entitlements held for environmental purposes ('held environmental water', mainly in the form of environmental entitlements)[39] and water achieving those purposes through operation of legal instruments ('planned environmental water', usually effected through conditions on legal water management instrument such as bulk entitlements or licences). The latter include 'passing flows' and 'above cap' water. 'Passing flows' are minimal volumes of water retained in streams and channels at certain geographic locations. 'Above cap' water is remaining once all consumptive uses have been met. 'Passing flow' provisions are in general set administratively rather than by reference to hydro-ecological targets or conditions. 'Above cap' water similarly operates separate to any hydro-ecological reference, as it is a residue based on the volume of water allocated to consumptive use (diversions). Overwhelmingly, the environmental water reserve in Victoria comprises 'above cap' volumes, which in turn are most susceptible to climate change (drying) effects.[40]

20. Subsection 22C(1)(c) of the *Water Act* suggests that planning under an SWS is required to be undertaken in order to set (perhaps over time) the environmental water reserve at a level that is tied to an hydro-ecological reference point – one aligned to those values set out in the 'environmental water reserve objective'.[41] On its face that would be the meaning of 'maintenance of the environmental water reserve in accordance with the environmental water reserve objective'.[42] Waterway managers are subject to similar obligations in their conduct and practices.[43]

21 *Water Act 1989* (Vic) s 93 (e).

22 *Water Act 1989* (Vic) s 32A.

23 *Water Act 1989* (Vic) s 84B.

24 Victorian Government Department of Sustainability and the Environment, *Our Water, Our Future: Securing our Water Future Together* (2004) 26.

25 Water (Resource Management) Bill Second Reading Speech, Victoria, *Parliamentary Debates,* 6 October 2005 (John Thwaites, Minister for Water).

26 *Water Act 1989* (Vic) s 22C (2)(c).

27 *Environment Protection Act 1970* (Vic).

28 *Environment Protection Act 1970* s 1C.

29 *Environment Protection Act 1970* s 1D.

30 *Environment Protection Act 1970* s 1E.

31 *Khan v Minister for Immigration and Ethnic Affairs* [1987] FCA 457 [25].

32 *Singh v Minister for Home Affairs* [2019] FCAFC 3 [37].

33 *SZSLA v Minister for Immigration, Citizenship, Migration Services and Multicultural Affairs* [2020] FCA 944 [26].

34 *Water Act 1989* (Vic), subs 22C(1)(a).

35 *Water Act 1989* (Vic), subs 22C(1)(b).

36 *Water Act 1989* (Vic) subs 22C(1)(c).

37 *Water Act 1989* (Vic) subs 22C(1)(d).

38 *Water Act 1989* (Vic) s 4B.

39 Environmental entitlements operate mainly on regulated river systems, with large storages (hence diversions) and target specific, high value sites ('assets'). Environmental entitlements are held on the La Trobe system (from Blue Rock Dam and for take for flooding wetlands in the Lower La Trobe system) and in the Thompson system (from the Thompson Dam and Lake Glenmaggie on the Macalister River system). See *Bulk Entitlement (Thompson River - Environment) Order 2005*; *Blue Rock Environmental Entitlement 2013*; *Macalister Environmental Entitlement 2010*; *Lower Latrobe Wetlands Environmental Entitlement 2010*.

40 DELWP *Long-term Water Resources Assessment for Southern Victoria: Overview Report* (2020), 81, 102-105.

41 *Water Act 1989* (Vic) s 4B.

42 *Water Act 1989* (Vic) sub 22C(1)(c).

43 *Water Act 1989* (Vic) subs 189(1)(ba).

21. Additionally, the Minister administering the *Water Act 1989*, as well as public water authorities, is now bound by the obligation to give 'proper consideration' to the biodiversity objectives of the *Flora and Fauna Guarantee Act 1988*,[44] which encompass not only obligations in relation to protection but also recovery and restoration of ecological communities.[45] The content of these obligations is arguably broader than obligations relating to sustainability (ESD), including for example restoration and recovery obligations. These obligations are additional to those under the *Water Act 1989*. We note them here although for limitations of space we do not address them expressly in this report.

22. This report considers the strategic planning context of SWSs in particular. Nonetheless, the legal analysis of sustainability as applied to water resources in the Gippsland Lakes and catchment is relevant to the broader functioning of water management in this ecological system, such as in making operational decisions.

44 *Flora and Fauna Guarantee Act 1988* (Vic) s 4B.

45 *Flora and Fauna Guarantee Act 1988* (Vic) s 4.

The Ramsar Convention and sustainability

23. The Gippsland Lakes (and surrounding wetlands and lower parts of the inflowing rivers) are listed as wetlands of international importance under the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* ('Ramsar Convention').[46] The Lakes were listed under the Ramsar Convention in 1982. Contracting Parties to the Ramsar Convention commit to formulating and implementing their planning to promote the conservation and wise use of their wetlands,[47] and to maintaining their 'ecological character' of Ramsar wetlands at the time of listing[48] within the context of sustainable development.[49]

24. As a matter of fact, the status of the Gippsland Lakes as a Ramsar Site is patently relevant and important to the question of water management in this ecosystem and its catchment. This consideration is reflected in the current Gippsland SWS.[50] The Ramsar status of the Gippsland Lakes is not expressly a legal consideration under the *Water Act 1989*. Hydrological management of freshwater flows in the Lakes system does enliven legal obligations under other statutory schemes, such as the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

25. Provisions and concepts arising under the Ramsar Convention can and should inform the context and meaning of sustainability operative under Victorian water law. The most prominent of these concepts is the 'wise use' of wetlands, which requires maintenance of ecological character, referable both to an 'ecosystem approach' and sustainability (or sustainable development).[51] As far as possible, this framework applies to all wetland ecosystems, not only those formally listed.[52]

26. The approach to 'wise use' is also informed by the ecosystem services approach of the Millenium Ecosystem Assessment, including the framing of the pivotal concept of 'ecological character' as 'the combination of the

46 The Ramsar Convention (Convention on Wetlands of International Importance, signed in 1971 came into force 1975) is an international convention that provides a framework for the conservation and use of wetlands. Wetlands are considered 'internationally important' if they meet specific selection criteria. Listing a wetland as a Ramsar site creates certain obligations, including managing and creating procedures to maintain the wetland's 'ecological character'.

47 Ramsar Convention (Convention on Wetlands of International Importance, signed in 1971 came into force 1975) (Ramsar Convention) art 3.2.

48 Ibid.

49 Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Wetlands and Water Synthesis* (World Resources Institute, 2005).

50 DSE *Gippsland Region Sustainable Water Strategy* (2011), 146-149.

51 'Wise use of wetlands is the maintenance of their ecological character, achieved through implementation of ecosystem approaches, within the context of sustainable development.' Ramsar Convention CoP *A conceptual framework for the wise use of wetlands and the maintenance of their ecological character* 9th Meeting of CoP, 2005, Res IX.1 Annex A. Previously the CoP have recognised 'wise use' as incorporate 'sustainable utilization… compatible with maintenance of natural properties of the ecosystem' (CoP3, 1987) and recognised the 'congruence' between the ecosystem approach set out under the Convention on Biological Diversity and the Ramsar Convention: see Ramsar Convention Secretariat *Wise Use of Wetlands: Concepts and Approaches for the Wise Use of Wetlands* (Ramsar Handbook for the Wise Use of Wetlands, 4th ed, 2010), Appendix 1.

52 Ramsar Convention Secretariat (n 51) [23].

ecosystem components, processes and benefits/services that characterise the wetland at a given point in time'.[53] This ecological model is instructive to sustainability principles, including threat management affecting any specific 'combination' (precaution), ecosystem conservation and integrity, and preservation of services and values (intergenerational equity). As we note below, hydrological factors are central to this framing of ecological character in the Gippsland Lakes, which must, in our view, be considered within the full complex of cumulative factors or, as adopted under the Ramsar approach, '*combination*... of components, processes and benefits/services.'

27. The 'wise use' model is informative of sustainability of water resources management affecting the Gippsland Lakes. We refer to this approach and Ramsar considerations more broadly in this report as it is useful to do so.

53 See ibid [15].

Water management in the Central and Gippsland Region and freshwater inflows to the Gippsland Lakes

The Gippsland Lakes

28. Prior to colonisation, the Gippsland Lakes were a dynamic open-and-closed coastal lagoon system, which oscillated between freshwater and estuarine conditions, with greater variability of water levels than the present day.[54] The cutting of a permanent entrance to the Lakes in 1889 – combined with a matrix of other, cumulative human impacts – has altered this environment. Today the Gippsland Lakes is network of coastal lagoons and marsh environments,[55] the largest estuarine lagoon system in Australia. The environmental conditions of the Gippsland Lakes are set out more fully below in this report.

29. The Lakes' tributary rivers drain an extensive, industrialised and highly modified catchment. Threats and pressures arise from a multitude of human activities, including:

- water diversions and reductions in freshwater inflows to the lakes from water resource use, for both potable and irrigation use;
- dredging of and maintenance thereafter of a deeper permanent entrance between the lakes and the sea thus changing the tidal prism;
- mining within the catchment, including legacy mining and offshore gas extraction;
- brown coal mining and power generation;
- offshore gas extraction;
- land clearing and forestry, including plantation timber;
- agriculture and industrial uses;
- the impacts of fire, including increased sediment loads in the catchment;
- residential and commercial development;
- invasive species, including introduced marine pests (e.g. European shore crab), Terrestrial animals (e.g. cats, foxes, pigs and deer) and terrestrial plants (e.g. sea spurge);

54 Boon et al 'The Gippsland Lakes: Management Challenges Posed by Long-Term Environmental Change' (2016) 67 *Marine and Freshwater Research* 6 721; BTM WBM, *Ecological Character Description of the Gippsland Lakes Ramsar Site – Final Report* (Department of Sustainability, Environment, Water, Population and Communities, 2010); Ladson, et al *Lake Wellington Salinity: Preliminary Investigation of Management Options* (SKM, 2010); Ladson et al, 'Lake Wellington salinity: investigation of management options' 34th IAHR World Congress – Balance and Uncertainty, 26 June-1 July 2011; Harris et al, *Gippsland Lakes Environmental Audit: Review of Water Quality and Status of the Aquatic Ecosystems of the Gippsland Lakes* (CSIRO, 1998); Boon et al 'Why has *Phragmites australis* persisted in the increasingly saline Gippsland Lakes? A test of three competing hypotheses' (2019) 70 *Marine and Freshwater Research* 70 469

55 Bird *The Geomorphology of the Gippsland Lakes Region* (Ministry for Conservation, 1978), Ch 1.

- recreational activities and impacts from recreation and tourism; and
- climate impacts, including drought and altered freshwater flows and yields; and storms and sea level rise resulting in increased inundation and physical damage.

Water management and the Lakes

30. The *Water Act 1989* (Vic) is the main legislation for the management of water in Victoria, and regulates the flow, storage, extraction or diversion, use and access to water. Particularly relevant instruments under the Act include bulk entitlements to water held in storage, licences to 'take and use' water, environmental water-holdings (Victorian Environmental Water Holder), and special controls over water supply catchments, among many other measures. SWSs establish a state-wide framework for water resource planning (under Division 1B of the *Water Act 1989*). A SWS is to be informed by a Long-Term Water Resource Assessment (LTWRA) to the extent of decline or deterioration in water resources.[56] A LTWRA provides a retrospective reference point for water management.

31. The *Catchment and Land Protection Act 1994* (Vic) governs management of land and water in designated catchment management areas. The Catchment Management Authorities (CMAs) aim to provide integrated management of land, biodiversity and water within their region. The Gippsland Lakes catchment lies within two CMA regions: the East Gippsland CMA and West Gippsland CMA. Each CMA has a relevant Regional Catchment Strategy (RCS) that provides an overarching framework for land, water and biodiversity management in each of the CMA regions. There are two relevant Regional Catchment Strategies, the East Gippsland RCS and West Gippsland RCS. The RCSs may be influential instruments but do not establish legally binding controls over water management.

32. The East Gippsland Waterway Strategy and West Gippsland Regional Waterway Strategy sit under the Victorian Water Management Strategy and Regional Catchment Strategies. They outline planning for regional waterways.

33. The CMAs also have climate change strategy documents that aim to integrate climate change knowledge into RCS implementation, including the East Gippsland RCS: Climate Change Adaption and Mitigation Plan and the West Gippsland Regional Climate Change Strategy.

34. Victoria's state-owned water sector comprises 19 water corporations constituted under the *Water Act 1989*. Relevant water authorities for the Gippsland region include: Southern Rural Water (Rural Water Corporation), East Gippsland Water, Central Gippsland Water and South Gippsland Water (Urban Water Corporations), plus the Victorian Environmental Water Holder.

35. There has been altered hydrology leading to reduced total freshwater inflows to the Lakes (Figure 1). The largest contributors of freshwater to the Gippsland Lakes are from the Latrobe–Macalister–Thomson River system and the Mitchell River. Smaller inflows are received from the Avon–Perry, Nicholson and Tambo Rivers.

36. Approximately 20% of the total average freshwater inflow to the Gippsland Lakes is extracted for consumptive purposes.[57]

37. Water resource use is higher in the western rivers of the catchment than the east. These rivers have been developed to provide potable water to Melbourne (Thomson River), support irrigated agriculture (e.g. Latrobe River, Glenmaggie Dam, Macalister River), and supply water for thermal electricity generation (Latrobe River). The Latrobe River system, for instance, has been identified as over extracted and a flow-stressed system.[58]

38. Total freshwater extraction has resulted in an average reduction of freshwater inflow into Lake Wellington of more than 33%, with approximately 50% reduction in the lower Thompson River, 47% reduction in the Macallister River and 30% reduction in the La Trobe River.[59] The reduction in freshwater inflows has far-reaching environmental consequences, including contributing an increase in salinity[60] and reduction in water quality.

39. The specific ecological consequences of declining volumes and rates of freshwater inflows into the (now estuarine) Lakes system depend on dynamics in the sub-catchments and river confluences within the Lakes system, such as presence of fringing wetlands and/or distance from the saline influence of the permanent entrance. Variability includes variable ecological sensitivities to altered freshwater flows based on ecological conditions. For example, ecological conditions in the lower Mitchell River are proportionately sensitive to small reductions in freshwater inflows.[61]

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56 *Water Act 1989* (Vic) subs 22C(4).

57 East Gippsland Catchment Management Authority, *Gippsland Lakes Environment Report 2018: Technical Report* (2018).

58 Alluvium, *Environmental Water Requirements Report: Latrobe Environmental Water Requirements Investigation* (Report, June 2020).

59 O'Connor et al, *Understanding the Environmental Water Requirements of the Gippsland Lakes System: Stage 1 Technical Report* (Report to East and West Gippsland Catchment Management Authorities, 2009); Alluvium (n 58), 19.

60 This reduction in freshwater inflows has been identified as the critical factor affecting salinity (and the rise of salinity) in Lake Wellington: ibid; Bird (n 55); see also Harris et al (n 54), 10-11.

61 Tilleard and Ladson, *Understanding the Environmental Water Requirements of the Gippsland Lakes System: Stage 2 Input into the Gippsland Region Sustainable Water Strategy* (Report to East and West Gippsland Catchment Management Authorities, 2010) 8.

Figure 1: *Long-Term Water Resource Assessment overall estimates of consumptive use vs environmental use of water in major tributaries to the Gippsland Lakes (current climate period and sharing arrangement)* [62]

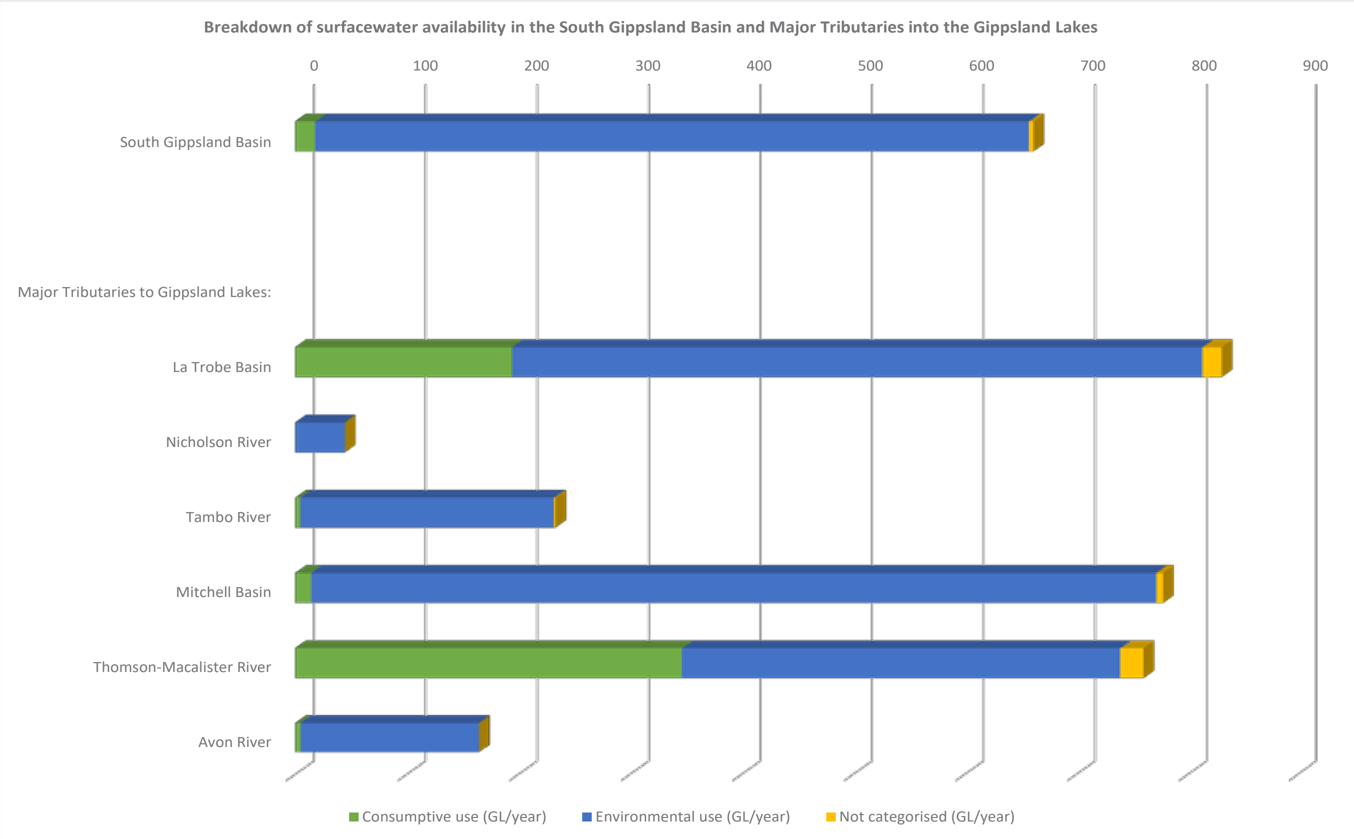


Figure 2: *Water quality indicators of Lake Wellington (75th percentiles, with the exception of dissolved oxygen). Specific units of measurement for each indicator are removed from this reproduced version. Shading indicates exceedance of SEPP (Waters) objective. Data from EPA Victoria. DO = dissolved oxygen, DIN = dissolved inorganic nitrogen, TN = total nitrogen, DIP = dissolved inorganic phosphorus, TP = total phosphorus, TSS = total suspended solids.* Source: Hale et al, *Latrobe Valley Regional Water Study – Ecological Effects Assessment. A report to the Department of Environment, Land, Water and Planning* (2020).

Indicator	SEPP Objective	2013	2014	2015	2016	2017
Chlorophyll-a	25	40	21	19	20	16
DO (25th – max)	95-130	98-112	93-107	95-103	94-105	96-109
DIN	15	10	20	11	19	16
TN	1000	887	820	828	880	830
DIP	15	3	3	3	7	5
TP	120	125	100	100	100	90
TSS	30	35	35	35	38	31

62 Data collated from Department of Environment, Land, Water and Planning, *Long-Term Water Resource Assessment for Southern Victoria* (2020).

40. There is a direct link between water hydrology and water quality, and there is evidence to indicate that modified hydrology in the Gippsland Lakes' catchment has led to a decline in water quality. While salinisation is a distinct water quality issue for the Lakes, a range of other biogeochemical pollutants present substantial environmental challenges to this ecosystem. For example, a combination of extraction and pollution means that water in the Lower Latrobe and Morwell Rivers rarely meets any SEPP (Waters) objectives.[63]

41. Altered hydrology in the catchment is a factor in the increasing salinity of many of the fringing wetlands and in Lake Wellington,[64] which regularly exceeds water quality indicators and turbidity (TSS) in the SEPP (Waters) (Figure 2, page 11). These impacts are discussed further at paragraphs 46–51.

63 Hale et al (n 5) 11; Alluvium (n 58) 100; Harris et al (n 54); additionally, in relation to heavy metal contaminants in the Lakes catchment, see Hale (n 4) 12; Sinclair and Schneider 'Mercury emissions, regulation and governance of coal-fired power stations in Victoria, Australia' (2019) 36 *Environmental and Planning Law Journal* 630.

64 Hale et al (n 5) 13; East Gippsland Catchment Management Authority (n 57) 14; Boon et al (2016) (n 54); Ladson et al (n 54); O'Connnor et al (n 59); Tilleard and Ladson (n 61); Hale et al, *Dowd Morass Salinity Risk Assessment and Management Options* (West Gippsland CMA, 2018).

ESD in practice 1: Does water management in the Gippsland Lakes system and catchment implement the precautionary principle?

42. The precautionary principle is perhaps the most well-described principle of ESD. It is essentially a rule of prudence.[65] It is not an isolated principle but should be implemented in the context of other ESD principles.[66]

43. The formulation of the precautionary principle in the *Environment Protection Act 1970* (Vic) is as follows:[67]

(1) If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

(2) Decision making should be guided by— (a) a careful evaluation to avoid serious or irreversible damage to the environment wherever practicable; and (b) an assessment of the risk-weighted consequences of various options.

44. The precautionary principle is triggered by two conditions precedent:

   a. a threat of serious or irreversible environmental damage; and

   b. a lack of scientific certainty as to that damage.[68]

45. These conditions or thresholds are cumulative. Once both of the conditions or thresholds are satisfied, a proportionate precautionary measure should be taken to avert the anticipated threat of environmental damage.[69] Where the conditions precedent are met, then the decision-maker must assume that the threat of serious or irreversible environmental damage is no longer uncertain but is a reality. The burden of showing that the threat does not exist or is negligible reverts to the proponent of the action.[70] The more significant and the more uncertain the threat, the greater the degree of precaution required.[71]

65 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133

66 Brian Preston 'The Judicial Contribution to Water Justice: The Australian Experience' (2018) 48 *Environmental Law Reporter* 10580.

67 *Environmental Protection Act 1970* (Vic) s 1C. This definition is adopted into the preparation of Sustainable Water Strategies through operation of *Water Act 1989* (Vic) subs 22C(2)(c): 'A sustainable water strategy must take into account… (c) the principles set out in sections 1B to 1L of the Environment Protection Act 1970.'

68 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [128].

69 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [128].

70 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [150].

71 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [161].

Threat of serious or irreversible environmental damage

46. A 'threat' includes direct and indirect threats, secondary and long-term threats and the incremental or cumulative impacts[72] of multiple or repeated actions or decisions.[73] It is not necessary that serious or irreversible damage have actually occurred; a threat of such damage is sufficient to fulfil the condition.

47. There has been altered hydrology of the Lakes and catchment (paragraphs 35–41). This changed hydrology has contributed to changed ecology of the Gippsland Lakes as part of a wider, cumulative matrix of impacts. Changed hydrology in the Gippsland Lakes catchment is a key factor among a suite of pressures, which include the dredging and maintenance of a permanent entrance to the Lakes[74] and impacts from industry and other land uses in the catchment. The issue of dredging is discussed further in Box 1.

48. This changed hydrology in conjunction with this cumulative matrix of impacts (Box 1) arguably has resulted in serious or irreversible environmental damage, including those listed in Table 1.

72 For example, see VCAT analysis of cumulative impact of waste water and septic tank systems on water quality in open potable water supply catchments resulting from increased dwelling density: *Simpson v Ballarat CC* [2012] VCAT 133. See also *Rozen v Macedon Ranges SC & Anor* [2010] VSC 583.

73 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [130].

74 King, 'Tidal Scour in the Gippsland Lakes' (1981) 92 *Proceedings of the Royal Society of Victoria* 1, 11; Boon et al (2016) (n 54); Harris et al (n 54);

Table 1 *Threats of serious or irreversible damage resulting from changed hydrology of the Gippsland Lakes and catchment*

THREAT OF SERIOUS OR IRREVERSIBLE DAMAGE	DETAILS AND EXAMPLES
Threat of serious or irreversible damage to ecological communities such as fringing wetlands	There has been changes in condition and/or distribution of almost all the wetlands that fringe the perimeter of the Gippsland Lakes.[75] This is exemplified by changes in salinity of fringing wetlands. Ecological values of the extensive and diverse fringing wetlands, notably around Lake Wellington, are among the highest in the Gippsland region. Those wetlands cover an area in excess of 12,500 ha.[76] Of the extensive system of fringing wetlands around Gippsland Lakes, only two remain fresh: Sale Common (a relatively small upstream wetland) and Macleod Morass (where freshwater is condition maintained due to input from treated sewage from the Bairnsdale Sewage Treatment Plant into its upper portion and the construction of barrage gates at the lower end).[77]
Threat of serious or irreversible damage to flora	Changes to vegetation are evidenced by, for instance, increase in mangroves[78] and possible loss of seagrass beds. There is noted change in fringing vegetation, including increases in saltmarsh and decreases in the freshwater angiosperm *Vallisneria australis*.[79] Analysis of historical aerial photographs confirms the progressive loss of reed beds and their replacement by swamp paperbacks in Dowd Morass, one of the largest fringing wetlands,[80] as shown in Figure 4. Over a 39-year timeframe, the *Melaleuca ericifolia*-dominated Swamp Scrub increased by 72%, while *Phragmites australis*-dominated Reed communities declined by 26%.[81] Boon et l identify these changes as the result of a combination of salinity, microtopographical relief and water levels.[82]

(continued following page)

75 Boon et al (2016) (n 54).

76 West Gippsland Catchment Management Authority *West Gippsland Wetlands Plan – Stage 1* (West Gippsland CMA, 2006)

77 Ibid.

78 Ibid. Also Boon 'Are mangroves in Victoria (south-eastern Australia) already responding to climate change?' (2017) 68 *Marine and Freshwater Research* 2366

79 Ibid.

80 Boon et al 'Vegetation Changes over a Four Decade Period in Dowd Morass, a Brackish-Water Wetland of the Gippsland Lakes, South-Eastern Australia' (2008) 120(2) *Proceedings of the Royal Society of Victoria*.

81 Boon et al (2016) (n 54). Retreat of Phragmites reed-beds are typical of key changes in ecological structure produced by saline influence, with consequent ecosystem impacts resulting from shoreline erosion and contribution to coastal processes: see Sjerp et al, *Gippsland Lakes Shoreline Erosion and Revegetation Strategy* (Gippsland Coastal Board, 2002).

82 Ibid. Boon et al (2019) (n 54)

THREAT OF SERIOUS OR IRREVERSIBLE DAMAGE	DETAILS AND EXAMPLES
Threat of serious or irreversible damage to fauna	Consequent changes to fauna are exemplified by Black Bream, one of the iconic species in the Lakes. Black Bream has declined to an all-time low and is classed as 'depleting' by the Fisheries Research and Development's fish status report.[83] Seagrass habitat is an important nursery habitat for post-settlement juvenile Black Bream,[84] and loss of seagrass has facilitated decline of the species. Additionally, freshwater flows and the generation of salinity stratification have a large influence on the size of suitable habitat for larval bream spawned further upstream.[85] In addition to Black Bream, there have been noted declines in King George whiting, garfish and silver trevally.[86]
Threat of serious or irreversible damage to geomorphology	Loss of reed beds and other fringing vegetation has serious impacts on shoreline stability. Further, there has been cut-back and erosion of shorelines and progressive loss of geomorphologically significant silt jetties along the Mitchell River.[87] Substantial erosion has been documented in other shorelines around the Gippsland Lakes.[88]
Threat of serious or irreversible damage to hydrogeochemical processes	Decreased freshwater inflow also leads to the prevalence of active acid sulphate soils, such as in Heart and Dowd Morass.[89] The Gippsland Lakes region has a high incidence of potential acid sulphate soils that, when exposed to air and oxidised, release sulphuric acid and toxic heavy metals into the environment. Potential acid sulphate soils can be activated by altered water regimes, and lead to significant reductions in water and sediment pH and associated impacts to aquatic species, such as fish kills and a suite of sub-lethal stresses.[90]

83 Fisheries Research & Development Corporation *Black Bream (Acanthopagrus butcheri) Report Card* (2018)

84 Boon et al (2016) (n 54).

85 Jenkins et al 'Delayed Timing of Successful Spawning of an Estuarine Dependent Fish, Black Bream *Acanthopagrus butcheri*' (2018) 93(5) *Journal of Fish Biology* 931; Williams et al. 'Linking Environmental Flows with the Distribution of Black Bream *Acanthopagrus butcheri* Eggs, Larvae and Prey in a Drought Affected Estuary' (2013) 483 *Marine Ecology Progress Series* 273.

86 East Gippsland Catchment Management Authority (n 57).

87 Boon et al (2016) (n 54).

88 Ibid: '*Bird (1962a, 1970, 1983) reported that examples of highly vulnerable shorelines included the Mitchell and Tambo River deltas; in a later study, Sjerp et al. (2002) identified also the Latrobe and Avon River deltas, and parts of McLennan Strait as showing evidence of continuing erosion. Other areas of substantial erosion, identified by Sjerp et al. (2002), include Roseneath Point, Swell Point, Storm Point, west of the Avon River/ Clydebank Morass, Marlay Point, around Loch Sport, Luff Point, Harrington Point, northern Raymond island, Point Fullarton, Tambo Bluff, and the northern shores of Jones Bay*'. See, more extensively, the three-volume study Boon et al *Shoreline geomorphology and fringing vegetation of the Gippsland Lakes. Volume 1: A literature review*. Report to Gippsland Lakes Ministerial Advisory Committee, 2015a); Boon et al *Shoreline geomorphology and fringing vegetation of the Gippsland Lakes. Volume 2: Field & laboratory assessments* (Report to Gippsland Lakes Ministerial Advisory Committee, 2015b); Boon et al *Shoreline geomorphology and fringing vegetation of the Gippsland Lakes. Volume 3: Detailed site descriptions*. (Report to Gippsland Lakes Ministerial Advisory Committee, 2015c).

89 Unland et al 'Assessing the Hydrogeochemical Impact and Distribution of Acid Sulphate Soils, Heart Morass, West Gippsland, Victoria' (2012) 27 *Applied Geochemistry* 10 2001.

90 BTM WBM (n 54) 129.

49. **Contribution to threatening processes:** Consequences of the impacts listed in Table 1 include contribution to threatening process such as algal blooms. Both toxic and non-toxic algal blooms are a regular occurrence in the Gippsland Lakes, driven primarily by nutrients runoff from the catchment. Toxic blooms of *Nodularia spumigena* were infrequent before 1986, after which blooms of *N. spumigena* have be frequently reported. These toxic algal blooms, in addition to non-toxic blooms of cyanobacteria, have led to closure of the lagoons for recreation, loss of seagrass, and fish kills.[91]

50. **Amplification of threats due to climate change:** Climate change is making Victoria warmer and drier, and changing longstanding hydrological (flow) cycles of rivers as well as interactions between surface waters and groundwater and surface water and terrestrial ecosystems. Recent climate shifts are acknowledged, for example, in the methodology of the Victorian LTWRA.[92] Climate change exacerbates threats to freshwater inflows, and hence the character of the Lakes. Climate-driven drying trends are observable across southern Australia.[93] Projected decline in rainfall, stream flows and groundwater resources is well-established in the scientific literature.[94]

a. The *Latrobe Valley Regional Water Study – Ecological Effects Assessment* notes in respect of projected climate impacts on water a decline of rainfall of 4-20% to 2065, depending on climate scenario, and 17-49% decline in runoff over that period.[95]

b. These changes are not solely projections for the distant future, but there are strong indications that the anticipated changes are already starting to manifest and be measurable. For example, the LTWRA indicates that there has been a marked decline in surface water due to warmer and drier conditions. The period 1975 to 2018, for example, saw a 5% decline in surface water in the Latrobe Basin, compared with the long-term historical record.[96] Climate change impacts on water resources in the catchment additionally exacerbate uncertainties regarding timing, degree and nature of water resource declines (rainfall and streamflow) in the catchment.[97]

c. It has been argued elsewhere that failure to account properly and effectively for the impacts of climate change on water resources and ecosystems, in the course of decision-making and management of those water resources, amounts to negligence and is indefensible on the part of the statutory actor concerned.[98]

51. **Altered hydrology within an overall matrix of cumulative impacts:** Threats arising from altered hydrology and diversions in freshwater inflows must be calculated/calibrated and considered within an overall threat 'matrix' that is cumulative in nature. Cumulative impact occurs where a project, in combination with one or more other proposed projects, or existing activities in an area, may have an overall significant environmental effect.[99] For example, an instance of cumulative impacts is the dredging and maintenance of the permanent entrance, in combination with pressures including reductions of freshwater inflows and the impacts of climate change – leading to the salinisation of the Gippsland Lakes (discussed in Box 1). For the purposes of the precautionary principle, a 'threat' includes direct and indirect threats, secondary and long-term threats, and the incremental or cumulative impacts[100] of multiple or repeated actions or decisions.[101]

91 Boon (2016) (n 54).

92 Department of Environment, Land, Water and Planning, *Long-Term Water Resource Assessment for Southern Victoria* (2020).

93 CSIRO and BoM, *State of the Climate 2020* (2020) 6-9.

94 Grose et al, *Southern Slopes Cluster Report: Climate Change in Australia, Projections for Australia's Natural Resource Management Regions* (CSIRO and BoM 2015); Hobday and Lough 'Projected Climate Change in Australian Marine and Freshwater Environments' (2011) 62 *Marine and Freshwater Research* 1000; Barron et al *Climate Change Impact on Groundwater Resources in Australia: Summary Report* (2011).

95 Hale (n 5).

96 Department of Environment, Land, Water and Planning, *Long-Term Water Resource Assessment for Southern Victoria* (2020).

97 Brown *Climate Change Projections: La Trobe Valley Regional Rehabilitation Strategy, Method Report and User Guidance* (DELWP 2017), 24.

98 See Walker *Royal Commission into the Murray Darling Basin: Final Report* (2019), 55-56, Ch 6.

99 Department of Sustainability and Environment, *Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978* (2006), 18. Generally, see Nelson, 'Breaking Backs and Boiling Frogs: Warnings from a Dialogue between Federal Water Law and Environmental Law' (2019) 42 *UNSW Law Journal* 4 1179.

100 For example, the cumulative impact of waste water and septic tank systems on water quality in open potable water supply catchments resulting from increased dwelling density: *Rozen v Macedon Ranges SC & Anor* [2010] VSC 583; *Simpson v Ballarat CC* [2012] VCAT 133.

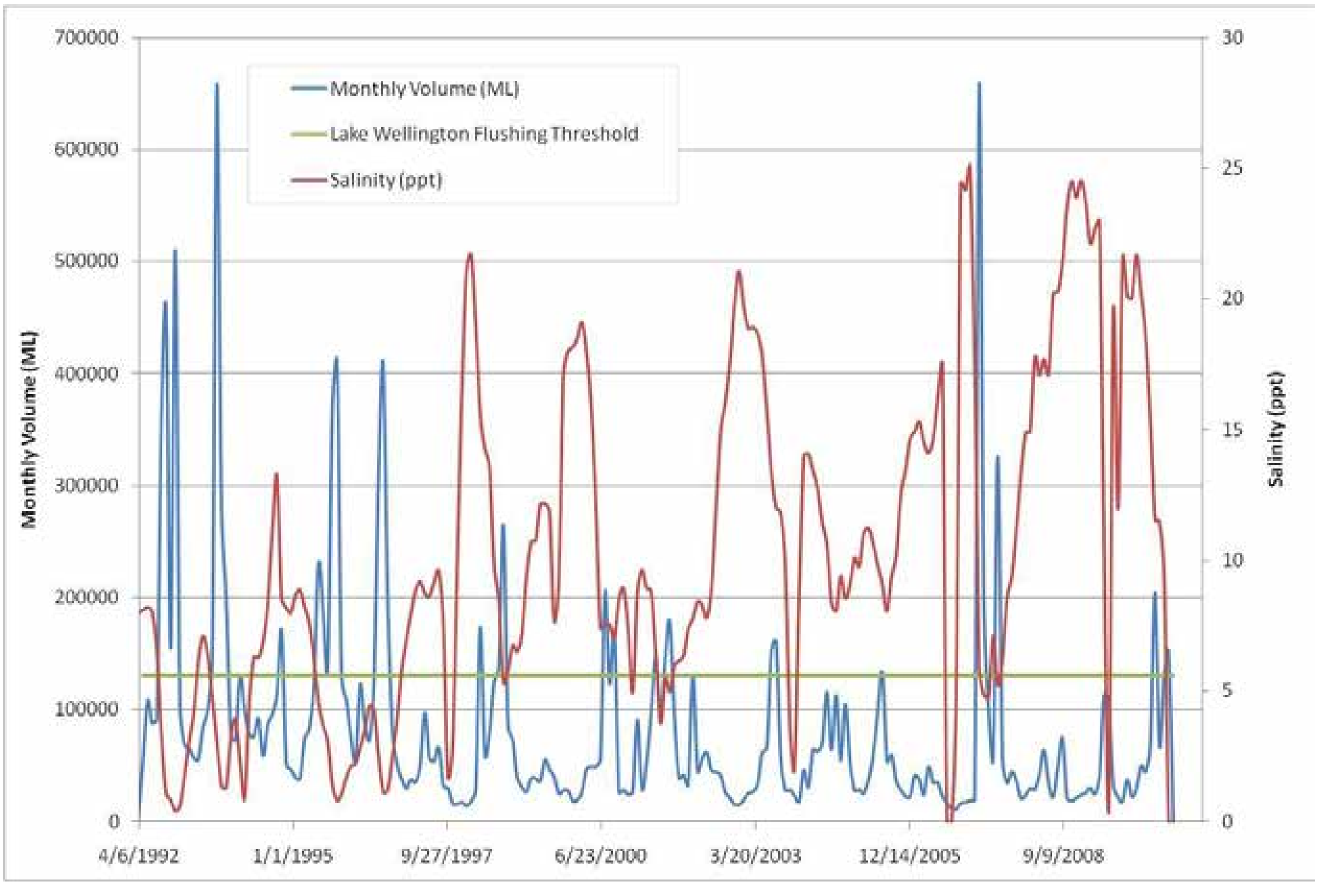
101 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [130].

BOX 1: CUMULATIVE IMPACT AND THE PERMANENT ENTRANCE TO THE GIPPSLAND LAKES

In 1889, an artificial permanent entrance was cut from the Gippsland Lakes system to Bass Strait in order to allow ships to pass in and out of the Lakes. The permanent entrance fundamentally altered the character of the Lakes, changing the system from an open-and-closed-lagoon system to one permanently linked to the ocean. This resulted in an immediate change to water levels and salinisation of the Lakes. In the longer term, salinisation was exacerbated by a number additional pressures, including freshwater abstraction (agriculture, mining) and changes in local hydrology (forestry, offshore gas, coal mines).[102]

The quantitative contribution to salinisation due to the reduction in freshwater inflows versus the saltwater inflow from the entrance (including dredging depth) is disputed. Qualitatively, each is a contributing factor. Reductions in freshwater inflows increase salinity in the Lakes (as shown in Lake Wellington, Figure 3), whereas flushing events (for example, in 2007) decrease salinity. Meanwhile, the entrance's operative regime allows saline intrusion from the ocean. The ecological effect of the entrance was observed in the years immediately following 1889,[103] and while the precise impacts of dredging depth is disputed,[104] it is clear that the existence of the entrance allowed for the original shift in the Gippsland Lakes system from dynamic open-and-closed coastal lagoon system to an estuarine system. Ecological effects of the permanent entrance are complex and include not only expanding salinisation (water chemistry) but also scour and erosion across the Lakes system[105] with geomorphic, water quality (for example, turbidity) and ecological effects.[106]

Figure 3: *Monthly Inflow volume versus salinity for Lake Wellington (1992-2010).* Source: *Water Technology, report prepared for Gippsland Ports 'Review of Hydrodynamic and Salinity Effects Associated with TSHD on the Gippsland Lakes' (August 2011).*



102 Boon et al (2016) (n 54)

103 Changes to fish species was observed within two years of the creation of the permanent entrance to the Lakes in 1889: Dow *Tatungalung Country: An Environmental History of the Gippsland Lakes* (PhD, 2004) 168-172.

104 Water Technology *Report prepared for Gippsland Ports 'Review of Hydrodynamic and Salinity Effects Associated with TSHD on the Gippsland Lakes'* (2011).

105 King (n 74).

106 Bird (n 55) especially Ch 6.

52. **The potential for 'tipping point' changes and threat of regime shift:** Tipping points, at which a sudden shift to a contrasting dynamical regime occurs, attract greater precautionary measures because there is greater uncertainty in terms of identifying and quantifying the tipping point.[107] There is a question as to whether the Lakes are reaching a 'tipping point' or permanent regime shift.[108] For instance, it is likely that the shift in Lake Wellington from a system dominated by rooted, submerged angiosperms to one dominated by phytoplankton in the late 1960s, is in practical terms, irreversible.[109] Coastal ecosystems are highly dynamic in nature. The Gippsland Lakes system is no exception.[110] Manifestly, a step-change in ecosystem structure resulted from permanent connection of the Lakes to Bass Strait.[111] There is a question as to whether a further step-change is underway, evident in the demise and/or threat to freshwater- and estuarine-influenced ecosystem components (such as vegetation communities) in western wetlands, including for example Lake Wellington and Dowds Morass, which was not evident up to the 1960s and 1970s.[112] At a minimum, the threat of such environmental degradation is supported by the evidence and arguably is intensifying.[113]

107 Selkoe et al, 'Principles for Managing Marine Ecosystems Prone to Tipping Points' (2015) 1(5) *Ecosystem Health and Sustainability* 1.

108 Boon et al (2016) (n 54).

109 Ibid; Harris et al (n 54).

110 See generally, Bird (n 55); Harris et al (n 54), 5, note, importantly, human interactions with this condition:

> What were flourishing freshwater marshes are becoming more saline and depauperate as the balance between freshwater and marine influences continues to shift towards the marine. This situation is further exacerbated by the development of saline areas in the lower Latrobe catchment resulting from deforestation, irrigation and consequent ground water rise. This too is a frequent result of agricultural development in southeastern Australia and it contributes to the inexorable drift towards saline conditions in rivers and low land marshes. The Lakes ecosystems are changing in response to a whole series of human activities over the last hundred years so continued change is inevitable. The Lakes system is not and probably never will be, at steady state. Really, the question is which changes are desirable and which deleterious and what might be done to push the balance one way or the other.

111 Bird (n 55).

112 Ibid, 84: 'This was the condition of the lakes when Europeans first reached then in 1839. Subsequently the cutting of an artificial entrance (1889) has led to an increase in lake salinity, die-back of much of the shoreline reedswamp, vegetation changes on bordering swamp land, and the onset of erosion around the lake shores. This erosion has been accentuated by the effects of cattle grazing and by other, less important factors. Shoreline erosion has become widespread on the shores of Lake King and Lake Victoria, and has halted the growth of the Mitchell and Tambo deltas, *but in parts of Lake Wellington, less affected by salinity increase, swamp land encroachment and delta growth still continue*.' (emphasis added)

113 Hale (n 5).

Lack of full scientific certainty

53. The precautionary principle applies where there is 'considerable' or 'substantial'[114] scientific uncertainty.[115] Factors to be considered in determining the degree of scientific uncertainty include:[116]

    a. The sufficiency of the evidence that there might be serious or irreversible environmental harm caused by the development plan, project or program;

    b. The level of uncertainty, including the kind of uncertainty – such as technological, methodological and epistemological uncertainty; and

    c. The potential to reduce uncertainty, having regard to what is possible in principle, economically and within a reasonable timeframe.

54. The uncertain nature of hydrology, geohydrology and modelling of water resources has been noted by courts and tribunals. For example, in *Castle v Southern Rural Water*,[117] the Victorian Civil and Administrative Tribunal noted that hydrogeology 'is a field where uncertainty is common' and that 'hydrogeology is a complex, difficult and inexact science'.[118]

55. While uncertainty does not necessarily mean (as found in *Castle*) that a statutory authorisation should not be granted, 'inherent uncertainties must be borne in mind as indicators of caution. The degree of uncertainty will vary from case to case. The need for good, relevant and meaningful data is obvious; and such data should be obtained as appropriate and where possible. The assessment and evaluation of such data, and the forming of decisions in relation to it, calls for good judgment based on knowledge and experience . . . The obtaining of relevant data will often require the carrying out of investigations and the conduct of testing. This implies proper reliable testing. It does not mean scanty, haphazard, careless, shallow, irrelevant or merely indicative testing.'[119]

56. Degrees of scientific uncertainty in management of the Gippsland Lakes catchment arguably traverse all aspects

114 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [143].

115 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [146]-[147].

116 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [152].

117 *Castle v Southern Rural Water* [2008] VCAT 2440. See also *Alanvale Pty Ltd v Southern Rural Water and Ors* [2010] VCAT 480

118 *Castle v Southern Rural Water* [2008] VCAT 2440 [48]. In particular, this is because some parameters are more ascertainable than others. While hydraulic parameters and human factors may be relatively ascertainable, 'there are other influences such as rainfall, subsequent aquifer recharge and long term climate variations that are beyond human control, measurement or prediction and yet are relevant influences on the extent and usability of a groundwater resource.' (*Castle*, [49]). Lack of certainty as to those parameters that should be certain is more likely to result in a need for more data and scientific information. Hydrological uncertainties can be compounded by terrestrial ecological factors, such as land use change or stochastic events (for example, bushfires): see East Gippsland Catchment Management Authority (n 57) 29.

119 *Castle v Southern Rural Water* [2008] VCAT 2440 [52]-[54]).

of environmental management of the Lakes system.[120] Specific dimensions of relevant uncertainty include:

a. **Lack of scientific certainty with regard to water chemistry:**

    i. There is a noted lack of baseline data, including long-term baseline data on salinity.[121] Qualitatively, baseline conditions shifted profoundly with establishment of a permanent ocean entrance. Shifting underlying salinity (and hence eco-hydrological conditions) has been occurring progressively in decades since, such as shift from Lake Wellington from freshwater to brackish in the 1960s;[122]

    ii. There is uncertainty regarding the impacts of current dredging depth of the permanent entrance on salinity;[123]

    iii. Lack of comprehensive information on toxicant concentrations in the waters and sediments of the Gippsland Lakes;[124]

    iv. Some of the fringing wetlands are less monitored than the main Lakes.[125] This is particularly problematic for wetlands with fluctuating hydrology, which typically have a more fluctuating profiles because they are more effected by dilution effects and evaporation;[126] and

    v. The extent, mobility, and impact of PFAS (chemical) contamination in the region remains uncertain, with implications for water recycling proposals.[127]

b. **Uncertainty with regard to hydrology:** uncertainty around flows and flow data arises in relation to the state of observable data on flows and reliance on estimates and modelling.[128] Methods and episodic nature of reporting on gauging stations may also influence uncertainty but information is not available on these aspects of monitoring.

    Use of scientific models in general to generate relevant knowledge may narrow bounds of uncertainty, but of themselves are unlikely to resolve problems of uncertainty, especially in relation to dynamic systems such as wetlands, and may be prone to mislead if used inappropriately.[129]

c. **Lack of scientific certainty with regard to ecology and eco-hydrology:**

    i. Habitats: there are no recent data available for assessing overall trends in condition and extent of habitat.[130] This includes a lack of data on the extent, condition and trends of seagrass[131] and of coastal saltmarsh (EPBC vulnerable).[132] There is a lack of information on the condition and extent of freshwater wetland vegetation, and salinisation rates affecting this vegetation, and the condition, extent and composition of variably saline wetland vegetation.[133]

    ii. Fauna: overall there is noted lack of quantitative information on the fauna of the Gippsland Lakes.[134] For instance, there is insufficient data on fish diversity to set a 'limit of acceptable change' for the Gippsland Lakes Ramsar site.[135]

    iii. Shoreline stability: The EGCMA notes[136] that 'there are very serious knowledge gaps' concerning shoreline dynamics and stability in the Gippsland Lakes, although that assessment does not appear responsive to detailed studies of 2002 and 2015 which confirm major problems in this area.[137]

120 East Gippsland Catchment Management Authority (n 57) 59, Table 14.

121 See BTM WBM (n 54) XVIII.

122 Ibid 133-134.

123 See Box 1.

124 East Gippsland Catchment Management Authority (n 57).

125 Ibid.

126 Ibid.

127 Environment Protection Authority, *Investigation of the Presence of PFAS in 19 Wetlands in Victoria* (Publication 1734, 2019).

128 The Bioregional Assessment of the Gippsland Basin bioregion found that the bioregion 'contains 197 streamflow gauges. Based on an analysis of all daily streamflow gauge data: 72% of all records were good; 8% fair; 6% poor; 4% unknown; and 10% missing. The quality of individual streamflow data varied significantly whilst results suggest that streamflow monitoring in the South Gippsland Basin was of a higher quality than the monitoring in all other basins' (DELWP *Observations analysis, statistical analysis and interpolation report for the Gippsland bioregion* (2017), 10). See also, more specifically, shortcomings in data and modelling for the La Trobe River: Tilleard and Ladson (n 61) 4.

129 See Lester, 'Wise use: using ecological models to understand and manage aquatic systems' (2020) 71 *Marine and Freshwater Research* 46.

130 East Gippsland Catchment Management Authority (n 56) 43, concluded that: 'Collectively, these findings indicate that existing vegetation monitoring needs to be greatly expanded and improved. A benchmark with respect to extent (and to a lesser extent) condition has now been established by the West Gippsland CMA vegetation project (Frood et al. 2015) and could be used, with future monitoring to assess change over time.'

131 Ibid 31: *Seagrass has been mapped at two points in time: 1997 and 2016. While the 1997 mapped extent of seagrass covered the entire main lakes (Roob and Ball 1997), the 2016 investigation covered a smaller area (Kitchingman 2016).*

132 Ibid 31.

133 Ibid 42-43.

134 Ibid 51: '*There is limited information on much of the fauna of the Gippsland Lakes. The size and diversity of the site and the variability in both space and time of fauna species makes assessing trends in diversity and abundance difficult. Annual aerial surveys of waterbirds that cover the entire site would help to improve our understanding of total waterbird numbers and trends in abundance over time. In addition, the regular monitoring as part of the Gippsland Lakes Important Bird Area project, could, over time, be used to derive condition thresholds for specific locations.*

Measures of native fish diversity are difficult, but if habitat specific monitoring were undertaken regularly, then trends in abundance and diversity of non-commercial fish species may be possible.

In addition, there are other species that are valued by the community in the lakes such as frogs, platypus and water rats (rakali). Consistent monitoring of these species over time could be used to report of their population viability and condition.'

135 Ibid 15: In terms of diversity, the recent update to the ecological character description (Hale unpublished) recognised that there is insufficient data to set a quantitative LAC. This is also the case for setting condition thresholds related to fish diversity.

136 East Gippsland Catchment Management Authority (n 57) 57.

137 Sjerp et al (n 81). Boon et al (2019) (n 54)

BOX 2: LACK OF SCIENTIFIC CERTAINTY AND RAMSAR CONVENTION OBLIGATIONS

There is a noted lack of scientific information about the overall condition of the Gippsland Lakes. Scientific enquiry into ecological health of the Gippsland Lakes has produced a steady flow of work since the 1960s. Overall scientific assessment of ecosystem health reflected in official documents has been more sparse. The last scientific audit of the Lakes was undertaken in 1998, and the Ramsar Information Sheet (RIS) was last updated in 1999. Under the Ramsar Convention, contracting parties are required to update the RIS at least every six years.[138] As noted by the Victorian Auditor-General,[139] this obligation has not been met for a number of Ramsar sites, including the Gippsland Lakes. An RIS provides information on the criteria under which a site qualifies as a Ramsar site as well as its physical, ecological, hydrological, social and cultural aspects. This information forms a basis to monitor and analyse the ecological character of the site and for assessing the status and trends of wetlands regionally and globally. An environmental assessment was produced in 2018, primarily using existing sources.

How is the precautionary principle to be implemented?

57. Where both of the above conditions precedent are satisfied, the precautionary principle will be engaged. This shifts the burden of proof so that a decision-maker must assume that the threat of serious or irreversible environmental harm is a reality, and the burden of showing that this threat does not exist reverts to the proponent of the plan, program or project.

58. Management of water resources in the Gippsland Lakes catchment entails a number of threats of serious or irreversible harm (which are both cumulative and potentially non-linear) (paragraphs 46–52, Table 1, Box 1) and various relevant gaps in scientific information and knowledge (paragraph 56, Box 2).

59. The consequent scope of precautionary measures required by the precautionary principle is outlined by Preston CJ in *Telstra*:[140]

> *'The type and level of precautionary measures that will be appropriate will depend on the combined effect of the degree of seriousness and irreversibility of the threat and the degree of uncertainty. This involves assessment of risk in its usual formulation, namely the probability of the event occurring and the seriousness of the consequences should it occur. The more significant and the more uncertain the threat, the greater the degree of precaution required.'*

60. The application of the precautionary principle in relation to the Gippsland Lakes must necessarily account for the cumulative nature of environmental threats. The threat to freshwater resources (quantitative inflows and qualitative element of ecological structure and function) is prominent in the threat to ecological degradation of important parts, or indeed all, of the Lakes' ecosystem.

61. Whether clear empirical evidence of step-wise change in ecological character, including exceedance of 'limits of acceptable change', has in fact occurred[141] – at least for the purposes of managing the Gippsland Lakes as a Ramsar site – is not the relevant test for the requirement of precaution to be triggered. Evidence of the *risk* to environment conditions, according to the appropriate level of gravity, is the test.

62. With respect to water resources management specifically, the scientific evidence is that water resources are presently over-allocated or over-extracted. This effect is arguably more aggravated in the western areas of the Lakes, including fringing wetlands, than the east, although the entire Lakes ecosystem is affected and ecological sensitivities and dynamics need to be accounted for rather than bald volumes of freshwater flows. The type and level of appropriate precautionary measures in relation to the Gippsland Lakes and catchment should therefore be significant in scope. Precaution (and therefore prudence) requires serious efforts to address freshwater diversions, alongside other adverse influences on catchment hydrology, in order to prevent further deterioration in environmental conditions in the Gippsland Lakes and to establish or ensure appropriate 'buffers' for long-term (intergenerational) ecosystem health.

63. In our view, given the significance of freshwater inflows to the environmental conditions of the Gippsland Lakes, to do other than act in a precautionary manner enables ongoing impairment and compromise of environmental conditions of that ecosystem (including ecological integrity and biological diversity). Principal actors include policy decision-makers, such as the Minister, in relation to SWSs, and water authorities as statutory water managers and delegates in operational decision-making. By extension, water managers of all descriptions (political or administrative) failing to proceed in a precautionary manner, responsive to the actual environmental challenges of the Lakes system, are arguably demonstrating pyrrhic or no real regard to an elemental principle of ecological sustainability and, therefore, are at risk of acting unlawfully.

138 Convention on Wetlands of International Importance especially as Waterfowl Habitat, signed 2 February 1971, UNTS 996 (entered into force 21 December 1975), Res VI.I.

139 Victorian Auditor-General's Office *Meeting Obligations to Protect Ramsar Wetlands* (Victorian Auditor-General's Report 2016 17:3, 2016)

140 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [161].

141 See BTM WBM (n 54) xiv.

64. In our view, a precautionary approach to management of the Gippsland Lakes catchment hydrology should, at the very least, include:

   a. An independent ecosystem audit of the Gippsland Lakes and catchment to reduce uncertainty and identify trends. The evidence that we have surveyed highlights a number of gaps in current knowledge and scientific certainty. An independent, comprehensive scientific audit of the Lakes and catchment is necessary both to implement the precautionary principle and to comply with obligations under the Ramsar Convention (Box 2). This evidence also empowers community to make informed decisions.

   b. The precautionary principle requires 'preventative anticipation', meaning that measures must be taken to prevent environmental damage without waiting until the seriousness of the threats of environmental damage fully materialise.[142] Key to resilience thinking and adaptive capacity is to include diversity and a degree of redundancy in the system to buffer against future impact.[143] Preventative anticipation in the context of the Gippsland Lakes and catchment includes, but is not necessarily limited to:

      i. a moratorium on new water allocations within the Lakes catchment and major tributary rivers (Latrobe; Thomson; Macalister; Mitchell) for consumptive uses or reallocation from existing to new consumptive uses;[144]

      ii. reallocation of rehabilitated mine operators' entitlements to environmental or cultural flows;[145] and

      iii. design and implementation of recovery strategies for key water ecosystem components, such as fringing wetlands, Lake Wellington, identified ecological communities and threatened species.

   d. Margins for error should be established and retained until all consequences of management actions[146] are discernible with a reasonable degree of confidence. Management actions and conduct, including statutory decision-making and planning, should be weighted in favour of environmental protection in order to allow margins of error. One way of retaining a margin for error is to implement an adaptive management approach, whereby uncertainties are acknowledged and the area affected is expanded as the extent of uncertainty is reduced.[147] Applying adaptive management principles involves taking into account climate change implications into water management decisions.[148] Adaptive management must be conducted subject to clear, robust and rule-based implementation of a 'step-wise' program.

   e. Precaution, including the establishment and maintenance of appropriate 'buffers' (margins of error), should require minimally the active conservation, protection and maintenance of freshwater and freshwater-influenced wetlands fringing the Gippsland Lakes.[149] Consideration needs to be given to strategies for expansion of the extent of those wetlands. Such strategies should be considered, as a response prompted by legal obligation, alongside complementary legal obligations concerning biodiversity conservation and ecological integrity or the Lakes' ecosystem (paragraphs 1.a.iv, 65–70 below, Box 3) and outcomes consistent with intergenerational equity (paragraphs 77–78 below).

142 Where a proposed development will use water resources in an unsustainable manner, a preventative approach is appropriate and development consent may properly be refused. For example, in *Mercer & Anor v Moorabool SC & Central Highland Water Authority* [2002] VCAT 401, VCAT refused a permit to enlarge two dams on the basis that to do so would be an unsustainable use of water resources.

143 Perrings 'Resilience and sustainable development' (2006) 11 *Environment and Development Economics* 4 417 424.

144 Compare Tilleard and Ladson (n 61).

145 Hale (n 5). Redistributive allocations in such a manner enable long-term justice outcomes, with the additional prospect of allocations (water rights) being used either in aid of protection and restoration of Country (including ecosystem health) or for consumptive purposes (such as water market trade) or both, as the Traditional Owner holding entity see fit or is consistent with its own legal obligations. Generally, on the redistributive agenda, see Elizabeth Macpherson, *Indigenous Water Rights in Law and Regulation: Lessons from Comparative Experience* (Cambridge University Press, 2019) p 3.

146 *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133, [162].

147 E.g. *Ulan Coal Mines Ltd v Minister for Planning* (2008) 160 LGERA 20 [163].

148 *Alanvale Pty Ltd & Anor v Southern Rural Water & Ors* [2010] VCAT 480 [159]: 'until the implications of the effects of climate change on rainfall recharge to the aquifer are investigated and better understood, we should apply the precautionary principle and be cautious in making decisions about the allocation of groundwater resources now.'

149 Boon et al(2016) (n 54); Tilleard and Ladson (n 61); Hale et al (n 5). This approach might be said to be broadly consistent with the paradigm of policy responses for wetlands management under climate change conditions proposed by Finlayson et al (n 6).

ESD in practice 2: Does water management in the Gippsland Lakes and catchment implement the principle of conservation of biological diversity and ecological integrity?

65. ESD requires that the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making, including in the formulation, adoption and implementation of any economic and other development plan, program or project.

66. The principle of conservation of biodiversity and ecological integrity is formulated in the *Environment Protection Act 1970* (Vic) as follows:[150]

> *The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.*

67. The statement that the principle of conservation of biodiversity and ecological integrity is a 'fundamental consideration' has given rise to the argument that priority weighting should be afforded to these considerations in relation to other factors influencing decision-making.[151] Where a number of factors are mandated for consideration without any statutory indication as to the priority or weight to be accorded to the various factors, then the relevance of each of these factors is a question of fact for the decision-maker to determine.[152] In *Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited,*[153] Preston CJ held that a proposed extension to a coal mine had inadequate measures to avoid loss of biological diversity and ecological integrity. The court held that significant impacts on biological diversity and inadequate mitigation and compensation measures was 'a fundamental matter to be considered in the decision-making process, to which significant weight should be assigned.'[154] In our view, the Gippsland Lakes' Ramsar status (Box 2), combined with risks to biological diversity and ecological integrity (paragraph 10.b.ii, Table 1, Box 3) contributes to an argument that conservation of biological diversity and ecological integrity should be weighted as a relevant factor in decision-making for the Gippsland Lakes and catchment.

68. There is also an argument that further weighting must be given to the principle in order to halt biodiversity decline. Dr Gerry Bates in this context noted that:

> *'Use of the precautionary principle to address potential impacts on biodiversity is welcome, however, without more attention being given to this aspect of sustainability in decision-making, biodiversity decline is probably set to continue.'*[155]

69. As the various constituent principles of ESD are intended to be employed together, in an integrated manner, the principle of biodiversity conservation and ecological integrity ought, additionally, to be read closely with the precautionary principle. This approach is especially relevant in the context of ecosystem management. Biological diversity and ecological integrity may be considered relevant standards or conditions of sustainability in that context (reflecting imperative outcomes) and precaution a key rule of conduct affecting ecosystem management in accordance with those standards or conditions.

70. Biological diversity and ecological integrity, as envisaged by ESD principles comprises:[156]

    a. **Genetic diversity (the variety of genes in any population):** The importance of genetic diversity has been highlighted with regard to the Lakes' iconic Burrunan dolphin. The very small population size, lack of genetic diversity and the isolation of these populations mean the Burrunan dolphins are especially vulnerable to threats and pressures.[157] One such threat includes 'freshwater skin disease' which is triggered by abrupt and marked decreases in salinity.[158]

    b. **Species diversity (the variety of species):** The Gippsland Lakes are home to around 300 native wildlife species and 400 plant species. Some of these are listed threatened species,[159] including: fish species such as the Australian grayling;[160] flora including the dwarf kerrawang,[161] swamp everlasting[162] and metallic sun-orchid;[163] and threatened frog species.[164] In particular, waterbird abundance and diversity is one of the most important aspects of the Gippsland Lakes, and one reason for its listing as a Ramsar site. The Lakes provide important feeding, resting and

150 *Environment Protection Act 1970* (Vic) s 1E.

151 Bates (n 8) 238, noting that decision-makers rarely apply the principle as a 'fundamental consideration' in practice.

152 *Minister for Aboriginal Affairs v Peko-Wallsend Pty Ltd* (1986) 162 CLR 24 [41].

153 *Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited* [2013] NSWLEC 48.

154 *Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited* [2013] NSWLEC 48, [255].

155 Bates (n 8) 239.

156 Ibid 233-239.

157 Charlton-Robb et al, 'Population Genetic Structure of the Burrunan Dolphin (*Tursiops australis*) in Coastal Waters of South-Eastern Australia: Conservation Implications' (2015) 16 *Conservation Genetics* 1 195-207.

158 Duignan et al, 'Fresh Water Skin Disease in Dolphins: A Case Definition Based on Pathology and Environmental Factors in Australia' (2020) 10 *Scientific Reports* 21979.

159 See BTM WBM (n 54), section 3.4 and section 3.5.

160 Backhouse et al *National Recovery Plan for the Australian Grayling* Prototroctes maraenaavailable (Department of Sustainability and Environment, 2008).

161 Carter and Walsh *National Recovery Plan for the Dwarf Kerrawang* Rulingia prostrata (Department of Sustainability and Environment, 2010).

162 Carter and Walsh *National Recovery Plan for the Swamp Everlasting* Xerochrysum palustre (Department of Sustainability and Environment, 2011).

163 Duncan and Coates, *National Recovery Plan for Twenty-Two Threatened Orchids* (Department of Sustainability and Environment, 2010).

164 Clemen and Gillespie, *National Recovery Plan for the Southern Bell Frog* Litoria Raniformis (Department of Sustainability and Environment, 2012).

breeding habitat for 86 waterbird species. The Lakes are home to a significant pelican rookery.[165]

c. **Ecosystem diversity (the variety of communities and ecosystems):** Ecosystem diversity includes the four EPBC-listed ecological communities identified in the Gippsland Basin bioregion.[166] Three communities are Critically Endangered including the ecologically significant Gippsland Red Gum (*Eucalyptus tereticornis subsp.* mediana), the Grassy Woodland and Associated Native Grassland. One community, the Subtropical and Temperate Coastal Saltmarsh, is listed as Vulnerable. The diversity arising from both freshwater and saltwater systems highlights the importance of the remaining freshwater ecosystem for ecosystem diversity. Analysis of historical aerial photographs confirms the progressive loss of reed beds and their replacement by swamp paperbacks in Dowd Morass, one of the largest fringing wetlands,[167] as shown in Figure 4. Over the 39 year timeframe, *Melaleuca ericifolia*-dominated Swamp Scrub increased by 72%, while *Phragmites australis*-dominated Reed communities declined by 26%.[168] Boon et al attribute these changes to a combination of variation in salinity, water levels and microtopographical relief.[169]

Figure 4 Area of the four wetland land-cover classes in Dowd Morass calculated from classified images for the period 1964-2003. Source: Boon et al 'Vegetation Changes over a Four Decade Period in Dowd Morass, a Brackish-Water Wetland of the Gippsland Lakes, South-Eastern Australia' (2008) 120 *Proceedings of the Royal Society of Victoria* 2.

165 BTM WBM (n 54) 83, 139

166 Australian Government *Bioregional Assessments: Gippsland Basin Bioregion*, 'Terrestrial species and communities', https://www.bioregionalassessments.gov.au/assessments/11-context-statement-gippsland-basin-bioregion/1172-terrestrial-species-and-communities.

167 Boon et al. (n 80)

168 Ibid.

169 Ibid. Boon et al (2019) (n 54)

BOX 3: CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY AND THE GIPPSLAND LAKES RAMSAR LISTING

Biological diversity and ecological integrity are fundamental to the listing of the Gippsland Lakes as a Ramsar site. Wetlands are considered 'internationally important' if they meet specific selection criteria. Listing a wetland as a Ramsar site creates certain obligations, including managing and creating procedures to maintain the wetland's ecological character.

The Gippsland lakes was originally listed for criteria for waterfowl[170] and criteria based on representative wetlands.[171] The most recent Ramsar Information Sheet (RIS) indicated that the site meets the criteria because: it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region;[172] it regularly supports 20 000 waterfowl;[173] it regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity;[174] where data on populations are available, it regularly supports one per cent of the individuals in a population of one species or subspecies of waterfowl.[175]

The Gippsland Lakes Ecological Character Description (2015) considers the Ramsar site as meeting six of the nine nomination criteria. Note however, that the formal process of reviewing and updating the criteria under which a site is listed occurs through the updating of the RIS, which has not been undertaken since 1999.

Biological diversity and ecological integrity were therefore fundamental to the listing of the Gippsland Lakes' as a Ramsar site. So too, the maintenance of this biological diversity and ecological integrity is essential to retaining Ramsar status. Within the Ramsar Convention, biological diversity and ecological integrity is expressed in the language of 'ecological character' as maintained through 'wise use'.

Contracting parties to the convention commit to formulating and implementing their planning to promote the conservation and wise use of their wetlands.[176] The relationship between these concepts has been clarified as follows:

Wise use of wetlands is the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development. Ecological character of a wetland is the combination of the ecosystem components, processes and benefits/ services that characterise the wetland at a given point in time.[177]

A notification of change of ecological character is required under the Ramsar Convention (Article 3.2) if the ecological character of a site has changed, is changing or is likely to change due to human activities. The Australian Government's National Guidance Principles guide such notifications.[178] Limits of acceptable change (LAC) are listed in the Gippsland Lakes Ecological Character Description. Exceeding or failing to meet an LAC does not necessarily indicate that there has been a change in ecological character within the meaning of the Ramsar Convention, only that further investigation is required. There have been a number of third party Article 3.2 Notifications of Change in Ecological Character (in 2011 and 2015-16) for the Gippsland Lakes, one of which is still being investigated by the Federal government.

170 Ramsar Convention Criteria adopted at the 1996 Conference of Parties (Criterion 1a): It regularly supports 10,000 ducks, geese and swans; or 10,000 coots or 20,000 waders; (Criterion 1b): It regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl.

171 Ibid, (Criterion 3): It is a particularly good example of a specific type of wetland characteristic of its region.

172 Ibid (Criterion 1a).

173 Ibid (Criterion 3a).

174 Ibid (Criterion 3b).

175 Ibid (Criterion 3c).

176 Ramsar Convention (Convention on Wetlands of International Importance, signed in 1971 came into force 1975) Art 3.2.

177 Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Wetlands and Water Synthesis* (World Resources Institute, 2005).

178 Department of the Environment, Water, Heritage and the Arts, *National Guidelines for Notifying Change in Ecological Character of Australian Ramsar Sites* (Module 3 of the National Guidelines for Ramsar Wetlands— Implementing the Ramsar Convention in Australia, 2009).

How is the principle of conservation of biodiversity and ecological integrity to be implemented?

71. Biodiversity conservation and ecological integrity requires ensuring that water for the environment meets thresholds necessary to ensure long-term biodiversity conservation and ecological integrity.

72. For the Gippsland Lakes, ecological and biological conditions for at least a century have comprised an estuarine ecosystem functioning within dynamic parameters, subject to saline (marine) and freshwater influences. Whether a baseline is set at 1982 (Ramsar listing) or a decade or so earlier (freshwater dominance of Lake Wellington), the ecological and conservation principle appears to presume a stabilised estuarine regime within robust freshwater-influenced ecologies (both terrestrial and aquatic) in intersecting zones between catchment (rivers) and deep permanent lagoons (lakes proper). This stabilisation arguably has been compromised through accreting marine influence, as exemplified for example in decline of salt-intolerant flora communities and retreat of key fish ecological niches (such as Black Bream, Table 1).

73. As noted above, in order to accord with principles of sustainability, such an ecosystem regime needs not only to be stabilised – itself more challenging in the face of climate change – but also to incorporate appropriate 'buffers' against compromise of ecological character consistent with a precautionary approach. That stabilisation, combined with genuine 'buffers' against further deterioration of ecological conditions, can be said to provide some degree of resilience to the Lakes' ecosystem. Furthermore, it may provide a degree of ecological 'space' through which to enable recovery of endangered species or elements of the Lakes' ecosystem. That type of approach is consistent with legal understandings of conservation.[179]

74. The prevailing scientific evidence compellingly suggests that the conservation of biodiversity and ecological integrity for the Gippsland Lakes requires, in the context of permanent marine connection, the maintenance of estuarine character and, by extension, expansive freshwater influence. This signature pattern is seen, for example, in Lake Wellington and the Lower La Trobe wetlands, but is pervasive throughout the Lakes' system. The setting of lesser objectives arguably contravenes this principle of sustainability.[180]

75. In our view, biodiversity conservation and ecological integrity in the Gippsland Lakes requires precautionary actions in relation to water management, as noted above. More specifically consideration needs to be given to:

    a. assessing the hydrological needs of the Gippsland Lakes, particularly but not limited to the Ramsar site, on the basis of appropriate freshwater inflows (hydrological targets) required to meet the ecological integrity of this ecosystem, with specific regard to the integrity of freshwater and freshwater-influenced components.[181] This approach is in line with the Ramsar *Guidelines for the allocation and management of water for maintaining the ecological functions of wetlands*.[182] That assessment should *establish* best available scientific knowledge.

    b. implementing an ecologically sustainable flow regime on the basis of ecosystem integrity and biological diversity, whether expressed in terms of Ramsar criteria (Ecological Character Description) and/or alternative tools (such as an appropriate reference model for recovery), and including water planning pathways contributing to ecosystem recovery. The latter should be implemented through the SWS process. The prominent risk to ecological integrity of further incursion of saline conditions into freshwater-influenced ecosystems drives this need for strong ecosystem-based inflows, adjusted over time having regard to climate change risks and principles of accommodation, mitigation and adaptation to those risks.

76. It is an uncertain proposition that failure to have proper regard to stabilisation of ecological conditions in the Gippsland Lakes would, on the basis of the principle of biodiversity conservation and ecological integrity, give rise to risks of unlawfulness in decision-making. This is in significant part because the principle is largely untested as a rule of law (as distinct from a more general norm). However, in treating ecological sustainability as a package of considerations it may not be necessary to make that particular assessment of risk but rather approach this principle as informing the substance and object of sustainability – that is, a biodiverse and resilient ecosystem.

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179 *Brown v Forestry Tasmania (No 4)* [2006] FCA 1729 [300].

180 Compare Alluvium (n 58) 102 (emphasis added): 'Historically the Lower Latrobe Wetlands would have been fresh, and *most of the values are tied to maintaining freshwater ecosystems*. For example, the presence of canoe scar trees and the rookery at Dowd Morass demonstrates the importance of freshwater to that wetland. That is, canoe scar trees indicate that there was hunting plants and animals would have been present for hunting and collected; freshwater would have provided the conditions suitable for these plants and animals... While the Lower Latrobe Wetlands were once a freshwater system, the system has been fundamentally changed since the opening of the Gippsland Lakes. This is acknowledged in the Ramsar objectives. Returning to a freshwater system is beyond the current catchment constraints and beyond the scope of this study. Nonetheless, freshwater supply to the lower Latrobe Wetlands is still an important objective of this study, but the ultimate goal is not a completely freshwater system for the lower Latrobe Wetlands.'

181 Compare Finlayson et al (n 2).

182 Ramsar CoP *Assessing and reporting the status and trends of wetlands, and the implementation of Article 3.2 of the Convention* (Resolution VIII.8, 8th Meeting of the Conference of the Parties, 18-26 November, 2002)

ESD in practice 3: Does previous and current management of the Gippsland Lakes and catchment implement the principle of intergenerational equity?

77. The principle of intergenerational equity provides that 'the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.'[183] It is akin to a principle of public trust.[184] It has been held that the principle is to be framed in terms of equal treatment and equal rights between generations including the right to 'benefit from the exploitation of resources as well as enjoyment of a clean and healthy environment.'[185]

78. Intergenerational equity is based on the following subsidiary considerations:[186]

    a. **The 'conservation of options' principle:** requires each generation to conserve the diversity of the natural and cultural resource base in order to ensure that options are available to future generations for solving their problems and satisfying their needs. Options are foreclosed or lost if, for example, irreplaceable aspects of natural or cultural heritage are destroyed, or if resources are depleted or rendered inaccessible by present actions.

    In consideration of the Gippsland Lakes, water management positively contributing to loss of species or ecological communities (such as threatened species and communities), or arguably even diminishing abundant species (such as fish species) would have the effect of narrowing or abolishing options for future generations – by analogy, the capital base of the Lakes environment is being eroded. The loss, which would be particularly acute for Aboriginal communities, may include loss of opportunities to receive and transmit culture based on imperilled or compromised features of the natural environment.

    b. **The 'conservation of quality' principle:** holds that each generation must maintain the quality such that it is passed on in no worse condition than it was received.[187]

    As outlined in paragraphs 38–41 there has been a reduced quality of ecosystem services throughout the catchment and the Lakes, including reduction evident since Ramsar listing. This includes a reduction in water quality, flora and fauna, and ecological communities (paragraphs 38–41; 46–52, Table 1). One key aspect is the progressive salinisation of the Lakes. The unique character of the dynamic open-and-closed coastal lagoon system, evident until late in the 19th century, has been disrupted, if not lost.[188] Cumulative impacts have, and continue, to alter the system by progressive salinisation (Box 1).

    Conservation of quality would require that the degree and extent of salinisation be curtailed to at least the 1982 Ramsar listing baseline. Preferably, conditions and trends of salinisation should manifest retreat in order to enable recovery of representative ecological communities and species. Performance indicators and targets for this type of recovery could apply to fringing freshwater-dependent woodland and wetland systems in and around Lake Wellington and Black Bream populations and life-cycle.

    The question of 'quality' arguably aligns with concepts such as ecological integrity. It is also arguable that, while importing reflection of the duty to maintain ecological character, compromise of obligations concerning intergenerational equity can occur as an incremental decline in the state of environment of the Lakes within a maintained (if impoverished) ecological character.[189] For example, where representative features of ecological character are maintained but geographically in retreat it is arguable that ecosystem 'quality' is not being conserved and hence the duty compromised.

    c. **The 'conservation of access' principle:** provides that each generation should give its members equitable rights of access to the legacy of past generations and conserve this access for future generations.[190] Conservation of access gives the members of the present generation a reasonable, non-discriminatory right of access and offers a principle of justice between generations and between members of the same generation. [191]

183 *Environment Protection Act 1970* (Vic) s 1D.

184 Bates (n 8) 233.

185 *Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited* [2013] NSWLEC 48, [492].

186 Weiss, 'Intergenerational Equity: A Legal Framework for Global Environmental Change' (1992) 385 *Environmental change and international law: New challenges and dimensions* 390-93.

187 See e.g. *New Acland Coal Pty Ltd v Ashman & Ors and Chief Executive, Department of Environment and Heritage (No 4)* [2017] QLC 24. The Land Court considered the merits of the proposed New Acland Stage 3 coalmine expansion, including the objections to the expansion, and determined to make a recommendation that the Minister reject the proposed expansion. One of the reasons for this determination was the potential impact of the proposed expansion on groundwater for future generations, as *"there is a real possibility of landholders proximate to Stage 3 suffering a loss or depletion of groundwater supplies because of the interaction between the revised Stage 3 mining operations and the aquifers…the potential for that loss or interference with water continues at least hundreds of years into the future, if not indefinitely"* [1337] per PA Smith.

188 King (n 74).

189 Ecological character for the purposes of the Ramsar Convention being the described 'combination of ecosystem components, processes and benefits/services that characterise the wetland at a given point in time': Ramsar CoP, *A conceptual framework for the wise use of wetlands and the maintenance of their ecological character* Resolution IX.1 Annex A, 9th Meeting of the Conference of the Parties, 8-15 November 2005, [15]; see also DEWHA *National Framework and Guidance for Describing the Ecological Character of Australia's Ramsar Wetlands: Module 2 of the National Guidelines for Ramsar Wetlands – Implementing the Ramsar Convention in Australian* (2008) [1.5].

190 Brian Preston, 'The Role of the Judiciary in Promoting Sustainable Development: the Experience of Asia and the Pacific' (2005) *Asia Pacific Journal of Environmental Law* 109. This article was quoted with approval in *New Acland Coal Pty Ltd v Ashman & Ors and Chief Executive, Department of Environment and Heritage (No 4)* [2017] QLC 24 [1308].

191 Ibid.

Current and previous distribution of access to water resources in the Gippsland Lakes has arguably afforded access to various industries at the expense of environmental conditions of the Lakes ecosystem. Industrial impacts have focused particularly on natural resources extraction including mining, logging, agriculture and urban water supply. The Latrobe Valley produces approximately 85% of the state's electricity, from coal-fired power stations.[192] The Thomson Dam provides for about 60% of Melbourne's water[193] while the Gippsland dairy industry produces about a fifth of Australia's dairy production.[194] The degree of historic and current allocation of water resources to industrial purposes can be said to pose an 'ecological debt'[195] owed by Victoria to the Gippsland region.

How is the principle of intergenerational equity to be implemented?

79. Similar to considering the principle of biodiversity conservation and ecological integrity, taking account of the principle of intergenerational equity requires that weight is given to ensuring water management decisions safeguard the ecological conditions of the Lakes for benefit of present and future generations.

80. The available scientific evidence would suggest this safeguard is not being maintained. This decline has been evident since at least Ramsar listing. A more dramatic decline in ecological conditions has occurred since the 1960s [paragraphs 52, 56(a)(i)].

81. Decline of freshwater resources and inputs into the Lakes ecosystem is a significant variable in the arguable failure to afford equity, as between present and future generations, in management of the Gippsland Lakes going forward. In absence of concerted actions directed to reversal of present trends, including enabling extended freshwater-influence in key ecological areas, this decline will, on the basis of available evidence and scientific opinion, reflect unsustainable practices in water management for the Gippsland Lakes.

82. In our view, appropriate measures to address the arguably inequitable distribution of environmental benefits across generations are similar to those set out above concerning ecological integrity and the application of precaution to decision-making and water management.

83. Intergenerational equity in the management of the Gippsland Lakes includes measures capable of stabilising the current trajectory of ecosystem decline and, most likely, reversing that trajectory at least to the extent freshwater-influenced ecological conditions and processes (such as particular vegetation communities and threatened species) exhibit meaningful signs of recovery and resilience.

84. Without precaution and concerted efforts at the conservation of biodiversity and ecological integrity in the Gippsland Lakes, the science indicates that freshwater-influenced wetlands and communities will decline further. This dynamic is well underway. Commencing from the present, intergenerational equity adverts to the need to avoid further deterioration in freshwater-influenced wetlands and communities and implement recovery in key, targeted indicator species and communities, such as reed beds and swamp gum woodlands, Black Bream populations, and waterbird and shorebird abundance. Intergenerational equity has been held to be a relevant rule of law in the context of imperilling natural or cultural heritage.[196] Without clear regard for it in the context of water management in the Gippsland Lakes actions continuing present environmental trajectories risk unsustainability and by extension unlawfulness.

192 Weller et al, *The Regional Effects of Pricing Carbon Emissions: An Adjustment Strategy for the Latrobe Valley* (Final Report to Regional Development Victoria (2011).

193 Melbourne Water, 'Thomson Dam', https://www.melbournewater.com.au/water-data-and-education/water-storage-levels/water-storage-reservoirs

194 Agriculture Victoria, *Dairy* (Report, 2018) <https://global.vic.gov.au/__data/assets/pdf_file/0003/326505/Invest-in-dairy_August_2018.pdf>.

195 See e.g. Paredis et al *The Concept of Ecological Debt: its Meaning and Applicability in International Policy* (Academia Press, 2008).

196 For example, *Gray v Minister for Planning and Ors* [2006] NSWLEC 720, [118]-[126] and cases cited therein.

Conclusion: management of the Gippsland Lakes system and its catchment is unsustainable without greater freshwater inflows

85. The evidence surveyed in this document reflects authoritative scientific evidence on the hydrology and ecology of the Gippsland Lakes. It is a high-level review of leading publicly available science and provides preliminary or interim insights.

86. That evidence was reviewed in light of the legal concept of 'ecologically sustainable development', including certain prominent constituent principles operating under that concept. We equate the concept of 'sustainability' with ESD in this report. The principles considered in this report are the precautionary principle, the principle of biodiversity conservation and ecological integrity, and the principle of intergenerational equity. These principles are not exhaustive of all ESD principles.

87. Our analysis of these insights concludes there is an arguable case that management of water resources in relation to the Gippsland Lakes and catchment area fails to implement ESD principles.

88. Without sufficient and robust consideration of those principles, including the rules and norms contained within them, there is the risk that water planning, as it proceeds under SWSs for example, fails to conform to legal requirements.

89. A new SWS for the Gippsland Region is to be prepared and concluded in the course of this year. As the name of the instrument would suggest, water planning under the SWS is to be guided by principles of sustainability. This report has been prepared with a view to informing this strategic planning process but also with regard to wider application of the legal framework of ESD to water management in the Gippsland Lakes catchment.

90. In addition, sustainability principles apply to the broad functions and activities of water authorities.

91. In our view, the precautionary principle must be applied to decision-making with respect to water management in the Gippsland Lakes and its catchment. To the extent precaution is a principle of prudence, current management of water resources in this ecosystem is not prudent. Ecological conditions are in decline. This correlates to historic and current decline in freshwater flows into the Lakes. There is no clear evidence of concerted action directed to maintenance of freshwater and freshwater-influenced ecological features and processes within the Lakes ecosystem, including maintenance of sufficient buffers to ensure resilience of these water ecosystems.

92. The principle of conservation of biological diversity and ecological integrity is relevant to management of water resources. Freshwater inflows into the Lakes and fringing wetlands are critical to biodiversity conservation and ecological integrity of this complex and dynamic system, particularly in sustaining estuarine influence and preserving the integrity of freshwater-dominated ecosystems. There is evidence biodiversity and ecological integrity of the Lakes system has been and continues to be jeopardised through constrained inflows, resulting from water diversions, alongside other cumulative factors. The level of extraction of water resources is a substantial contributor to these conditions. Failure on the part of decision-makers to respond genuinely and give weight to these ecological risks to the Gippsland Lakes may also give rise to risks of unlawfulness.

93. Climate change is amplifying the threats to water resources and the ecological fate of the Gippsland Lakes. Absent clear and genuine response to climate change risks in the hydrodynamics of the Lakes, water managers will likely exacerbate existing threats to the Lakes ecosystem. That course of action would, arguably, represent direct disregard for the biodiversity conservation and ecological integrity principle but also flagrantly conflict with a precautionary approach. To do so risks an unsustainable approach to the management of Gippsland Lakes' water resources and hence unlawfulness in the conduct of water resources management.

94. Without precaution and concerted efforts at the conservation of biodiversity and ecological integrity in the Gippsland Lakes, the science indicates that the fate of the Lakes ecosystem will continue toward greater impoverishment and degradation. Estuarine and freshwater wetlands and communities will decline further. Patently, that dynamic is well underway, or has been since various baselines of the 1982 Ramsar listing or the pre-development scenario of the 1960s. The principle that we should preserve or enhance the environmental benefits of the Lakes for future generations is, arguably, already in jeopardy. Commencing from the present, intergenerational equity adverts to the need to avoid further deterioration in wetlands and communities and achieve recovery in key indicator species and communities, such as reed beds and woodlands, Black Bream populations, and waterbird and shorebird populations, based on enabling ecosystem functions and processes. Intergenerational equity is a relevant rule of law in the context of imperilling natural or cultural heritage. Without clear regard for it in water management, actions effecting current environmental trajectories risk unsustainability and by extension unlawfulness.

95. The new Central and Gippsland SWSs should recognise that management of hydrology in the Gippsland Lakes catchment has been, and arguably continues to be, unsustainable and respond accordingly. In our view, this response should include water management strategies set out elsewhere in this report.

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Environmental Justice Australia
Telephone: 03 8341 3100
Email: admin@envirojustice.org.au
Website: www.envirojustice.org.au
Post: PO Box 12123, A'Beckett Street VIC 8006
Address: Level 3, the 60L Green Building, 60 Leicester Street, Carlton