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20 years of pacifying responses to environmental management

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Introduction

Environmental management involves managing the use, conservation and enhancement of natural resources so that ecological processes and services, on which life depends, are maintained. Any interpretation of major developments in environmental management in Australia and New Zealand must be made in consideration of governance systems.

Environmental management in Australia includes a mixture of State and Territory and Federal responsibilities. Australian High Court decisions during the late 1970s to early 1990s established precedent through which the Federal (Commonwealth) Government enacted environmental legislation under S51 of the Constitution (Bates 2013; Carvan 2010), representing a partial shift in responsibility away from the States. The *Environment Protection and Biodiversity Conservation Act 1999* gives the Commonwealth powers in relation to 'matters of national environmental significance' and has had implications for development activities that affect protected species and international environmental commitments (McGrath 2006). In 2013, the Federal Government began developing a framework to devolve responsibility for the assessment and approval of impacts on matters of national environmental significance to the States and Territories (Prime Minister of Australia 2013). Further changes have made water a matter of national environmental significance, requiring approval of coal seam gas and coal developments by ministerial decisions (Burke 2013; de Rijke, 2013a). Although local governments lack Constitutional status and independence, they play a central role in many environmental management initiatives, through the delegation of powers from State Governments and through implementing federally-funded environmental programs (Cuthill 2002, Wild River 2003).

In the early 1980s, the New Zealand Government began a process of streamlining environmental laws, governance and management, separating functions of policy making and implementation, and signalling neo-liberal reforms for the management of natural resources (Bührs & Bartlett 1993). Crown-owned conservation lands, including the inter-tidal zone, are managed under the *Conservation Act 1987* and the *National Parks Act 1980*; fisheries are managed under the *Fisheries Act 1996* in conjunction with specific Indigenous statutes¹; and land, air, freshwater and coastal waters are managed under the *Resource Management Act 1991* (RMA). The RMA provides for development of National Policy Statements on matters of national importance, as well as a detailed framework for the development of local government (regional, district and city) policies and plans governing the acceptability of resource development actions (Memon & Perkins 2000). In New Zealand, the *Local Government Act 2002* builds the institutional framework of local government, including regional government, and district and city councils. These tiers of local government all have law making responsibilities, and operate in a hierarchical fashion in terms of key resources. The single tier of central government gives national policy and standards direction, regional government develops regional level policy and rules, and district and city councils create plans consistent with these higher level requirements. A major advantage of the New Zealand regional council setting is its basis on catchment boundaries. Unlike in Australia, there are very few instances in New Zealand where catchments lie in more than one jurisdiction.

This summary of environmental management responsibilities provides the foundations for understanding recent trends in environmental management in both countries. What have the past 20 years contributed, and how might we learn from the past to inform the future of our research and practice? A multitude of potential responses to this question exists. In 2003, Dovers and Wild River

¹ These cover commercial and non-commercial fisheries, including *The Māori Fisheries Act 1989*, the *Treaty of Waitangi Fisheries Claims Act 1992*, and the *South Island Customary Fisheries Regulations 1999*.

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3 argued that effective environmental management required adaptive policy, institutions and
4 management. We build from this critique, providing an evidenced-based overview that interprets and
5 contrasts environmental management experiences using a state, pressure and response framework
6 across environmental domains. We argue that experience in environment management has largely
7 been ‘pacifying’ in nature: allaying public concern, without addressing environmental issues
8 holistically. That is, we have failed to make significant gains in most areas. Instead, responses have
9 resulted in perverse outcomes that have advanced some approaches at the expense of others, without
10 sufficient analysis of their overall effectiveness. We argue that a shift is needed beyond simple policy
11 adhocery toward a broader policy experiment that truly embraces a diversity of responses. This
12 needs to be applied strategically so lessons can be integrated within and across environmental
13 management domains.
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17 In addressing our aim of critiquing progress in environmental management in Australia and New
18 Zealand over the past 20 years, we contrast management responses in an attempt to share lessons
19 across the environmental domains of climate change, biodiversity, freshwater, and marine
20 management. These are in turn book-ended by two key foci: Indigenous perspectives and business
21 responsibilities. We start with Indigenous perspectives, in recognition of Aboriginal, Torres Strait
22 Islander and Māori peoples and the significant advances in recognising their rights and contributions
23 to environmental management during the last 20 years. Due to length constraints for this review,
24 genetic engineering, agriculture, mining, transport, and numerous other environmentally relevant
25 issues were unable to be considered, although we acknowledge that important advancements and
26 challenges in these fields affect environmental management.
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31 ***Indigenous environmental management fora***

32 International recognition of Indigenous peoples’ rights to self-determination dates back to the 1960
33 United Nations (UN) Declaration on the Granting of Independence to Colonial Countries and Peoples,
34 reinforced by the 2007 UN Declaration on the Rights of Indigenous Peoples to which both countries
35 are signatories. In the past 20 years, Australia has emphasised Indigenous ownership and co-operative
36 management arrangements (particularly for protected area management), whereas New Zealand has
37 emphasised devolved management and shared governance of resources.
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40 The year 1992 was of marked importance for increased recognition of Indigenous rights. The
41 Australian High Court Mabo decision overturned the notion of *terra nullius* (the claim that the land
42 belonged to no-one) and crystallised national attention on the relationships between Indigenous
43 peoples and management of country. The passing of the ensuing *Native Title Act 1993* followed an
44 earlier ruling under the Victorian *Archaeological and Aboriginal Relics Preservation Act 1972* over
45 heritage protection responsibilities (Weir 2009). In New Zealand, the *Treaty of Waitangi 1840*
46 formalised relationships with the Māori population (McHugh 1991), and subsequently incorporated
47 principles into modern legislation that require the Crown to actively protect rights including retention
48 of *tāonga* (treasures) in addition to the right of *tinorangatiratanga* (sovereignty) over those resources
49 and their lands (Barrett & Strongman 2013). Despite claims against Treaty breaches since 1849, the
50 first claim settlement did not occur until 1992 (O’Regan et al. 2006).
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54 Notwithstanding the existence of ongoing Indigenous responsibilities for land under traditional laws,
55 these responsibilities and rights are now strengthened in a complex array of arrangements in both
56 countries. First, relationships have been established between Indigenous peoples and resource
57 management agencies, often through Indigenous peoples representation on committees from
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3 ministerial to local levels. For example, Aboriginal and Torres Strait Islander peoples have secured
4 significant representation (up to 40 per cent) in all the Cape York Ministerial Committees during the
5 1990s. Relationships in New Zealand are manifest through the Māori electoral role and parliamentary
6 seats (national level), and the requirement to actively support Treaty related principles. For example,
7 decisions under the *Resource Management Act 1991* must take into account Iwi Management Plans
8 (e.g., Te Taumutu Rūnanga 2003); whereas Sections 33 and 36b allow for the transfer of functions,
9 powers and duties to public authorities, either jointly or in combination with government (although
10 there is only one instance of either). While this may seem like a positive step, arguments about lack of
11 due partnership and recognition still exist (Waitangi Tribunal 2011).
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14 Second, Indigenous peoples have advanced their own fora for engagement, enabling them to care for
15 their land and sea country (mana whenua, mana moana in New Zealand). In Australia, this includes
16 Indigenous-owned and managed protected areas, co-management enterprises, Indigenous Land Use
17 Agreements, and Indigenous Ranger Programs. Indigenous terrestrial conservation now occurs over
18 one-fifth of Australia's land area (Hill et al. 2012). Arrangements can include shared governance,
19 employment, customary use and access to resources, economic benefits (e.g., from visitor use fees),
20 and benefits to land management through the application of Indigenous knowledge (Ross et al. 2009;
21 Smyth & Ward 2009). Major funding programs supporting Indigenous engagement in working on
22 Country include Caring for Our Country, Indigenous Carbon Fund and Indigenous Heritage Program
23 initiatives (Hill et al. 2013; van Oosterzee et al. 2014). In New Zealand, most progress has occurred
24 through Treaty settlements, using a spectrum of approaches from consultation to full ownership and
25 management control (e.g. Pounamu and Tītī Islands), and a suite of co-operative management and
26 devolved management responsibilities with different land and resource ownership rights (Table 1).
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32 In Australia, sea-country title is always non-exclusive except in the intertidal zone (Smyth 2009).
33 Other state-specific arrangements, such as the 2002 amendment to the *NSW Fisheries Act*, allow for
34 cultural fishing, administered through a co-operative Aboriginal Fisheries Advisory Committee
35 (deKoninck et al. 2013). Non-exclusive title limits opportunities for economic development that might
36 address socio-economic disparities (Carter & Hill 2007). Indigenous engagement in freshwater
37 management offers little more than recognition of their interest and non-exclusive title for customary
38 use (Durette 2008; Hunt 2012).
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41 In New Zealand, sea country rights and responsibilities (mana moana) have been recognised through
42 fisheries settlements. Commercial settlements include significant cash, quota and fishing company
43 components resulting in over 20 percent of commercial fisheries rights (Memon & Kirk 2011). The
44 non-commercial component recognized customary fishing rights, providing recognition of local
45 peoples (Tangata Whenua) to make decisions about harvest quantity, size and catch method, and to
46 apply for Taiāpure and Mātaitai, two forms of customary protected areas. In New Zealand, Māori are
47 leading innovative environmental management initiatives, including in the development of Indigenous
48 environmental health indicators and assessment processes including for fisheries (Schweikert et al.
49 2012). Thus, in New Zealand fisheries are a significant arena of economic and cultural redress.
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52 Notwithstanding these developments, the reality is that Indigenous peoples still face institutional
53 impediments to full engagement in natural resource management. One impediment comes through the
54 engrained colonial framings of resource management. In both countries, the duality of land-sea
55 management, and the existence of multiple, sometimes overlapping, arrangements negotiated with
56 different stakeholders (e.g., Zurba et al. 2012), make whole of land-seascape and whole-of-country
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3 management difficult (deKoninck et al. 2013; Ross et al. 2009; Smyth & Ward 2009). Another
4 pressure is that Indigenous peoples are still socio-economically disadvantaged groups (Chapple 2000;
5 Marie et al. 2008; Marmot 2011). Unless redressed, these issues will continue to affect Indigenous
6 country connection and ability to manage country (Nursey-Bray & Jacobson in press). The ebb and
7 flow of Native Title negotiations and Treaty settlements have also had perverse consequences. The
8 onus on Indigenous peoples to prove Native Title and Treaty breaches have fuelled much internal
9 conflict and years of negotiations over who has the right to claim Native Title and a seat at Treaty
10 negotiations. The overlaying of Native Title in addition to the imposition of Western governance and
11 law systems has had profound impact on Indigenous peoples' own systems of governance and modes
12 of living (Smith & Hunt 2011). Further, the nature of responses are not always perceived as
13 adequately addressing colonial impacts; for example, the requirement for ministerial signoff on the
14 Uluru-Kata Tjuta management plan limited Traditional Owners' ability to ban climbing (Ross et al.
15 2011). Despite greater recognition of Indigenous rights and responsibilities regarding environmental
16 management, there are ongoing challenges to truly valuing the diversity that strong Indigenous
17 engagement brings to environmental management, including a clear ability to drive community-based
18 initiatives that encompass both Indigenous and non-Indigenous values.
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24 *Climate change*

25 Australia and New Zealand are among the highest per capita emitters of greenhouse gases (GHG):
26 Australians at 25 tonnes per capita and New Zealanders at 17 tonnes substantially exceed the world
27 average of 5.6 tonnes. Australia and New Zealand's overall emissions increased by 32 per cent and 22
28 per cent between 1990 and 2011 (DIICCSRTE 2013; MfE 2013a). The sources of GHG differ;
29 agriculture was the largest contributor to New Zealand's emissions in 2011 (47 per cent), closely
30 followed by the energy sector (43 per cent); whereas agriculture was only 15 per cent of Australian
31 emissions in 2009, in contrast to energy (52 per cent). Since 1990, the proportion of agriculture-
32 related emissions declined in both countries, although energy sector emissions grow and total
33 agricultural emissions continue to increase in New Zealand. A relatively heavy reliance on coal-fired
34 power plants may explain the rise in energy sector emissions in Australia (Bartleet & Gounder 2010;
35 Weng et al. 2012).
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39 Expected climate change impacts in Australia and New Zealand are well acknowledged (CSIRO 2007;
40 Garnaut 2011; OPMSAC 2013). Much of the populated area of Australia is expected to become hotter
41 and drier, with impacts on water security, agriculture, coastal communities, and infrastructure
42 (Garnaut 2011). In New Zealand, impacts are likely to be greatest on natural and farming ecosystems,
43 in infrastructure requiring a long lead-time to plan and build, and in areas with high vulnerability,
44 such as those already prone to flooding or drought (OPMSAC 2013). For ski tourism in New Zealand,
45 lower elevation sites are particularly vulnerable but the impact will depend on industry adaptations
46 (OPMSAC 2013; Hughey and Becken, in press)
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49 Responses to climate change have been influenced by largely separate policy processes and
50 developments at the international and domestic scales. Key international influences include: the
51 Intergovernmental Panel on Climate Change (IPCC), established in 1988 to provide independent
52 advice to inform decision-making on climate change; the United Nations Framework Convention on
53 Climate Change of 1992 (Bodansky 1993); and the 1997 Kyoto Protocol, the first binding
54 international agreement attempting to control greenhouse gasses, ratified by New Zealand in 2002,
55 and Australia in 2007 (Howarth 2010). Australia has responded with a variety of national initiatives.
56 However, the 2013 Federal Government change creates uncertainties regarding the future of
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3 Australia's climate change adaptation and mitigation arrangements. Climate change policy has been
4 heavily politicized along partisan political party lines, which will hinder climate change mitigation
5 policy advancements and international commitments, at least in the near future (Crowley 2013). The
6 Carbon Farming Initiative, however, is one mitigation program that appears to have maintained
7 widespread political support. The program uses opportunities in the rural sector to reduce GHG
8 emissions, with potential flow-on benefits for other biodiversity components.
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11 Australia's climate change mitigation responses began with the 1992 National Greenhouse Response
12 Strategy, succeeded by the 1998 Greenhouse Strategy, which focused on raising awareness and
13 understanding about greenhouse issues, limiting emissions growth and enhancing sink capacity, and
14 developing adaptation responses (The Commonwealth of Australia, 1998). After ratifying Kyoto in
15 2007, Australia introduced a national emissions trading system under the auspices of the *Clean*
16 *Energy Act 2011* (DCCEE, 2011). This national-scale approach to climate change included an initial
17 carbon pricing mechanism with later conversion to a market driven emissions trading scheme
18 designed to improve greenhouse gas abatement, energy efficiency and carbon storage. It was not
19 Australia's first attempt at a pricing mechanism, as NSW introduced a Greenhouse Gas Reduction
20 Scheme in 2003; one of the world's first mandatory emissions trading schemes (GGRSA, 2013).
21 Energy retailers were given mandatory reduction targets for reducing or offsetting GHG. Other states
22 adopted softer approaches. For example, Queensland introduced a strategy and government funding to
23 improve coal technology, increase natural gas use, and promote investment in renewable energy
24 technologies. Public response to such initiatives is evident through a sharp increase (747 per cent) in
25 installation of solar energy units from 2001 to 2010. Energy consumption also decreased for most
26 Australians (88 per cent in 2007-8); 82 per cent of New Zealanders reported that they had taken steps
27 to limit their electricity use (Hughes et al. 2013).
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32 Australia has adopted other adaptation initiatives driven by a research focus. The Australian
33 Greenhouse Office, established in 1998, targeted research and investment to understand adaptation
34 strategies in highly vulnerable regions, such as the Australian Alps and the Great Barrier Reef, and
35 began working on the national carbon accounting system, eventually completed in 2008. The National
36 Climate Change Adaptation Program was established to work with industries, scientific organisations,
37 residents and other governments to create solutions. This included the National Climate Change
38 Adaptation Research Facility, a research program to generate the information for decision-makers in
39 government and vulnerable sectors to manage climate change impacts (see Langton 2012; Mapstone
40 2010; Pearce 2010; Thom 2010). The Federal Government also provided support for local
41 government adaptation planning via the Local Adaptations Pathway Program (Measham et al. 2011;
42 Preston et al. 2011; Scott & Weston 2011). Finally, the Climate Adaptation Flagship was established
43 at CSIRO with the aim of assisting Australia to adapt more effectively to the impacts of climate
44 change and variability and inform national planning, regulation and investment decisions (see
45 Hennessy 2008; Preston & Stafford-Smith 2009).
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50 The New Zealand Government's principal policy response to climate change is the New Zealand
51 Emissions Trading Scheme (Richter & Mundaca 2013). This scheme is important but flawed; for
52 example, it does not include agriculture and is not transparent in terms of allocating free credits to
53 highly polluting industries (Cooper et al. 2013; Parliamentary Commissioner for the Environment 2013a).
54 However, in various sectors (such as energy, forestry and agriculture), the Government is also
55 undertaking a range of activities that are contributing to reduced greenhouse gas emissions, including
56 the New Zealand Energy Efficiency and Conservation Strategy (MfE 2007b), the Sustainable Land
57 Management and Climate Change Plan of Action, and the New Zealand Waste Strategy (MfE 2009,
58 2010b).
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3 In sum, despite broad consensus among scientists about the polluting role of greenhouse gases and the
4 negative implications of climate change, environmental management responses within the climate
5 change domain have been strategically focused on adaptation to impacts rather than addressing
6 pressures. Overall emissions are increasing, driven by the energy and agricultural sectors. Thus,
7 responses are best classified as pacifiers, with some perverse outcomes, such as a lack of taxation for
8 the biggest polluters. While political and social debate continues about whether climate change is
9 human induced, it is difficult to envision anything more than passive responses.
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12 13 14 **Biodiversity**

15 The UNCED Earth Summit in Rio in 1992 and subsequent Convention on Biological Diversity (CBD)
16 in 1993 were benchmarks in formalising the place of biological conservation globally. They instituted
17 the term 'biodiversity' in the public, governmental and scientific sectors, and in international attitudes
18 to conservation, environmental management and sustainable development. Recent global analyses
19 nevertheless indicate sharp declines in biodiversity and the extent and quality of habitat, yet increases
20 in threats to it (Biodiversity Indicators Partnership 2010; Butchart et al. 2010).
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23 Biodiversity declines in Australia are evident at ecosystem and species levels. Over a quarter of
24 Australia's nationally important wetlands are under pressure from changes to water regimes, while
25 only 17 per cent of Australian wetlands are mapped. Over 13 per cent of the original wetland
26 vegetation has been cleared since European settlement, and some vegetation types have incurred more
27 extensive losses: at least 30 per cent of the pre-European extent of eucalypt and mallee woodlands and
28 lowland rainforest, about 45 per cent of heath communities, and 99 per cent of temperate lowland
29 native grasslands has been cleared (Taylor 1998; NLWRA 2001; Williams & Saunders 2003; ASEC
30 2006; Commonwealth of Australia 2011). Much of the remnant vegetation is modified and still
31 incurring a net loss (Commonwealth of Australia 2011), and there are over 2800 threatened
32 ecosystems in Australia (Cork et al. 2006). Many of Australia's mammal species are now distributed
33 over less than 20 per cent of their original range; six per cent of marsupials and 14 per cent of rodents
34 extant 200 years ago are extinct; 76 species (one and a half per cent) of plants are extinct and 1260
35 species (six and a half per cent) are threatened (Briggs & Leigh 1996; Johnson 2006; Chapman 2009).
36 Australia has an increasing number of threats to biodiversity with 20 identified as key threatening
37 processes under the *Environment Protection and Biodiversity Conservation Act 1999*. The most
38 frequently cited threats are habitat fragmentation and invasive species, but legacy effects from land
39 clearing will continue for years or decades (Commonwealth of Australia 2011). National weed and
40 pest management strategies indicate increases in threats: 16 per cent of introduced plants have become
41 noxious weeds, and there are now more introduced vascular plants (ca 26,000) in Australia than native
42 species. There are also 73 introduced vertebrate species and dysfunctional ecosystems have led to
43 some native fauna (e.g. some kangaroo species, noisy miners) threatening other native species in some
44 areas. As stated by the Australian State of the Environment Committee in 2006, 'It is only a question
45 of how long it will be before pressures will overwhelm the resilience of the remaining ecosystems'
46 (ASEC 2006, p. 35).
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52 New Zealand biodiversity is largely endemic, including 71 per cent of birds and 80 per cent of plant
53 species (Brockie 2012). However, many native species are threatened by a multitude of introduced
54 species that are better suited to the contemporary disturbed landscapes (Kelly & Sullivan 2010). A
55 high proportion of birds (79 per cent) and vascular plants (37 per cent) are at risk or threatened (Craig
56 et al. in press). The most recent State of the Environment report (MfE 2007a) indicates declines of 7-
57 90 per cent in the population size and extent of seven terrestrial indicator species during 1970 - 2007.
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3 Roberts (2013) notes that, since the NZ Biodiversity Strategy was published in 2001, the deterioration
4 in status of threatened species has continued: the status has worsened for 13 bird species and two
5 skink species; the number of threatened vascular plants has risen from 243 in 2008 to 289 in 2012;
6 and the proportion of freshwater fish classified as 'Threatened' or 'At Risk' has risen from 53 per cent
7 to 67 per cent (2010 figures). These statistics contrast with conservation gains, such as a doubling in
8 the number of Kākāpō (*Strigops habroptilus*) since 1997 (MfE 2010a). Like Australia, much of New
9 Zealand's marine biodiversity is undescribed (Gordon et al. 2010).
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12 In Australia, protected area designation is based on the 1997 'JANIS' criteria for a comprehensive,
13 adequate and representative terrestrial reserve network, based on bioregional assessments (JANIS
14 1997), and a bioregional approach to marine reserve designation through the National Oceans Policy
15 (1998). Thirteen per cent of terrestrial lands are now protected in 9719 protected areas, with an
16 increase of 73 per cent from 1997 to 2010 (although 44 per cent of biological subregions are under-
17 represented, particularly rangelands and wetlands (Commonwealth of Australia 2011). A 234 per cent
18 increase in marine protected areas was observed over the same period growing to nearly 326,614km²
19 (CAPAD 2012) yet this comprises little more than three per cent of the total Economic Exclusion
20 Zone and recently designated marine reserves and management plans are now under review by the
21 new federal government.
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25 Australia has a strong history of biodiversity conservation with communities; 29 per cent of the
26 national reserve system is managed by communities, including Traditional Owners and private
27 consortia such as Bush Heritage Australia (CAPAD 2013). Investments in biodiversity through
28 broader natural resource management regimes (see Curtis et al. 2014, this edition, and Hajkowicz
29 2009) have also increased, including federal government long term program investments at the
30 equivalent annual rates of AU\$60million in 1990 to AU\$371million in 2007 (Hajkowicz 2009).
31 However, investment in private land management activities is significantly lower than for government
32 managed lands (Gilligan 2006: 68/9).
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35 New Zealand's conservation estate covers 33 per cent of the country's terrestrial area; all but one per
36 cent is managed by government (Government of New Zealand 2007). However, only 12 per cent of
37 that area is under active pest control (Craig et al. in press). Like Australia, marine protection in New
38 Zealand has grown significantly over the past 20 years, including doubling the area under protection
39 between 2000 and 2007, and the closure of 52 per cent of all seamounts to bottom trawling
40 (Government of New Zealand 2007). Marine reserves cover seven per cent of the managed marine
41 area (Gordon et al. 2010).
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44 New Zealand's Department of Conservation was characterised by emphasis on species preservation,
45 but by the mid-1990s, there was a growing emphasis on ecosystem and adaptive management
46 (Jacobson 2007). More recently, a combination of species and ecosystems has been managed within
47 the Department's Project Prioritisation Protocol, designed to optimise resource allocation (Joseph et al.
48 2009). Since 2012, the Department has faced declining budgets and new strategies have been required,
49 these have focused on partnerships, and communities and businesses in particular. Examples of
50 community engagement include Ngā Whenua Rahui private land covenants and community
51 partnerships (Allen et al. 2013, Craig et al. in press). Both public and private management emphasise
52 multi-species protection through the intensive management of offshore and 'mainland islands' where
53 many critically threatened species are thriving (Saunders & Norton 2001).
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57 In summation, despite significant efforts and commitment to international agreements, biodiversity
58 continues to decline (Coffey & Wescott 2010). This raises a critical question: are our responses
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3 simply insufficient and at the wrong scale, or might we have passed thresholds in biodiversity loss, as
4 indicated by Rockström et al. (2009)? Nevertheless, there are instances of novel responses which may
5 overcome declines. Examples include New Zealand conservation efforts in offshore and mainland
6 islands where rare species are now comparatively common, and the work of the Bushfire CRC in
7 understanding and communicating fire risk and threat while managing impacts on important
8 infrastructure, resources and the environment (Handmer & Dovers 2013). More recent efforts towards
9 'Connectivity conservation' through landscape-scale programs such as the NSW State Government
10 and NGO-led Great Eastern Ranges Initiative (Levin & Petersen 2011), the NGO-led Gondwana Link
11 (Jonson 2010), and by the NSW Natural Resources Commission need careful planning and resourcing
12 to ensure that they encompass existing natural areas at their core and avoid accelerated extinction by
13 diverting funding from species-focused conservation (Lindenmayer et al. 2010; Kirkpatrick 2011).
14 Perhaps what is needed is continued innovation beyond the dualistic categorisations of 'species' and
15 'landscapes', or 'protected areas' and 'production' lands, and their associated institutional
16 territoriality, and movement towards more "comprehensive, robust, and multi-scaled cross-tenure
17 conservation plans" (Lindenmayer et al. 2010, p. 1590); the consequences of not doing so are
18 evidently high.
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24 *Freshwater*

25 Droughts in combination with consumption patterns over the past 20 years have placed great strains
26 on the health of Australia's water resources. Historical development of water resources has involved
27 removing wetlands, building dams, weirs and barrages, and altering natural catchment flows, which
28 has increased salinity levels in freshwater systems. Meanwhile, urban and agricultural land use has
29 increased the nutrient levels in freshwater and coastal marine systems and consequently, many of
30 Australia's water environments are in degraded condition (Vörösmarty et al. 2010; SoE 2011). Future
31 climate variability will increase pressure on aquatic systems (SoE 2011). The Australian agricultural
32 sector in 2011-12 accounted for 9,418 ML of water, representing around 60 per cent of total
33 extraction (ABS 2013), down from highs of around 15,000 ML during the mid-1990s (ABS 2000) but
34 with increased human population. Recent declines in consumption for household and agricultural use
35 have largely been driven by adaptive action forced by droughts across south-eastern Australia (Saliby
36 et al. 2009; Prosser 2011).
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40 Australian water policy has been increasingly influenced by a move to mirror community expectations
41 of environmentally sustainable development. This move was initially reflected in the Australian Water
42 Reform Agenda (1994) under competition policy reforms driven by economic efficiency concerns,
43 and then later reinforced with the Intergovernmental Agreement on a National Water Initiative signed
44 in 2004 (Baldwin et al. 2009). Through these and other initiatives, water management has been
45 devolved to catchment-scale bodies (see Curtis et al., this issue; Robins & Dovers 2007; Hajkowicz
46 2009). As Hussey and Dovers (2006, p. 36) note, "the National Water Initiative is an unprecedented,
47 multicomponent national-level policy framework, with tensions between major components and
48 associated implementation challenges". It incorporates a range of market-based and educational
49 policy instruments, with demands placed at the catchment management authority level. While it
50 promotes environmental sustainability, it also preferences a neo-liberal policy approach using market-
51 based instruments and property rights to influence the use of public resources (Hussey & Dovers 2006;
52 Hajkowicz 2009). Included in these broad management approaches has been the Caring for our
53 Country program (2008), for which one success has been the AU\$200 million Reef Rescue Program
54 to improve water quality from agricultural catchments entering the Great Barrier Reef (Brodie 2012).
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3 The package of voluntary incentive-based and regulatory measures has had a positive effect on water
4 quality decline yet it is unlikely to save the reef (Brodie 2012). These catchment-based approaches
5 need to be up-scaled to a reef-wide approach and complemented by cross-regional collaboration for
6 greater effect (Peterson 2010). The Murray Darling Basin Plan seeks to restore the river's flow to
7 environmentally sustainable levels (Connell 2007; Grafton & Hussey 2007; Roberts et al. 2011), by
8 returning 2,750GL to environmental flows. Water trading and markets have encouraged more
9 efficient use, although being seen by some as ignoring social and economic needs, and are slowly
10 evolving as a fundamental aspect of Australian water management. However, the success of these
11 approaches is unclear due to limitations in evaluation instruments and insufficient evidence that
12 programs are achieving intended outcomes (Hajkowicz 2009; Commonwealth of Australia 2011).
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15 The Great Artesian Basin, which underlies 30 per cent of Australia, has been a policy focus at State
16 and Federal levels (Habermehl 2006). Over-extraction of water from the basin has created concern
17 about aquifer health, and in 2004, the Great Artesian Basin Coordinating Committee was established
18 to promote a 'whole of government' approach to managing the aquifer (which underlies three states
19 and the Northern Territory). The committee has had some success in regulating and reducing
20 extraction (Habermehl 2006); however, the recent coal seam gas boom occurring in eastern Australia
21 has the potential to compromise the aquifer's integrity (Lyster 2012; de Rijke 2013b).
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24 Water is also viewed as one of New Zealand's major environmental issues, with farming increasingly
25 perceived as a major cause of pressure on the resource (Hughey et al. 2013; Parliamentary
26 Commissioner for the Environment 2013). In a country where water is a seemingly abundant resource,
27 it is remarkable that freshwater issues are now viewed as 'wicked' environmental problems.
28 Successive governments over the last two decades have invested in a range of policy initiatives to
29 reverse the trend of decreasing water quality, especially in lowland streams and lakes (e.g., Verburg et
30 al. 2010). Most initiatives attempt to address trade-off issues (e.g., where rivers are nationally
31 significant for their in-stream values but also for hydro-electric and irrigation purposes (see Hughey
32 2013)). The most recent suite of policy responses began in 2003 with the Sustainable Water
33 Programme of Action which included the development of National Standards for freshwater quality
34 (yet to be approved), the land and water forum (2009-), followed by the National Policy Statement on
35 Freshwater. The Land and Water Forum, a multi stakeholder collaborative approach established in
36 2009, provided a vehicle for advising central government on this and other issues. Consequently, the
37 National Policy Statement on Freshwater was released in 2011, followed in 2013 by a proposed
38 national objectives framework.
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43 Perhaps the biggest change to result from recent New Zealand freshwater reforms is the government's
44 commitment to collaborative processes. These processes are embedded in the Canterbury Region
45 through implementation of the Canterbury Water Management Strategy (CWMS) (Canterbury
46 Mayoral Forum 2010). Jenkins (2013) supports most of its principles and practices but identifies some
47 emergent issues for on-ground implementation, notably those linked to water quality. As noted by the
48 Environmental Commissioner (Parliamentary Commissioner for the Environment 2013b, p. 5): "the
49 outcome of this modelling is not good news. ... It is almost inevitable that without significantly more
50 intervention, we will continue to see an on-going deterioration in water quality in many catchments
51 across the country, particularly in Canterbury and Southland".
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54 In summary, the future prospects for freshwater are uncertain. Water quality is declining, and the
55 implications of groundwater use are unknown, although consumptive pressures are reducing in
56 Australia. Unlike climate change, we appear to have moved beyond pacifier type responses. In
57 addition to policy-based approaches, market mechanisms (i.e. tradeable water licences), collaborative
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3 processes (including inter-governmental and community based approaches) and management against
4 standards (i.e. for nutrient loading) are being trialed in different catchments and in the case of New
5 Zealand as part of a strategic national approach to freshwater management. There is therefore
6 evidence of a degree of policy experimentation. However, the comparative effectiveness of each of
7 these approaches largely remains to be seen, particularly for reducing impacts on water quality. It is
8 also essential that collaborative processes are open and accountable to the public, given the competing
9 stakes that exist (industry, conservation, community) in the management of freshwater.
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12 13 14 *Marine estate*

15 Australia and New Zealand marine responsibilities estates are vast: the third and fourth largest in the
16 world respectively. They include areas off the mainland and offshore responsibilities in the Pacific,
17 Southern and Indian Oceans. In Australia, the States and Territories manage from the low water mark
18 to three nautical miles off-shore, and control oil, gas, fisheries to the edge of the economic exclusion
19 zone (Hayward 2003), while the Commonwealth manages the remaining Economic Exclusion Zone.
20 The New Zealand government, through various departments, has responsibility for managing all of
21 the equivalent area.
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24 In response to biodiversity challenges previously outlined and historical over-fishing, management of
25 fisheries has become a priority in both countries. Data on the health of Australia's fisheries is
26 incomplete. However, a recent Department of Agriculture evaluation notes that two fishing stocks
27 were over-fished, five were being depleted, eight were in a recovery stage and 98 were being
28 harvested at a 'sustainable' rate (Department of Agriculture 2013). There has been a modest decline in
29 Australian commercial fisheries over the past decade, both in terms of profits realised and production
30 (Department of Agriculture 2013). This decline has been somewhat moderated with the rapid rise of
31 the aquaculture industry, expanding from 12 thousand tonnes (worth ~ AU\$310 million) in 1992 to 85
32 thousand tonnes in 2012 (worth ~ AU\$1.1 billion) and now accounting for 34 per cent of Australian
33 seafood production (FRDC 2012; Department of Agriculture 2013).
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36 At the Australian federal level, governance of fisheries has been expedited via a structural separation
37 between the Department of Agriculture, Fisheries and Forestry, which undertakes management of
38 policy, and the more technical recommendations of the Australian Fisheries Management Authority
39 (AFMA). AFMA marked a shift in the approach to fisheries management, towards a market-based
40 Individual Transferable Quota system, defined within a system of Total Allowable Catch (TAC). The
41 predictive models for defining TAC, however, have been limited due to poor biological data for most
42 quota species (Tilzey & Rowling 2001; Dowling et al. 2008). The Harvest Strategy Policy of 2007
43 includes a requirement to operate under the principles of ecologically sustainable development (DAFF
44 2007; Smith et al. 2013). Smith et al. (2013) suggest that the strategy has been relatively successful, as
45 the proportion of federally managed stocks subject to over-fishing and the proportion of stocks of
46 uncertain status have both declined.
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50 Coastal and marine tourism is an ongoing management issue in the marine domain. For example, the
51 Great Barrier Reef region supports a substantial commercial-based tourism industry, generating
52 AU\$5.1 billion to the Australian economy (GBRMPA 2009). Additional pressures such as climate
53 change, sea-level change, and urban migration will all affect how tourism develops but, as it is a
54 major industry now, it will need careful management to ensure it is not overly affected by, nor
55 affecting the environmental and cultural values on which it depends.
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3 The ports and shipping industry is also a major player in Australian marine and coastal governance,
4 yet its role is little understood. For example, ports facilitate seaborne trade, which accounted for 90
5 per cent of global trade in terms of volume and 70 per cent in terms of value in 2006 alone. Given that
6 over 99 per cent of Australia's exports and imports, by mass, are transported by sea, there are
7 important environmental management considerations, especially given the role of ships in moving
8 foreign species via ballast water, and the potential for oil spills in areas such as the Great Barrier Reef,
9 as witnessed with the grounding of the Shen Neng 1 in 2010.
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12 In a study of global fisheries, Worm et al. (2009) showed that only New Zealand and California are
13 predicted to achieve a conservation target of having less than 10 per cent of their fish stocks being
14 defined as collapsed. New Zealand's introduction of the Quota Management System (Memon & Kirk
15 2011) increased the number of fish managed by quota from 27 in 1986, to 100 species groupings (of
16 130 commercially fished species)² in 2013. Management mechanisms include a Total Allowable
17 Commercial Catch (TACC) for 629 Fisheries Management Areas (Ministry for Primary Industries
18 2013), determined on the basis of maximum sustainable yield, where sustainability of fisheries is
19 interpreted on the basis of limits – a soft limit (exceeding of which is referred to as 'over-fished'), and
20 a hard limit (exceeding of which is referred to as 'collapsed'). A 2011 evaluation (Ministry for
21 Primary Industries 2011) indicates that only 15 per cent of stocks exceeded the soft limit, an
22 improvement from 19 per cent in 2009, while six per cent exceeded the hard limit, the same level as
23 2009. Although recent studies are positive (e.g., Worm et al. 2009), such estimates are based on a
24 limited dataset (only 19 species for which quota exist, and a limited number of fisheries management
25 areas for some species) indicating data adequacy issues as per Australia, and perhaps questionable
26 sustainability.
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31 New Zealand differs from Australia in that its TAC (Total Allowable Catch) includes Indigenous non-
32 commercial fisheries and recreational fishers. Novel to New Zealand is the allocation of rights to local
33 Tangata Whenua (locally affiliated Māori) to fish for customary purposes, including customary
34 marine protected areas called Mātaitai and Taiāpure. These mechanisms address some Tangata
35 Whenua concerns about rapid decline in coastal fisheries (Dick et al. 2012; McCarthy et al. 2014), and
36 provide for recognition of the social relationship between Tangata Whenua and the sea. Appointed
37 guardians regulate resource users, harvest quality, size, methods and other factors including for
38 commercial fisheries, which are excluded from Mātaitai at the outset (Jacobson and Moller, in press).
39 A recent survey (Chhun et al. 2013) indicates that such mechanisms are preferred (in combination
40 with marine reserves) over increased commercial harvest in the inshore zone. They are also an
41 otherwise largely missing mechanism for actively engaging non-indigenous community in fisheries
42 management, under Indigenous leadership (Jacobson and Moller, in press). Collaborative planning
43 under the *Fiordland Marine Management Act 2005* (Cameron 2006) and positive contributions to
44 self-management in the scallop fishery are other industry examples (Hughey et al. 2000; Cullen et al.
45 2005).
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49 On the other hand, it appears fisheries are now being managed in a more sustainable manner, with
50 declining numbers of over-fished stocks. However, this apparent improvement does not account for
51 uncertainties in some stock assessments, nor for the spatial impacts of fisheries. Local in-shore
52 fisheries are evidently in decline in many places, with increased pressures from tourism and port
53 development (the latter especially so in Australia). Management of fisheries in particular is rooted in
54 scientific adaptive management, with an emphasis on market-based mechanisms (similar to
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57 ² It is difficult to assess the total number of species that come under the QMS based on the fact that some
58 TACC are set for multiple species (e.g., eight species of flat fish fall under one quota).
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3 freshwater management). More recently, collaborative approaches are emerging to address a
4 perceived failing of these approaches, although they have been trialled simultaneously within the
5 same space. This has resulted in a somewhat perverse ‘race for space’, where different management
6 arrangements (e.g. protected areas, community fisheries, ports and commercial fisheries) are juxta-
7 positioned, especially within coastal waters, jockeying for space with less consideration for fisheries
8 themselves that transcend their boundaries (Memon & Kirk 2011). Australia’s situation is further
9 complicated through servicing an expanding energy sector (drilling and mining related industry), as
10 New Zealand’s may be in future years. Conflicts over use, zoning and placement of protected and
11 customary areas, and the links between State and Territory responsibilities (in Australia) continue to
12 cause social discontent, often resulting in poorer conservation outcomes due to political compromise
13 (e.g. new ports approved within the Great Barrier Reef). Thus, a closer examination is needed of the
14 appropriate balance of initiatives for effective management of marine resources as a whole.
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20 ***Business responsibilities***

21 Producers (businesses, including agriculture) and consumers increasingly affect the environment. This
22 is evident through increasing GHG emissions, solid waste to landfill, and intensified land uses. To this
23 point of our review, we have seen that, in New Zealand, business collaborations in biodiversity,
24 freshwater and marine management have the potential to deliver a range of outcomes, particularly
25 through collaborative approaches. For New Zealand, Dobbs and van Staden (2002) identified that
26 community concerns and shareholder rights are the main drivers of environmental sustainability and
27 business reporting initiatives. The organisational responses are typically voluntary, often aiming to
28 meet, or complement and exceed regulatory requirements.
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31 Regulatory requirements in Australia and New Zealand have embedded formal Environmental Impact
32 Assessment procedures as part of development consents at all government levels. In New Zealand,
33 Assessment of Environmental Effects is required for activities under the Resource Management Act.
34 More recently, Strategic Environmental Assessment has become more widespread, emphasising
35 effects at a broader than project scale. In Australia several Strategic Environmental Assessments have
36 been undertaken under the *Environment Protection and Biodiversity Conservation Act 1999* to
37 address matters of National Environmental Significance (e.g. Melbourne’s metropolitan growth and
38 the Molonglo development plan; ACTPLA 2011). The 2009 ‘Hawke Review’ recommended strategic
39 rather than project-scale assessment as a focus for national environmental policy. An example
40 application in New Zealand has been the Canterbury Water Management Strategy.
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44 Associated with Australian Environmental Impact Assessment for development proposals has been
45 the requirement for preparing Environmental Management Plans to address negative impacts during
46 development and operational phases of activities. While these are monitored during the development
47 phase, the plans often lack operational implementation, partly due to the lack of capacity of regulatory
48 bodies to monitor, review and advise where performance standards are not met. The exception to
49 limited operationalisation is when legal standards or a voluntary Environmental Management System
50 exists for the operator; however plan implementation can only be assumed to occur in these
51 circumstances, given the lack of checks. This failure to implement ongoing monitoring means that the
52 opportunity for adaptive management and knowledge sharing is lost.
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55 Voluntary mechanisms to manage the environmental effects of business are evident in codes of
56 practice or best practice frameworks that have continued to gain popularity during the last 20 years.
57 These mechanisms have covered a multitude of industry sectors including mining, oil and gas,
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3 agriculture, manufacturing and production, and the service sector across varying issues such as energy,
4 water, emissions and waste. In 2008, the Environment Institute of Australia and New Zealand
5 compiled an Environmental Best Practice Bibliography with more than 800 entries of best practice
6 (Whiley et al. 2008). The National Business Leaders Forum on Sustainable Development (Australia)
7 regularly gathers and promotes best practices in firms. Industry-wide 'codes of practice' or 'accords'
8 are found in both countries (e.g. the 2009 Australian Pipeline Industry Association's Code of
9 Environmental Practice, and the NZ Packaging Accord 2004-2009 which led to the current Packaging
10 Product Stewardship Scheme). More generic Cleaner Production approaches have involved
11 partnerships between councils and industry in New Zealand (Hughey & Chittock 2011). As with other
12 initiatives, there is little independent evaluation of performance for organisations with and without
13 Codes of Practice or of other approaches described below.
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17 The New Zealand agriculture sector illustrates how voluntary approaches have been used, and some
18 inherent concerns. The most recognised and perhaps most contested response to the declining quality
19 of freshwater has been the Dairying and Clean Streams Accord. This accord was initiated in 2003
20 (and updated in 2013 as the Sustainable Dairying: Water Accord) in response to growing concerns
21 about the impact of farming on water quality and other environmental aspects (Hughey et al. 2007).
22 Its goal was to have suitable water where appropriate for fish habitat, drinking by stock, and
23 swimming (in areas defined by regional councils). Most effort has involved excluding stock from
24 water bodies, but the new Accord emphasises fertiliser use and water quality concerns. Annual reports
25 of Accord progress and occasional 'independent' assessments (e.g. Deans & Hackwell 2008) have
26 mostly been highly critical, because output targets have been the focus rather than desired outcomes.
27 Herein lies the greatest challenge of accords, codes of practice, and best practice: they must be, but
28 are often not, linked to desired outcomes and monitoring thereof, and not just to practices or processes.
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32 At the 'more formal' end of voluntary approaches are certified, self-improvement, environmental
33 management systems. These include systems that can be applied across all industries (e.g. ISO 14001)
34 and those that are industry-specific (e.g. Marine Stewardship Council for commercial fisheries,
35 Sustainable Wine New Zealand, Forest Stewardship Council). These approaches have been applied in
36 Australia and New Zealand but with vastly different levels of organisation and industry penetration,
37 and with questionable performance outcomes (Lannelongue & González-Benito 2012). The ISO
38 14001 system is constructed around conformance with process and environmental regulation, and a
39 substantial (but not huge) number of Australasian businesses are ISO 14001 certified (749 Australian
40 and 155 New Zealand companies in 2007 (ISO 2007)). However, there has been little or no known
41 independent or rigorous evaluation of these companies (Alexander et al. 2011).
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45 Industry evaluations (e.g. Hughey et al. 2007), based largely on perception and self-reporting, may
46 nevertheless lead to improved performance over non-certified systems. Sustainable Winegrowing
47 New Zealand (SWNZ) was established in 1995 as an industry initiative directed through New Zealand
48 Winegrowers. The industry launched in 2007 a Sustainability Policy that aimed for all New Zealand
49 wines to be produced under independently audited environmental programs by 2012. According to
50 SWNZ, "participation ... rose to almost 100 per cent between the launch of the policy and the target
51 date of 2012 — an estimated 94 per cent or more of New Zealand's producing vineyard area
52 (accounting for approximately 90 per cent of the wine produced) is now SWNZ-certified." (New
53 Zealand Winegrowers 2013). A major gap existing in many of the environmental management
54 systems is the lack of compulsory reporting requirement, something particularly noticeable in ISO
55 14001. URS (2006) identified around 60-100 companies claiming to report, but with no verifiable
56 information on reporting efforts, and minimal contemporary critique of the quality of these reports or
57 the links to desired environmental or social outcomes generally.
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Obligations under the United Nations Framework Convention on Climate Change require the tracking of national emissions. The *National Greenhouse and Energy Reporting Act 2007* was the Australian regulatory response to this international requirement, which requires reporting by businesses with high carbon emissions or energy consumption. However, broader sustainability reporting in Australia remains voluntary and the Australian Government defers to internationally acknowledged frameworks such as industry codes of conduct, and the United Nations Global Compact and Standards such as the ISO 14000 series (Parliament of Australia, 2010).

Over the past ten years, advances in traceability have provided an opportunity for consumers (and government) to connect products with environmental sustainability more directly. An example is Icebreaker, a merino wool garment manufacturer in NZ. In 2008, an estimated 75,000 people used the 'baacode' to trace all aspects of the supply chain to the source farms in the Southern Alps (Icebreaker 2013).

Another significant success by business has been the contribution to managing point source impacts; for example, the Montreal Protocol, designed to eliminate ozone layer depleting substances. Indicators show that ozone substances have been largely eliminated from industry. This success can be best attributed to: the issue being well understood and resonating with the public, the problem was a relatively simple to explain cause-and-effect relationship, the technology existed to fix the problem, and the solutions were cost effective. This is in direct contrast to the characteristics and outcomes of the more 'wicked' problems addressed in this article, such as water resource management, biodiversity conservation, and climate change.

In summary, environmental management in the business sector is still marked by dualistic approaches of regulation and voluntary responses. Despite significant voluntary efforts, accessing independent scientific critique linked to environmental outcomes is almost impossible; since industry has focused on voluntary measures, the associated levels of auditing and reporting remain low. Furthermore, the focus on management processes rather than outcomes suggests these responses are pacifying, rather than recognising the potential economic benefits that can come from practices that reduce environmental impact. The challenge for the sector in contributing to improved outcomes across domains (i.e., climate, biodiversity, freshwater and marine) will be to marry the two. There is some evidence of this through collaborative approaches in the marine and water sectors, but their efficacy is not yet fully demonstrated.

Discussion

To assess progress in environmental management over the past 20 years, we summarised state, pressure and responses across environmental domains (Table 2). Our analysis was hampered, however, by disparate data, collected over different periods, often with large gaps, and not least by the size of our undertaking. Furthermore, evaluation of policy and program impact and sharing of lessons is scant but necessary to address the interconnected declines of socio-ecological systems (Beeton and Lynch 2012).

The main shift in responses to environmental management has been from largely regulatory approaches, evident in the 1970s to early 1990s, to the management of effects of human interaction with ecosystems that emphasise voluntary and best practice approaches (Dovers 2013). Three other changes are evident. First, there has been a shift in responsibility from Australian state government to a combination of federal government and quasi-autonomous regional community approaches, and, in

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3 New Zealand, from central government to a combination of regional government and community
4 initiatives. The extent of these initiatives has grown substantially in both countries. However, there
5 has been comparatively little cross-cutting research into the nature and extent of outcomes achieved,
6 nor critical reflection on their long-term viability, including resourcing.
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9 Second, market-based mechanisms have been increasingly evident in marine management (more so in
10 New Zealand) and freshwater management (more so in Australia), in the climate sectors in both
11 countries (although not for the heavily impacting industries), and to a lesser extent with regard to
12 biodiversity off-setting enabled under some Australian planning schemes. There also have been
13 significant developments in Indigenous rights and engagement. Although national strategies that cut
14 across sectors exist (e.g., Australian principles for Ecologically Sustainable Development and the
15 New Zealand Biodiversity Strategy), they are not sufficiently specific to enable lesson sharing across
16 sectors. The questions remain of whether they should, and whose responsibility this ought to be if it is
17 decided that they should. It appears that the need for lesson sharing and to learn from policy failure
18 occurs only when sufficient will exists (e.g. in the Indigenous domain).
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21 Third, there has been a shift towards monitoring and analysis, facilitated through increased computing
22 capacity, and investments in research, remote sensing and impact modelling. State of the Environment
23 reports in both countries are evidence of this, in addition to a multitude of domain specific reports
24 (e.g., biodiversity, water) at national, state and regional levels. However, this has resulted in an often
25 data-rich environment, but a lack of management-relevant information. There is a notable absence of
26 information about governance performance. The utility of information is limited by a lack of
27 comparable indicators, definitions and protocols for its collection, thus affecting long-term and multi-
28 scalar comparability. We have indicated that the marine domain is particularly data deficient, as is
29 ground water and some aspects of biodiversity, but this viewpoint couples concerns about limited data,
30 a lack of effective data sharing (Allen 2007) and concern about the 'right' data upon which to make
31 decisions (see Hockings et al. 2009). The critical issue for the next 20 years will be how we ensure
32 information is management relevant and utilised appropriately.
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36 In 2003, Dovers and Wild River (2003) applied five principles of adaptive policy, institutions and
37 management in a 30-year review of Australian environmental management. Ten years on, against
38 those principles, our experience can be summarised as:
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- 40 • persistence – poor;
 - 41 • purposefulness – moderate;
 - 42 • information-richness – potential high, use low to moderate;
 - 43 • flexibility – too much; and
 - 44 • inclusiveness – many gains, but patchy.
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47 In other words, our attempts have been well intentioned but disparate, short term, poorly informed
48 and inadequately inclusive. Despite notable achievements, the incremental approach to environmental
49 management has failed to reverse negative trends in key environmental indicators. Responses have
50 involved 'picking the low hanging fruit' and they appear insufficient in affecting broad-scale and
51 substantive change in environmental sustainability. Hence, we categorise these types of responses as
52 'pacifiers'. As Kirkpatrick (2011 p. 283) notes, decision-making has become somewhat of a 'ritual of
53 appeasement' with questionable long-term outcomes for the environment.
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56 Our responses to environmental challenges appear as small governance changes, bounded by political
57 shifts unconnected to learning from our experience. To address public administration challenges,
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3 Lindblom (1979) called for policy strategies that skilfully address uncertainties inherent in
4 environmental management. Adaptive management (Holling 1978; Lee 1999) is one such approach
5 that has gained traction both as science-based experimental learning and as a structured but less
6 formalised approach for learning from experience (Allen & Stankey 2009; Jacobson et al. 2009). In
7 the past 20 years, this approach has been mooted as best practice policy although effective practice is
8 often challenging (Allen and Stankey 2009, Jacobson et al. in press, Jacobson et al. 2008). Australian
9 studies from coastal and protected area management suggest that there has been limited critical
10 consideration of whether existing monitoring is sufficient in breadth and depth to facilitate
11 deliberative evaluation of policy and program adaptation, as opposed to reporting status (Jacobson et
12 al. 2009, Jacobson et al. in press). While on the surface we may be espousing a more adaptive
13 approach, we are failing in attempts to move beyond determining whether goals have been achieved
14 towards understanding which aspects of management need adapting. In essence, we are relying on one
15 approach, and then another, but rarely using our monitoring to adapt our approach nor to trial multiple
16 approaches simultaneously.
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20 Perhaps our emphasis on so called pacifying responses is merely a first step towards reversing
21 negative trends in environmental indicators that are evident across the domains, and an adaptive
22 response is imminent. We do not mean to suggest that national policy responses are not significant,
23 but it appears politically easier to gain agreement on plans and policies than to ensure their effective
24 implementation, monitoring, review and adaptation. However, a more circumspect reading of domain
25 reviews indicates that many are somewhat blind to the perverse outcomes generated by past responses.
26 While sustainability is important and strategic initiatives are evident across sectors, human
27 consumption and governmental emphasis on economic growth continues to come at environmental
28 and social cost. During revision of the Millennium Development goals, Rockström et al. (2013)
29 argued for reconceptualization of sustainable development from an eco-centric perspective,
30 recognising the underlying environmental costs of activities. Approaches such as full-cost (whole of
31 lifecycle) product accounting, payment for ecological and ecosystem services, and market
32 mechanisms (e.g., carbon emissions trading schemes) are attempts to operationalize this. However,
33 experience has shown that these approaches have limitations too. A reduction in resource use does
34 not necessarily result in an increase in biophysical capital due to dynamic and non-equilibrium
35 behaviour of socio-ecological systems (Gunderson & Holling 2002). Moreover, disparities in local
36 and global wealth compound the effective function of markets with commitments to development and
37 human rights. Ravetz (2006) argues that the developmental pathways used by the 'rich' are not
38 typically open to the 'poor' given that they involve a relationship of dependency between the two. For
39 Indigenous peoples, overcoming wealth and health disparity is compounded by the weight of land
40 claims, Native Title and Treaty settlements, the tyranny of remoteness (particularly in Australia) and
41 the assumption that it is reasonable to expect Indigenous peoples to be more willing to pay the costs
42 of environmental protection. For example, the Indigenous protected area program achieves at least
43 similar protection to government protected areas, but is funded at a fraction of the cost (Gilligan 2006).
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49 In cases where pacifiers exist, we have tended to rely on one approach rather than explicitly
50 considering or trialling alternatives. As Jacobson and Stephens (2009) pointed out, the dangers of
51 leaving this unchallenged is that some alternatives, which may provide plausible responses, are
52 implicitly considered inferior. There are numerous examples across environmental management
53 domains:
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- Although Indigenous and local knowledges are commonly recognised as pertinent in environmental management there are significant challenges to incorporating them (Stephenson & Moller 2009)
- We have tended to externalise, and even subsidise, the costs of environmental externalities, especially with climate change
- Business has emphasised voluntary approaches in contrast to regulatory approaches, which has resulted in a lack of scrutiny of effectiveness, although emphasis on the latter may preclude innovation.
- We have emphasised biodiversity conservation within protected areas in contrast to productive lands, native species in contrast to non-native species, iconic species in contrast to the rest of nature (Beeton & Lynch 2012), and land in contrast to marine areas.
- We have emphasised surface water management as opposed to ground water management
- We have emphasised property rights within the marine space, rather than working co-operatively to manage overall health of fisheries and the marine environment generally

Although more than one approach to the management of sector issues is recognised, these have tended to be applied without intention to learn from them, i.e. they have been applied as ‘solutions’ rather than policy experiments and on an assumption that we can ‘command and control’ ecosystems (Holling & Meffe 1996). As a result, we have tended to tinker with our management approaches, making incremental adjustments. Instead, we suggest that policy responses ought to be applied explicitly within each domain as part of a broader policy experiment, using best practice, and with evaluation and meta-analysis of outcomes across sectors, or we risk failure to achieve our still ill-defined environmental, socio-cultural and economic aspirations.

Conclusion

This review of environmental management in Australia and New Zealand provides sober reading. Whilst there has been progress in some areas (albeit slowly), in many others we are worse off than we were 20 years ago. Some strategic initiatives have delivered positive outcomes, particularly for Indigenous peoples, and there are new strategic and integrative initiatives in place and in trial. Success has varied; some approaches have failed to deliver positive environmental outcomes (e.g. many of NZ’s water reform packages), while the long-term effectiveness of others (e.g. Marine) is yet to be demonstrated. While we are learning about governance and management, we are not addressing governance and management outcomes in a comprehensive, cross-scale, cross-tenure, long-term and integrated manner to achieve sustainability. There is often inadequate attention paid to implementation pathways including transition arrangements, institutional arrangements, expectations of the time needed to achieve outcomes, a lack of resourcing, poor communication, and a lack of monitoring, evaluation and adaptive learning. Political cycles of 3-4 years compound these issues, as do the temporal constraints of budget forward estimates and thus program longevity. We argue that program continuity informed by sound monitoring and evaluation is imperative to address the ongoing environmental challenge.

Our comparative analysis provides opportunities for learning from these experiences. Different responses or response combinations have been applied within Australia and New Zealand in different domains. For example, community responses to natural resource management in Australia may be relevant to New Zealand, and some of New Zealand’s recent water management initiatives may complement Australian initiatives. However, there are inherent differences between our socio-political systems, including the nature of federal-state relationships and Indigenous participation.

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3 The ongoing environmental decline in both countries also suggest that we may not be able to sustain
4 all facets of our socio-ecological systems. Whilst policy development has dominated responses, the
5 existence of policies is clearly insufficient to prevent resource decline, hence their classification as
6 'pacifiers'. Responses to environmental management challenges across the domains have diversified
7 in the past 10 years to incorporate market-based, community-based and standards-based responses.
8 However, these have not been applied as true policy experiments with the foresight to ensure
9 monitoring and evaluation of their effectiveness within or across domains. The application of policy
10 *as experiment*, with adequate longevity and robust user-oriented monitoring and evaluation, as part of
11 a comprehensive, robust and integrated vision for the next 20 years is more critical than ever if we are
12 to minimise risks associated with tipping points and continued environmental decline.
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Table 1: Diversity of models of Indigenous engagement in environmental management in Australia and New Zealand.

<i>Model</i>	<i>Australia practice examples</i>	<i>New Zealand examples</i>
Community based forms of management	Dhimurru Aboriginal Corporation has developed a range of community based planning frameworks that express their intent to manage and look after their country. These include an Indigenous protected area management plan, a weed management plan, a sea country plan, business plan, and crazy yellow ant management plan. Indigenous protected areas (IPA) incorporate Indigenous-owned land into Australia's national system of protected areas. The first IPA in Australia was declared in 1998 in the community of Nepabunna in South Australia.	Multiple examples stemming from settlements, and negotiated arrangements. For example, joint management of government and Ngāi Tahu owned lake bed and margins, co-governance of the lake and lower tributaries, and involvement in the Selwyn-Waihora Water Zone Committee.
Co-operative forms of management	Over 500 examples exist of formal co-operative and joint management arrangements for Federal, State and Territory managed protected areas. Uluru Kata Tjuta, Kakadu and Booderee are jointly managed, Indigenous-owned protected areas leased back to the Australian Government. Booderee also has a provision for full Aboriginal management at the end of the 99 year lease (Ross et al. 2009)	Resource specific co-governance agreements (e.g., of Te Urewera National Park with Tūhoe, and of the Waikato River with Waikato Tainui, Raukawa, Te Arawa and Ngāti Tūwharetoa (2011)). Broad ranging joint committees, including the Bay of Plenty Bay Regional Council Iwi Planning Committee.
Networks and alliances	Northern Australia Land and Sea Management Alliance (NAILSMA) involves an alliance between three Indigenous representative groups: Balkanu Cape York Development Corporation (Qld), the Northern Land Council (NT) and the Kimberley Land Council (WA). NAILSMA's aim is to support strategic approaches to care for land and sea country.	Iwi Chairs Forum, established in 2005, meets regularly to discuss and enable Māori aspirations in the spheres of cultural, social, economic, environmental and political development.
On-ground works	Formal training at Cairns TAFE (Qld) and Bachelor College (NT) in the early 1990s. Now over 680 Indigenous rangers are employed in teams across Australia to deliver environmental outcomes in culturally appropriate ways.	For example, Whakaora te Waihora has delivered over 100,000 plants to revegetate riparian margins, fencing and numerous scientific studies.
Legislative provisions and devolution of powers	Variant Memorandums of Understanding; for example, Traditional Use Marine Resources Agreement (TUMRA) is a legal instrument by which Indigenous peoples are engaging with management of turtle and dugong. It is effectively a partnership between the Great Barrier Reef Marine Park Authority and the Traditional Owners that live adjacent to the marine park, allowing conservation and cultural aspirations to be addressed through joint agreement on management of particular areas.	Mātaitai and Taiāpure are examples of Indigenous led customary protected areas that aim to improve local fisheries; see Carter and Ruru (2007) for a detailed breakdown of consultation processes negotiated as part of Treaty settlements).
Indigenous climate adaptation programs	Eight major projects examining Indigenous peoples' vulnerability and adaptation to climate change (e.g., the Arabana people of the Kati-Thanda Lake Eyre Region developed their own climate change adaptation strategy (Nurse-Bray et al. 2013)).	Indigenous components to major research grants, including climate change grants.

Table 2: Summary of responses

Domain	State	Pressures	Key responses	Response effectiveness
Climate change	Long term impacts predicted, likely more serious for Australia	<i>Australia:</i> High and increasing emissions particularly from the energy sector, but declining emissions from agriculture <i>New Zealand:</i> Increasing emissions from agriculture sector especially	<i>Australia:</i> Clean Energy Act (future un-resolved); Climate Change Adaptation Program; research initiatives <i>New Zealand:</i> Emissions Trading Scheme (agriculture excluded); Energy Efficiency and Conservation Strategy	Pacifying response given that strategic responses have had little impact on emissions
Biodiversity	<i>Australia:</i> 2,800 threatened ecosystems; 8% plants extinct or threatened; 14% rodents and 6% marsupials extinct, condition generally in decline <i>New Zealand:</i> 79% bird and 37% vascular plant spp. at risk or threatened; generally worsening outcomes but pockets of success (mainland and off-shore islands)	<i>Australia:</i> >20 threatening processes including habitat fragmentation; more introduced vascular plant species than natives; 73 species of introduced vertebrates; dysfunctional native ecosystems <i>New Zealand:</i> Continuing habitat loss in lowlands; ongoing pressure on plants and vertebrates from introduced mammals (e.g. deer, stoats, rats) and weed species	<i>Australia:</i> 73% increase in terrestrial protected areas from 1997-2010 to 13% of all lands; 234% increase in marine protected areas (but subject to review); strong emphasis on conservation with communities <i>New Zealand:</i> 2-fold increase in marine protection, closure of 52% of sea mounts to bottom trawling; terrestrial conservation already high (33%); shift towards conservation with communities and ecosystem based conservation	Continued biodiversity decline in-line with the global trend; protected areas alone appear insufficient to meet biodiversity conservation goals
Freshwater	Water quality is declining; implications of irrigation use on groundwater reserves unclear (both countries)	<i>Australia:</i> Household and agricultural water consumption declining but ongoing pressures on quality from agriculture and horticulture run-off, legacy effects of wetland removal, alteration of river flows, land clearing and salinity <i>New Zealand:</i> Huge increases in agricultural water use, especially for irrigation. Declining flows and water quality in lowland areas especially.	<i>Australia:</i> 2004 National Water Initiative; tradable water rights; Reef rescue projects to reduce nutrient and sediment loading within catchments <i>New Zealand:</i> New government commitment to collaborative reforms of water quality through setting limits on nutrient loading of waterways, and a National Objectives Framework linked to revised National Policy Statement on Freshwater	Market mechanisms, collaborative processes and management against standards trialed, but unclear how effective they will be individually or in combination
Marine	Decline in proportion of stocks with uncertain or over-fished status; rapid rise in aquaculture; evidence of concern about over-fished inshore areas (both countries)	Increased tourism, competing use of marine spaces (both countries) including the development of ports in Australia	Use of Quota Management System and Total Allowable Catch (more extensive in NZ than in Australia); NZ focus on co-operative management of inshore fisheries and through collaborative initiatives, particularly Indigenous-led initiatives	Data deficiencies and large EEZs mean stock assessments should be read cautiously and may not apply locally; multiple marine zone uses have potential to generate conflict
<i>Cross cutting domains</i>				
Indigenous		International pressures including UN Declaration on the Rights of Indigenous Peoples; National pressures through Native Title,	Legal changes through Native Title and Treaty of Waitangi have created broader awareness of and space for Indigenous-led initiatives (e.g. Northern Australia Indigenous Land and Sea Management Alliance), plus	Indigenous led initiatives are emerging despite the imposition of western governance systems and socio-economic

Treaty and broader Indigenous rights agenda

numerous co-operative initiatives between Indigenous peoples, government and communities (e.g. Taiāpure)

disadvantages

Business Pressures from the general public and government

Regulatory provisions including environmental management plans, assessment of environmental effects, environmental impact assessment and strategic environmental assessment; multiple voluntary schemes but lack of required reporting; ozone impacts reduced through industry change

Combination of regulatory and voluntary provisions, but lack of compliance reporting makes effectiveness difficult to assess

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