PROMOTING RESILIENCE TO CLIMATE CHANGE IN AUSTRALIAN CONSERVATION LAW: THE CASE OF BIODIVERSITY OFFSETS

JAN MCDONALD*, PHILLIPA C MCCORMACK** AND ANITA FOERSTER***

'Conservation is not rocket science; it is far more complex'.[1]

I INTRODUCTION

There is unequivocal evidence that climate change is having direct and widespread effects on species and ecosystems.[2] Current approaches to biodiversity conservation are poorly equipped to respond to these impacts. Existing conservation strategies emphasise the protection and preservation of existing biodiversity values, focusing on the in situ conservation of native threatened plants and animals and the establishment of a protected area system that reserves a proportion of Australia's intact native ecosystems. Even under current conditions, these strategies have been insufficient to arrest biodiversity decline or to prevent accelerating extinction rates.[3] Future climate change will only exacerbate these inadequacies.

Reform is therefore needed to reverse the current downward trajectory of Australia's biodiversity conservation laws and provide the tools and mechanisms

* Faculty of Law, University of Tasmania. The authors acknowledge the helpful comments of three anonymous reviewers.

** Faculty of Law, University of Tasmania.

*** Faculty of Law, University of Tasmania and Melbourne Law School, University of Melbourne.

1 Edward T Game et al, 'Conservation in a Wicked Complex World; Challenges and Solutions' (2014) 7 *Conservation Letters* 271, 271.

2 See Intergovernmental Panel on Climate Change, 'Summary for Policymakers' in Christopher B Field et al (eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability: Part A: Global and Sectoral Aspects: Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2014) 4; Will Steffen et al, *Australia's Biodiversity and Climate Change: A Strategic Assessment of the Vulnerability of Australia's Biodiversity to Climate Change* (CSIRO Publishing, 2009) ('*Australia's Biodiversity and Climate Change*'); Nancy B Grimm et al, 'The Impacts of Climate Change on Ecosystem Structure and Function' (2013) 11 *Frontiers in Ecology and the Environment* 474.

3 For example, 49 species were listed as threatened or had the severity of their threatened status upgraded in the most recent review of Australia's Commonwealth statutory threatened species list: see Department of the Environment and Energy, Australian Government, *Biodiversity: Species Profile and Threats Database* <www.environment.gov.au/cgi-tmp/publiclistchanges.17a4572b13bc386e313d.html>, up to and including those gazetted on 5 May 2016.

to address new threats from climate change.[4] Resilience Thinking provides a useful lens through which to reconceptualise conservation laws because it emphasises that human and natural systems are inextricably linked and highly dynamic: change is at the heart of Resilience Thinking. While Resilience scholarship has found its way into the United States' environmental law and climate adaptation literature, its application to Australian environmental and resources law remains unexplored. This article applies Resilience Thinking to a key component of conservation law practice in Australia – the growing use of biodiversity offsets – as a case study for understanding the shortcomings of existing approaches and for demonstrating the value of a Resilience framing in redesigning conservation law for future climate change.

The argument proceeds in five parts. Following this introduction, Part II outlines the projected impacts of climate change and the ways in which the current legal framework for biodiversity conservation will be challenged by these impacts. Part III then introduces the principles of Resilience Thinking and argues that they provide the most appropriate framework for future biodiversity law reform. The Resilience lens is then applied to the specific case study of biodiversity offsets within conservation law. Offsets are used as a case study for three reasons: their use is growing and is now firmly entrenched within conservation regimes in Australia and many other jurisdictions;[5] they illustrate the mismatch between conventional conservation approaches and what is required to address climate change impacts; and they provide an ideal vehicle for exploring the value of Resilience principles to guide reforms. Part IV explains and critiques the theory and practice of offsetting in Australian law. It applies Resilience principles to highlight both the general critiques of offsets and the ways in which climate change exacerbates existing problems or creates new ones. Part V draws on Resilience principles to offer a set of prescriptions for climate-adaptive biodiversity offsetting. While we recognise the multiple problems with the theory and practice of offsets, we take a pragmatic approach that acknowledges the potential for offset programs to inject much needed private funds into biodiversity conservation and allow for productive partnerships between public and private landholders and managers. We seek to explore how a Resilience framing can help improve the practice of offsetting so that it can be

4 Céline Bellard et al, 'Impacts of Climate Change on the Future of Biodiversity' (2012) 15 *Ecology Letters* 365; Nicole E Heller and Erika S Zavaleta, 'Biodiversity Management in the Face of Climate Change: A Review of 22 Years of Recommendations' (2009) 142 *Biological Conservation* 14 and references cited therein.

5 Martine Maron et al, 'Stop Misuse of Biodiversity Offsets' (2015) 523 *Nature* 401; Joseph W Bull et al, 'Biodiversity Offsets in Theory and Practice' (2013) 47 *Oryx* 369, 369; Bruce A McKenney and Joseph M Kiesecker 'Policy Development for Biodiversity Offsets: A Review of Offset Frameworks' (2010) 45 *Environmental Management* 165, 165–7; Business and Biodiversity Offsets Programme, 'Standard on Biodiversity Offsets' (January 2012) 1 <http://www.forest-trends.org/documents/files/doc_3078.pdf> ('*Standard on Biodiversity Offsets*').There are now offsets programs in nearly 40 countries, both developed and developing. Together with North America, Australia is viewed as a leader in policy development around offsets – Australian offsets programs often feature in comparative or explanatory discussions: see, eg, The Biodiversity Consultancy, 'Independent Report on Biodiversity Offsets' (Report, International Council on Mining and Metals and International Union for Conservation of Nature, January 2012) 13; McKenney and Kiesecker, above n 5.

used as a strategic conservation tool to support the adaptation of species and ecosystems and to help manage the types of biodiversity conservation trade-offs that will be unavoidable in the future as climate change materialises. We conclude in Part VI that offsets can help promote resilience to climate change impacts. To do so, they should form part of more strategic, multi-sectoral bioregional planning or, at the very least, a coordinated landscape-scale offsets strategy. Reforms to offset practice are also needed in order to operationalise Resilience principles. These include raising the standard for offset performance to achieve net gain or benefit, explicitly planning for climate change impacts, and promoting both the transparency and agility of offset arrangements to respond to change.

II THE IMPLICATIONS OF CLIMATE CHANGE FOR CURRENT CONSERVATION LAW

A Projected Impacts of Climate Change on Biodiversity

The impacts of climate change are already being felt and many species have already experienced significant range shifts.[6] Ongoing future climate change will create a 'perfect storm' for biodiversity, exacerbating the effects of existing stressors and adding new direct stressors to push many species and ecosystems into extinction or system transformation. Climatic changes such as temperature increases, sea-level rise and changing patterns of precipitation will result in 'multi-directional' species movement globally.[7] Species are generally expected to track climatic niches– the area in which climatic conditions are suitable for species viability – by shifting polewards or higher in altitude. However, complex interactions between climatic variables such as temperature and precipitation may cause unexpected and unpredictable rates of, and direction in, species movement.[8] Some species may benefit from local changes and expand their distributions into new habitat,[9] while for others, range shifts will result in the contraction or disappearance of climatic habitat. In addition, the projected rate at which existing climatic niches will shift is likely to outpace the rate at which most species can adapt.[10]

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6 Gian-Reto Walther et al, 'Ecological Responses to Recent Climate Change' (2002) 416 *Nature* 389; Camille Parmesan and Gary Yohe, 'A Globally Coherent Fingerprint of Climate Change Impacts Across Natural Systems' (2003) 421 *Nature* 37; Grimm et al, above n 2.

7 Jeremy VanDerWal et al, 'Focus on Poleward Shifts in Species' Distribution Underestimates the Fingerprint of Climate Change' (2013) 3 *Nature Climate Change* 239, 239. See also Michael T Burrows et al, 'The Pace of Shifting Climate in Marine and Terrestrial Ecosystems' (2011) 334 *Science* 652.

8 VanDerWal et al, above n 7, 239–40; *Australia's Biodiversity and Climate Change*, above n 2, 101.

9 Joshua H Schmidt et al, 'Season Length Influences Breeding Range Dynamics of Trumpeter Swans *Cygnus Buccinator*' (2011) 17 *Wildlife Biology* 364, 369.

10 For example, VanDerWal et al estimate that the speed of migration required for species to track their climatic niche, when measured in terms of poleward shifts, has been underestimated 'by an average of 26% in temperate regions of the continent and by an average of 95% in tropical regions': VanDerWal et al, above n 7, 239.

Novel climatic conditions and species movements are likely to disrupt familiar ecological assemblages and biotic interactions, including through the arrival of new competitors, predators and prey.[11] Some ecosystems will be reconfigured, while others may be lost locally or globally.[12] Favourable habitat for some shifting species may no longer exist, or may not exist in a location that is within reach.[13]

Climate change will also increase the frequency and severity of extreme events such as bushfires, cyclones, heat waves and floods. These events may damage or destroy habitat and disrupt ecosystem functions, or trigger disease outbreaks and facilitate species invasions.[14] Extreme events may also result in local or global extinctions where affected species have limited distributions or rely on niche habitat that is lost.

The implications of projected climate change for biodiversity are complicated by the likelihood that its direct impacts will vary considerably across landscapes, species and ecological communities.[15] The direct effects of climate change on biodiversity will exacerbate existing stressors such as habitat loss and fragmentation from land clearing for agriculture, urban development and natural resource exploitation.[16] Changing fire regimes and invasive species have also been identified as primary drivers of Australia's exceptionally high extinction rates.[17] Ecosystems that are already under stress are likely to respond more rapidly and negatively to a changing climate.[18] As a result, current rates of biodiversity decline are likely to accelerate, as existing stressors interact with the direct impacts of climate change.[19]

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11 Miguel Lurgi, Bernat C López and José M Montoya, 'Review: Novel Communities from Climate Change' (2012) 367 *Philosophical Transactions of the Royal Society B: Biological Sciences* 2913, 2919; Michelle D Staudinger et al, 'Biodiversity in a Changing Climate: A Synthesis of Current and Projected Trends in the US' (2013) 11 *Frontiers in Ecology and the Environment* 465, 466–7; Mark C Urban, Josh J Tewksbury and Kimberly S Sheldon, 'On a Collision Course: Competition and Dispersal Differences Create No-Analogue Communities and Cause Extinctions During Climate Change' (2012) 279 *Proceedings of the Royal Society B: Biological Sciences* 2072, 2076–7.

12 Grimm et al, above n 2, 477–8.

13 Chris D Thomas et al, 'Extinction Risk from Climate Change' (2004) 427 *Nature* 145; Burrows et al, above n 7, 654.

14 Intergovernmental Panel on Climate Change, above n 2, 13–15.

15 See Josef Settele et al, 'Terrestrial and Inland Water Systems' in Christopher B Field et al (eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability: Part A: Global and Sectoral Aspects: Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2014) 271, 301–19, describing the impacts and risks posed by climate change to major ecosystems.

16 Ibid 324; State of the Environment 2011 Committee, 'Australia: State of the Environment 2011' (Report, Department of Sustainability, Environment, Water, Population and Communities (Cth), 2011) 638–9 [3.13] ('*SoE 2011 Report*').

17 John C Z Woinarski, Andrew A Burbidge and Peter L Harrison, 'Ongoing Unraveling of a Continental Fauna: Decline and Extinction of Australian Mammals since European Settlement' (2015) 112 *Proceedings of the National Academy of Sciences of the United States of America* 4531.

18 Amanda Staudt et al, 'The Added Complications of Climate Change: Understanding and Managing Biodiversity and Ecosystems' (2013) 11 *Frontiers in Ecology and the Environment* 494, 496–9.

19 Don A Driscoll et al, 'Priorities in Policy and Management when Existing Biodiversity Stressors Interact with Climate-Change' (2012) 111 *Climatic Change* 533.

B Adaptation Strategies for Biodiversity Conservation

As the 'fingerprint' of climate change becomes increasingly evident,[20] reforming conservation practice to promote climate adaptation is increasingly urgent. Strategies for promoting biodiversity adaptation under rapid climate change fall along a spectrum of intervention, depending on the vulnerability, exposure, and dispersal characteristics of the target species, assemblages or ecosystems.[21] 'Place-based' adaptation strategies are designed to promote the adaptive capacity of ecosystems and landscapes and include expanding and enhancing the protected area estate, identifying and protecting climate refugia, promoting landscape connectivity including by rehabilitating degraded land, and reducing or removing existing biodiversity stressors.[22] More controversial, species-specific adaptation strategies include conservation introductions.[23] These are among the most information- and resource-intensive adaptation strategies, but will be needed to avoid species extinctions and ecosystem collapse.[24]

C Current Biodiversity Law Approaches and Mechanisms

If conservation law is to have a chance at maximising the conservation of genetic diversity, species and ecosystems under such conditions, it will be because the law is adaptive and promotes resilience, providing legal mechanisms that embrace the complexity of nature as a dynamic, adaptive system.[25] While there are some areas of Australia's current law that take, or have the potential to take, a more adaptive approach to biodiversity conservation,[26] Australian conservation law in general does not emphasise these characteristics. The legal framework for biodiversity conservation in Australia consists of a nested hierarchy of instruments at international, national, state and local levels. International agreements, particularly the *Convention on Biological Diversity*

20 See *SoE 2011 Report*, above n 16; WWF, 'Living Planet Report 2014: Species and Spaces, People and Places' (Report, WWF International, 2014); Intergovernmental Panel on Climate Change, above n 2.

21 Terence P Dawson et al, 'Beyond Predictions: Biodiversity Conservation in a Changing Climate' (2011) 332 *Science* 53, 56.

22 Heller and Zavaleta, above n 4, 22–5; Jonathan R Mawdsley, Robin O'Malley and Dennis S Ojima, 'A Review of Climate-Change Adaptation Strategies for Wildlife Management and Biodiversity Conservation' (2009) 23 *Conservation Biology* 1080, 1082–4; Alexander K Fremier et al, 'A Riparian Conservation Network for Ecological Resilience' (2015) 191 *Biological Conservation* 29, 35–6.

23 These include assisted colonisation and ecological replacements: Philip J Seddon, 'From Reintroduction to Assisted Colonization: Moving along the Conservation Translocation Spectrum' (2010) 18 *Restoration Ecology* 796, 798–9.

24 Dawson et al, above n 21, 56; Philip J Seddon et al, 'Reversing Defaunation: Restoring Species in a Changing World' (2014) 345 *Science* 406.

25 J B Ruhl, 'General Design Principles for Resilience and Adaptive Capacity in Legal Systems – With Applications to Climate Change Adaptation' (2011) 89 *North Carolina Law Review* 1373, 1374.

26 For example, developments in Australian water law to provide for the allocation of water to the environment to conserve aquatic biodiversity, maintain ecosystem function and to realise more adaptive management as environmental conditions change over time are discussed in Anita Foerster, 'Water Law: Adapting to Climate Change in Southern-Eastern Australia?' in Michael Kidd et al (eds), *Water and the Law: Towards Sustainability* (Edward Elgar Publishing, 2014) 245, 257–70.

('*CBD*'), set high-level objectives.[27] The *CBD* emphasises 'in situ' conservation of species, providing the international legal legitimacy for species-specific conservation efforts in national and state legislation. Below this, the conservation laws of the Commonwealth and each state and territory adopt a two-pronged approach. Primary emphasis is on reserving large areas of public land primarily for conservation purposes.[28] *Australia's Strategy for the National Reserve System 2009–2030* recognises that the primary means of securing long-term protection for Australia's terrestrial biodiversity is a 'comprehensive, adequate and representative' national system of protected areas.[29]

The second main emphasis in conservation law involves the listing and protection of threatened species, or in some cases ecological communities.[30] Protection takes the form of prohibitions on taking or harming species or their habitat without a permit.[31] A permit will only be granted where the impacts of specific development have been considered and balanced through environmental impact assessment frameworks. This assessment and approval process may involve the imposition of conditions such as securing other sites or undertaking other conservation activities by way of biodiversity offsets. The laws in most jurisdictions also contemplate proactive management activities, such as the preparation and implementation of species recovery and threat abatement plans.[32] However, resource and information constraints greatly limit the implementation and effectiveness of such measures.[33]

In addition to biodiversity conservation regimes, land use planning and natural resource regimes, such as for water, native vegetation and catchment management, play a significant role in achieving biodiversity conservation outcomes in Australia. The interaction between state-level planning and native vegetation conservation regimes is particularly important when considering biodiversity offsets, which are often governed largely through these regimes.[34]

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27 *Convention on Biological Diversity*, opened for signature 5 June 1992, 1760 *UNTS* 79 (entered into force 29 December 1993).

28 The majority of Australia's protected areas estate is reserved and managed under state legislation which dates to the 1970s, eg, *National Parks and Wildlife Act 1974* (NSW), *National Parks and Wildlife Act 1972* (SA), *National Parks Act 1975* (Vic). At the federal level, the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ('*EPBC Act*') also provides for the proclamation and management of Commonwealth reserves (both terrestrial and marine) and also special provisions for particular protected areas (including world heritage sites and Ramsar-listed wetlands).

29 Natural Resource Management Ministerial Council, *Australia's Strategy for the National Reserve System 2009–2030* (Australian Government, 2010) 4.

30 Relevant legislation is at both the state and federal level: eg, *Environment Protection and Biodiversity Conservation Act 1999* (Cth); *Flora and Fauna Guarantee Act 1988* (Vic).

31 See, eg, *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 18.

32 See, eg, *Flora and Fauna Guarantee Act 1988* (Vic) pt 4.

33 Marc Carter, 'A Revolving Fund for Biodiversity Conservation in Australia', (Paper, Environment Australia, January 1998) <https://www.environment.gov.au/resource/revolving-fund-biodiversity-conservation-australia>; Josie Carwardine et al 'Prioritizing Threat Management for Biodiversity Conservation' (2012) 5 *Conservation Letters* 196, 202.

34 For example, in Victoria, the planning regime under the *Planning and Environment Act 1987* (Vic) governs the conservation of native vegetation and sets out assessment and approval processes for native vegetation removal and offsets.

D Shortcomings of Current Approaches

Current legal arrangements for conservation provide an essential foundation for identifying and managing areas for biodiversity conservation and to curb Australia's poor extinction track record. Yet they are based on assumptions that affect their capacity to deliver flexible, responsive protection under conditions of change. In a general sense, current laws prioritise the protection and preservation of existing biodiversity values, with objectives focusing on the in situ conservation of native threatened plants and animals and the establishment of a protected area system that protects a representative sample of Australia's current, intact, native ecosystems.[35] These measures are understood by reference to historical baselines in the location, structure and function of species and ecosystems. They presume controllable rates and linear patterns of change.[36]

Species-specific legal mechanisms such as statutory lists of threatened species and ecological communities have been criticised for their emphasis on administration and information gathering rather than threat abatement or recovery.[37] Rapid climate change, including extreme events, will dramatically increase the number of species under threat and such lists are likely to be overwhelmed and potentially unhelpful in directing conservation priorities. Existing legal mechanisms for identifying and conserving habitat for species with the capacity to move to track climate niches are based on existing distributions and historical records. These will cope poorly with non-linear changes to local climate conditions, the loss of some species' habitat, and the emergence of novel ecosystems.

Broader legal mechanisms for conservation such as establishing and managing protected areas and undertaking ecosystem restoration or rehabilitation currently emphasise preserving or returning native ecosystems to historical states.[38] These mechanisms will need to be reconceived to ensure that new ecological values can be recognised and managed for. This will require a shift in the focus of legislative and policy instruments, for example, from managing a protected area to preserve its current suite of native species to promoting ecosystem health and adaptive capacity under change.[39]

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35 Phillipa McCormack and Jan McDonald, 'Adaptation Strategies for Biodiversity Conservation: Has Australian Law Got What it Takes?' (2014) 31 *Environmental and Planning Law Journal* 114, 123.

36 Game et al, above n 1, 1, and the references cited therein; Robin Kundis Craig, '"Stationarity is Dead" – Long Live Transformation: Five Principles for Climate Change Adaptation Law' (2010) 34 *Harvard Environmental Law Review* 9, 15.

37 Allan Hawke, 'The Australian Environment Act: Report of the Independent Review of the *Environment Protection and Biodiversity Conservation Act 1999*' (Final Report, 30 October 2009), 75; Tara G Martin et al, 'Acting Fast Helps Avoid Extinction' (2012) 5 *Conservation Letters* 274, 278.

38 Jan McDonald et al, 'Rethinking Legal Objectives for Climate-Adaptive Conservation' (2016) 21(2) *Ecology and Society*, Article 25, 2 <http://dx.doi.org/10.5751/ES-08460-210225>. For example, *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) requires world heritage areas to be managed to 'identify, protect, conserve, present, transmit to future generations and, if appropriate, rehabilitate' the cultural and natural heritage values: at sch 5 cl 1. Implicit in this is that they remain in the condition they were in at the time of listing and, for the purposes of transmitting to future generations, are presumed to be essentially stable and unchanging.

39 Michael Dunlop and Peter R Brown, 'Implications of Climate Change for Australia's National Reserve System: A Preliminary Assessment' (Report, CSIRO, March 2008), 16–17; Michael Dunlop et al,

A related shift will be to recognise that '[t]here is no "right" solution to wicked problems in complex systems, only trade-offs that appear more or less favorable depending on your perspective'.[40] Balancing competing priorities for conservation – for example, places of economic versus recreational, cultural and spiritual value – where the effects of climate change will be spatially and temporally uneven, will involve increasingly complicated trade-offs across governance scales, sectors and interests.[41] Considerations of equity in negotiating trade-offs will become more important as social and economic adaptation imperatives compete with biodiversity conservation goals under climate change.[42] Legal instruments for biodiversity conservation must acknowledge the inevitability of trade-offs in decision-making about climate change, and the processes prescribed by law for making decisions that involve such trade-offs must be made explicit.

Even adaptation-oriented approaches in law, such as those described above, are unlikely to eliminate climate risks to species and ecosystems.[43] Conservation law for climate change adaptation will therefore need to be designed to accommodate loss and transformation when it is unavoidable, while still requiring decision-makers and other stakeholders to act in a way that promotes ambitious and desirable conservation outcomes. To do so, conservation laws should embrace unpredictability and contributions from diverse disciplinary perspectives.[44]

III RESILIENCE AS A NEW FRAMING FOR BIODIVERSITY CONSERVATION

Change and disturbance are at the heart of Resilience Thinking. Traditional approaches to conservation outlined above assume that conditions in nature are stable or that change is slow and linear. They also tend to separate ecological from social systems, particularly in the treatment of 'nature', emphasis on native species, and preservation of species 'in the wild'. Socio-Ecological Systems ('SES') Resilience, on the other hand, recognises that social, political and natural systems form complex, integrated and adaptive 'social–ecological systems' in

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'Climate-Ready Conservation Objectives: A Scoping Study' (Final Report, National Climate Change Adaptation Research Facility, 2013), 94–102; McDonald et al, above n 38, 5–6. While NSW and the Commonwealth list loss of climatic habitat as a result of anthropogenic climate change as a key threatening process, no threat abatement plans or other adaptation strategies have been devised to address these threats.

40 Game et al, above n 1, 272.

41 J B Ruhl, 'Climate Change Adaptation and the Structural Transformation of Environmental Law' (2010) 40 *Environmental Law* 363, 410–13; Olivia Odom Green et al, 'A Multi-Scalar Examination of Law for Sustainable Ecosystems' (2014) 6 *Sustainability* 3534, 3536.

42 Tim M Daw et al, 'Evaluating Taboo Trade-Offs in Ecosystems Services and Human Well-Being' (2015) 112 *Proceedings of the National Academy of Sciences of the United States of America* 6949, 6952. See also Anita Foerster, Andrew Macintosh and Jan McDonald, 'Trade-Offs in Adaptation Planning: Protecting Public Interest Environmental Values' (2015) 27 *Journal of Environmental Law* 459.

43 Intergovernmental Panel on Climate Change, above n 2, 15.

44 Game et al, above n 1, 271.

which humans are part of nature.[45] SESs interact across sectors, scales and time: in managing for one part, influences from, and impacts on, other systems must be considered.[46]

SES Resilience recognises that systems are capable of existing in a range of alternate states, with different functions, feedbacks and structures.[47] Unlike engineering resilience, for example, which emphasises the ability to 'rebound' from disturbance,[48] SES Resilience focuses on the ability of a system to undergo change and still maintain basic characteristics and functions, without crossing a threshold into an undesirable state.[49] Since constant change processes mean that it is not possible to return to a pre-disturbance state, a key concern of SES Resilience is how a system responds to disturbance and change through adaptation and reorganisation, and in some cases transformation.[50]

Resilience Thinking conceptualises change processes as occurring in 'adaptive cycles'.[51] The ways in which each subsystem responds to different stimuli is non-linear. Recognising the relationship between nested hierarchies of subsystems all of which are at different phases of the adaptive cycle – what Gunderson and Holling call 'panarchy'[52] – helps with understanding how processes of change, evolution and self-organisation in one subsystem influence and, in turn, are influenced by those occurring above and below. The legal system, as a subsystem within the broader 'panarchic' web of interconnected complex adaptive systems, interacts and evolves with other subsystems, across multiple spatial and temporal scales.[53] This highlights the important role for law

45 Fikret Berkes and Carl Folke (eds), *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience* (Cambridge University Press, 1998); Brian Walker and David Salt, *Resilience Thinking: Sustaining Ecosystems and People in a Changing World* (Island Press, 2006) 34–6; Carl Folke et al, 'Resilience Thinking: Integrating Resilience, Adaptability and Transformability' (2010) 15(4) *Ecology and Society*, Article 20, 2 <http://www.ecologyandsociety.org/vol15/iss4/art20/>.

46 See generally, Lance H Gunderson and C S Holling (eds), *Panarchy: Understanding Transformations in Human and Natural Systems* (Island Press, 2002); Fikret Berkes, Johan Colding and Carl Folke (eds), *Navigating Social Ecological Systems: Building Resilience for Complexity and Change* (Cambridge University Press, 2003).

47 C S Holling, 'Resilience and Stability of Ecological Systems' (1973) 4 *Annual Review of Ecology, Evolution, and Systematics* 1, 3; Gunderson and Holling, above n 46; Brian Walker et al, 'Resilience, Adaptability and Transformability in Social–Ecological Systems' (2004) 9(2) *Ecology and Society*, Article 5, 2 <http://www.ecologyandsociety.org/vol9/iss2/art5/>; Donald R Nelson, W Neil Adger and Katrina Brown, 'Adaptation to Environmental Change: Contributions of a Resilience Framework' (2007) 32 *Annual Review of Environment and Resources* 395, 401.

48 J B Ruhl, 'General Design Principles', above n 25, 1377; Carl Folke, 'Resilience: The Emergence of a Perspective for Social–Ecological Systems Analyses' (2006) 16 *Global Environmental Change* 253, 256.

49 Walker et al note that different people have different views about what constitutes a 'desirable' or 'undesirable' state, part of the social component of SES resilience: Walker et al, above n 47, 8.

50 Walker and Salt, above n 45, 28–31.

51 Each adaptive cycle consists of four phases. Rapid growth (exploitation) and conservation together constitute the 'fore loop' and account for the majority of a system's state. Release and reorganisation – the cycle's 'back loop' – typically occur faster. The ability to effect change is greater in some phases than in others and modes of reform may differ depending on which phase of the adaptive cycle the system is in and the phases of the cycles elsewhere in the hierarchy: Lance H Gunderson, Craig R Allen and C S Holling (eds), *Foundations of Ecological Resilience* (Island Press, 2010).

52 Gunderson and Holling, above n 46, 5.

53 J B Ruhl, 'Panarchy and the Law' (2012) 17(3) *Ecology and Society* 31; Geoffrey Garver, 'A Complex Adaptive Legal System for the Challenges of the Anthropocene' in Laura Westra, Janice Gray and

in promoting resilience across social–ecological systems, since it determines the rules for the operation of other social systems.[54]

Resilience Thinking emphasises the importance of identifying thresholds for key variables that, if crossed, will bring about undesirable, potentially irreversible reconfiguration or regime shift.[55] In general terms, systems become more vulnerable as they get closer to critical thresholds. Maintaining high levels of system diversity and redundancy is critical for ensuring the system has the capacity to continue essential functions in the face of disturbances.[56] A key issue to note, however, is that Resilience Thinking has little to say about what kind of system state is desirable and thus should be made more resilient to disturbance. Resilience itself is not a normative concept: unjust, ecologically damaging systems can be highly resilient.[57] It does not obviate the need for societal agreement on trade-offs between competing priorities and values. However, it might offer prescriptions for how to expose those trade-offs and structure our social and governance arrangements to prevent an SES system from nearing or crossing a threshold to a less desirable state. It may also offer prescriptions for enabling a system to reach a tipping point into a more desirable regime.

Resilience Thinking poses challenges for traditional conceptions of law and for environmental law reform in particular. Legal systems are often seen as discrete and separate from wider social and natural systems.[58] While they are sometimes used to introduce and manage social change, they are typically aimed at preserving the status quo, providing stability and predictability, and resisting or withstanding change.[59] Legal systems are jurisdictionally constrained based on spatial boundaries that are at odds with social–ecological systems.[60]

The growth in Resilience scholarship – both critical and applied – has increased exponentially in recent years.[61] The vast majority of the emerging

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Vasiliki Karageorgou (eds), *Ecological Systems Integrity: Governance, Law and Human Rights* (Routledge, 2015) 232, 236.

54 J B Ruhl 'Law's Complexity: A Primer' (2008) 24 *Georgia State University Law Review* 885, 897.

55 Walker et al, above n 47, 2–3; Nelson et al, above n 42, 401–2.

56 Walker and Salt, above n 45, 89–90. Redundancy refers to more than one species or element of a system performing the same role within a system. In political and economic terms, redundancy might be viewed as inefficient, but redundancy enhances the resilience of systems because it safeguards against system collapse when one elements fails: Brian H Walker, 'Biodiversity and Ecological Redundancy' (1992) 6 *Conservation Biology* 18, 20.

57 J B Ruhl, 'General Design Principles', above n 25, 1382.

58 Olivia Odom Green et al, 'Barriers and Bridges to the Integration of Socio-Ecological Resilience and Law' (2015) 13 *Frontiers in Ecology and the Environment* 332, 332.

59 Craig Anthony (Tony) Arnold and Lance H Gunderson, 'Adaptive Law and Resilience' (2013) 43 *Environmental Law Reporter* 10 426, 10 427.

60 Bradley C Karkkainen, 'Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism' (2002) 21 *Virginia Environmental Law Journal* 189, 212.

61 Resilience Thinking is criticised by some social scientists for characterising human societies as 'systems', and overlooking issues of power and agency. Olsson et al criticise Resilience Thinking for its lack of normative content and for ignoring or underplaying the problems of agency, conflicts of interest, and unequal distributions of wealth and power. The strong emphasis on system function and the principle of self-organisation also tend to oversimplify and depoliticise social change processes and underplay the difficulty of identifying the boundaries of each system or even levels within a nested system. There is little evidence of its performance where governance arrangements are complex, and there are high levels of political conflict, uneven power relations and conflicting economic interests: Lennart Olsson et al,

scholarship on Resilience Thinking and the law has focused on United States environmental and natural resources law.[62] It forms part of a wider movement in environmental law scholarship away from command-and-control regulation that focuses on single-issue, front-end decision-making aimed at providing stability and predictability for development activity.[63] While there are various opinions about the extent to which law can contribute to SES Resilience,[64] most scholars examining law and Resilience Thinking see it as a valuable way of enabling law to deal with a future of growing complexity and accelerating change.[65] Indeed, some argue more passionately for Resilience Thinking to replace Ecologically Sustainable Development ('ESD') as the new foundation for environmental and resources law.[66]

Legal analysis of Resilience Thinking shares many features in common with other theories that advocate more nuanced and responsive governance techniques, such as adaptive management,[67] adaptive governance,[68] new governance,[69] and, to some extent, complexity theory.[70] These bodies of

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'Why Resilience is Unappealing to Social Science: Theoretical and Empirical Investigations of the Scientific Use of Resilience' (2015) 1(4) *Science Advances* 1, 2–3, quoting Anne Jerneck and Lennart Olsson, 'Adaptation and the Poor: Development, Resilience and Transition' (2008) *8 Climate Policy* 170; Liam Phelan, Ann Henderson-Sellers and Ros Taplin, 'The Political Economy of Addressing the Climate Crisis in the Earth System: Undermining Perverse Resilience' (2013) 18 *New Political Economy* 198, 200–1.

62 See Robert L Glicksman, 'Ecosystem Resilience to Disruptions Linked to Global Climate Change: An Adaptive Approach to Federal Land Management' (2009) 87 *Nebraska Law Review* 833; J B Ruhl, 'General Design Principles', above n 25; Barbara A Cosens, 'Legitimacy, Adaptation and Resilience in Ecosystem Management' (2013) 18(1) *Ecology and Society*, Article 3 <http://dx.doi.org/10.5751/ES-05093-180103>; Ahjond S Garmestani and Craig R Allen (eds), *Social–Ecological Resilience and Law* (Columbia University Press, 2014); Arnold and Gunderson, above n 59; Margot Hill Clarvis, Andrew Allan and David M Hannah, 'Water, Resilience and the Law: From General Concepts and Governance Design Principles to Actionable Mechanisms' (2014) 43 *Environmental Science & Policy* 98; Tracy-Lynn Humby, 'Law and Resilience: Mapping the Literature' (2014) 4 *Seattle Journal of Environmental Law* 85, 111; Green et al, above n 41.

63 Ruhl, 'Climate Change Adaptation', above n 41, 413–19.

64 See C S Holling, 'Response to "Panarchy and the Law"' (2012) 17(4) *Ecology and Society* 37.

65 This view is generally expressed, but see, eg, Craig Anthony (Tony) Arnold and Lance H Gunderson, 'Adaptive Law' in Ahjond S Garmestani and Craig R Allen (eds), *Social–Ecological Resilience and Law* (Columbia University Press, 2014) 317; Green et al, above n 58, 41.

66 'Resilience thinking offers a new model for coping with climate change, because it accepts ecological change and threshold crossings as baseline realities, avoiding the trap of the stationarity-based assumptions that characterize sustainability': Robin Kundis Craig, 'Becoming Landsick: Rethinking Sustainability in an Age of Continuous, Visible, and Irreversible Change' (2016) 46 *Environmental Law Reporter* 10 141, 10 145. See also Melinda Harm Benson and Robin Kundis Craig, 'The End of Sustainability' (2014) 27 *Society & Natural Resources* 777; Arnold and Gunderson, above n 59.

67 See Craig R Allen and Ahjond S Garmestani, 'Adaptive Management' in Craig R Allen and Ahjond S Garmestani (eds), *Adaptive Management of Social–Ecological Systems* (Springer, 2015).

68 See Brian C Chaffin, Hannah Gosnell and Barbara A Cosens, 'A Decade of Adaptive Governance Scholarship: Synthesis and Future Directions' (2014) 19(3) *Ecology and Society*, Article 56, 6–7 <http://www.ecologyandsociety.org/vol19/iss3/art56/>; Ahjond S Garmestani and Melinda Harm Benson, 'A Framework for Resilience-Based Governance of Social–Ecological Systems' (2013) 18(1) *Ecology and Society*, Article 9, 2–3 <http://www.ecologyandsociety.org/vol18/iss1/art9/>.

69 For example, Cameron Holley, Neil Gunningham and Clifford Shearing, *The New Environmental Governance* (Routledge, 2012). See also Ruhl, 'General Design Principles', above n 25, 1397.

scholarship all emphasise the importance of integrated multi-sectoral approaches; the need for law to be more agile and responsive; the benefits of broad participation in decision-making; and the value of multi-scalar, multi-modal, trans-temporal governance approaches.

We argue that the core principles of Resilience Thinking offer valuable guidance for reforming biodiversity conservation law under climate change for two reasons. First, as we have argued in Part II, it is apparent from assessments of Australia's biodiversity that current approaches to conservation law are performing poorly. They tend to compartmentalise conservation issues based on resource regimes, thereby underplaying complexity and social–ecological interactions. The principles of ESD upon which current laws are based call for an integrated approach and the conservation of biodiversity, but in practice, 'integration' or balancing of factors has resulted in greater consideration being given to economic factors. No 'ecological bottom line' has been defined or prescribed. Resilience approaches arguably provide a more coherent framework for conserving biodiversity, by explicitly recognising the range of services they provide within social–ecological systems and the importance of identifying slow variables and ecological thresholds or other tipping points. Secondly and most importantly, the emphasis in Resilience Thinking on change and adaptive cycles offers the best chance of ensuring that climate change influences are incorporated into conservation and resource management regimes.[71] Resilience Thinking demands that communities decide on the characteristics of the state they wish to either retain or strive for, and then identify the critical thresholds that must be observed in order to prevent irreversible regime shifts.[72] Rather than viewing Resilience Thinking as an alternative or replacement for the goals and principles of ESD, therefore, the Resilience principles discussed below can complement, refine and help deliver ESD under a changing climate.

Resilience practitioners and scholars identify seven prescriptions for promoting SES Resilience:

1. maintaining diversity and redundancy;
2. managing connectivity;
3. managing slow variables and feedbacks;
4. fostering complex adaptive systems thinking;
5. encouraging learning;
6. broadening participation; and
7. promoting polycentric governance systems.[73]

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70 Donald T Hornstein, 'Complexity Theory, Adaptation and Administrative Law' (2005) 54 *Duke Law Journal* 913; Garver, above n 53.

71 See, eg, Craig, 'Becoming Landsick', above n 61.

72 Walker and Salt, above n 45, 37; Jan McDonald, 'Using Law to Build Resilience to Climate Change Impacts' in Bridget Hutter (ed), *Risk, Resilience, Inequality and Environmental Regulation* (Edward Elgar, forthcoming, 2016).

73 Reinette Biggs, Maja Schlüter and Michael L Schoon (eds), *Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems* (Cambridge University Press, 2015); Sturle Hauge Simonsen et al, *Applying Resilience Thinking: Seven Principles for Building Resilience in Socio-*

Together these prescriptions can help to enhance decision-making structures and processes, identify when thresholds are approaching, and deal with regime shifts.[74] The first three form critical components of the adaptation strategies outlined in Part II above. Designing our governance arrangements to promote the resilience of desired ecological states means that we are more likely to avoid crossing these thresholds, or at least be better equipped to reorganise then, and transform in ways that continue to meet social and ecological needs.

Rather than set out a comprehensive blueprint for how Resilience Thinking principles could inform the design of climate-adaptive conservation laws generally, the remainder of this article uses biodiversity offsetting as the lens through which to demonstrate the value of this approach and identify pathways for future reform.

IV THE THEORY AND PRACTICE OF OFFSETS IN AUSTRALIAN LAW

This Part introduces and critiques the theory and practice of offsets in Australian conservation law by reference to the Resilience principles outlined in Part III. Data for this discussion derives from a combination of a desktop review of the scientific literature on offsets, doctrinal and policy analysis, and two lines of empirical inquiry. A series of 13 semi-structured research interviews conducted in 2014 provided insights into how decisions were made in practice within the regulatory and policy framework in the state jurisdiction of Victoria.[75] Participants included planners from 13 different local governments spanning rural, peri-urban and urban contexts; ecological consultants; and state government policy officers and planners. Legal and policy frameworks for biodiversity offsets have changed significantly since they were first introduced in Victoria in 1989 and continue to be a focus of reform. This empirical work considered decision-making under the applicable frameworks from 2002 until 2014.

This empirical work at a state level was complemented by a systematic content analysis of the submissions made to the federal Senate inquiry into environmental offsets. A total of 94 written submissions were made from industry, research, government and non-governmental groups and individuals, representing a valuable cross-sectoral data set.[76] It cannot be said that the submissions were representative of all perspectives, but the diversity of

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Ecological Systems (Stockholm Resilience Centre, 2012) <http://www.stockholmresilience.org/download/18.10119fc11455d3c557d6928/1459560241272/SRC+Applying+Resilience+final.pdf>.

74 Biggs, Schlüter and Schoon, above n 73; Simonsen et al, above n 73.

75 The interviews were conducted on an anonymous basis. For further detail, see Anita Foerster and Jan McDonald, 'Thresholds, Scale and Strategy for Biodiversity Offsets in Australia: Where to Draw the Line?' (2016) 28 *Environmental Law & Management* 13.

76 Of the total submissions to the inquiry: 15 were made by individuals, 13 by researchers, 11 by industry and professional bodies, three by national government bodies, one by local government, three by consultants, and 35 by community organisations or non-government organisations ('NGO'). The nature of each submission referred to below is noted in parentheses after the citation.

submissions offers a unique insight into attitudes towards the national offsets programme. Each submission was read and coded using qualitative data analysis software NVivo. This provided a new source of data to support our scholarly analysis and critiques of offsets in Australia. While the inquiry's terms of reference did not explicitly include climate change, they did call for an examination of:

> the history, appropriateness and effectiveness of the use of environmental offsets in federal environmental approvals in Australia, including:
>
> a. the principles that underpin the use of offsets;
>
> b. the processes used to develop and assess proposed offsets.[77]

Several submissions therefore included references to climate change or related issues and separate codes were established to capture references to 'climate change', 'connectivity', and 'strategic and landscape approaches'.[78] Similar themes to those identified in the content analysis emerged in the analysis of the interviews with Victorian decision-makers.

A The Rationale for Offsets

Biodiversity offsets are generally characterised as a market mechanism designed to account for and compensate adverse impacts on ecological communities, species and their habitats as a result of development.[79] Offsets function by creating a compensatory 'positive' environmental value to balance the loss of, or damage to, environmental values caused by a particular development.[80] In theory, offsets target *residual* environmental impacts and should only be available to a development proponent after all efforts have been made to first avoid and minimise habitat loss, in accordance with the 'mitigation hierarchy'.[81] An offset scheme typically employs a range of principles and metrics to calculate measurable, comparable biodiversity losses and gains, which are used ostensibly to achieve a 'no net loss' or sometimes a 'net gain' environmental outcome.[82] Offset schemes aim to internalise the environmental costs of development, consistent with principles of ESD,[83] and facilitate informed trade-offs between local losses and broader environmental gains. At a time when public funding for environmental programs is stretched, offsets can also direct

77 Senate Environment and Communications Reference Committee, Parliament of Australia, *Inquiry into Environmental Offsets* (2014) 1.

78 To ensure consistency, decisions about coding were made by a single coder.

79 Irene Alvarado-Quesada et al, 'Market-Based Mechanisms for Biodiversity Conservation: A Review of Existing Schemes and an Outline for a Global Mechanism' (2014) 23 *Biodiversity & Conservation* 1, 4; Bull et al, above n 5, 370–1.

80 Bull et al, above n 5, 370–1.

81 Ibid.

82 Business and Biodiversity Offset Programme, above n 5, 1.

83 Department of the Environment and Energy (Cth), Ecologically Sustainable Development Steering Committee, *National Strategy for Ecologically Sustainable Development* (1992); *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 3A ('Principles of ESD'); Bull et al, above n 5, 371.

private funds towards conservation outcomes and involve private landholders and managers in conservation efforts.[84]

The activities or arrangements that comprise biodiversity offsets vary from scheme to scheme, but are generally organised into two types of offset: restoration and protection of averted loss.[85] Restoration offsets may include undertakings to create or restore specified sites, either through vegetation, revegetation or active management of pests or other threats, or even the establishment of new conservation sites. Averted loss offsets generally involve the protection of a parcel of land that is 'ecologically equivalent' to the development site (the ecological equivalence requirement), either in perpetuity or at least for the duration of the predicted impacts on the development site (the security requirement).[86] In practice, averted loss offsets are often combined with some restoration and revegetation activities. Further, in many jurisdictions, including the Commonwealth, Victoria, Queensland, and NSW, some form of 'indirect offset' may also be permitted to compensate adverse development impacts through the funding of research or public education campaigns or funding alternative measures which target other causes of biodiversity decline.[87]

B Legal and Policy Arrangements for Offsets

In Australia, offsets are used in both state and federal environmental assessment and approval regimes. At the state level, offsets programs are found within interacting statutory regimes for land use planning, environmental assessment, native vegetation conservation and threatened species protection.[88] These regimes cover the majority of developments involving habitat removal and biodiversity loss on private land, including for agricultural and urban projects. At a national level, offsets are also used under the *EPBC Act*, which stipulates additional assessment and approval requirements where developments are likely to have a significant impact on listed matters of national significance, including nationally listed threatened species and ecological communities, World Heritage

84 Joseph M Kiesecker et al, 'Development by Design: Blending Landscape-Level Planning with the Mitigation Hierarchy' (2010) 8 *Frontiers in Ecology and the Environment* 261, 265.

85 Martine Maron et al, 'Faustian Bargains? Restoration Realities in the Context of Biodiversity Offset Policies' (2012) 155 *Biological Conservation* 141, 142.

86 There is a general trend away from pure revegetation offsets, with some schemes significantly restricting the use of revegetation offsets in favour of averted loss offsets. For example, the Victorian offsets scheme only allows revegetation offsets to compensate for low risk clearing (small area, no incidence of threatened species) and provides specific standards to govern their use: Department of Environment and Primary Industries (Vic), *Permitted Clearing of Native Vegetation: Biodiversity Assessment Guidelines* (2013) 23–4 ('*Permitted Clearing of Native Vegetation*').

87 For example, mining proposals in the Tarkine region of Tasmania have been required to provide funding to support the breeding of 'insurance populations' of Tasmanian devils whose numbers have been dramatically reduced by the Devil Facial Tumour disease: Minister for the Environment, Heritage and Water (Cth), *Approval: Nelson Bay River Magnetite and Hemamite Mine, near Nelson Bay River, North-West Tasmania*, EPBC 2011/5846, 29 July 2013, cl 15; Minister for the Environment, Heritage and Water (Cth), *Approval: Riley DSO Hematite Mine Project, Tasmania*, EPBC 2012/6339, 3 August 2013, cls 24, 28.

88 For an overview of offset regimes in Australian states and territories, see Martin Fallding, 'Biodiversity Offsets: Practice and Promise' (2014) 31 *Environmental and Planning Law Journal* 11.

sites, and Ramsar-listed Wetlands.[89] The significant impact threshold means that, as a general rule, projects that trigger the *EPBC Act* assessment processes will be larger in scale – for example, significant mining, infrastructure and urban development projects.[90]

The scope and design of offset programs varies across Australia and internationally[91] and several state jurisdictions have recently reviewed their offsets schemes and introduced reforms to expand and change the use of offsets.[92] Programs are generally based around the core principles of ecological equivalence, additionality and security, and posit offsets as the third option within the mitigation hierarchy of avoid, minimise, compensate/offset.[93] To achieve ecological equivalence, most offset schemes set a 'like-for-like' standard for site selection, and do not allow for offsetting of one habitat type in exchange for the loss of another. Scale and location are also considerations, and many offset schemes require the offset site to be within a certain area of the development site (the proximity requirement) and use size ratios to provide for the protection of a larger area than that which is damaged or destroyed.[94] Additionality requires that the offset must achieve a level of protection that is additional to what would otherwise have been provided to the site. For averted-loss offsets, additionality derives from protecting a site that might have otherwise been developed or protecting and managing a site that would otherwise not have been managed for conservation. As such, estimating the likelihood of that site being developed or substantially degraded in the future without 'offset protection' is a key consideration.[95] Points of difference across schemes include:

89 *EPBC Act* ch 2 pt 3.

90 Smaller projects will not meet the threshold of being activities likely to have a 'significant impact': see Department of the Environment (Cth), 'Matters of National Environmental Significance: Significant Impact Guidelines 1.1' (Guideline, 2013).

91 See Bull et al, above n 5.

92 For example, on 1 July 2014, a new environmental offsets framework was introduced in Queensland, including overarching legislation and associated policy documents: *Environmental Offsets Act 2014* (Qld), *Environmental Offsets Regulation 2014* (Qld); Department of Environment and Heritage Protection (Qld), 'Queensland Environmental Offsets Policy' (Version 1.1, December 2014) ('*Qld Offsets Policy*').

93 McKenney and Kiesecker, above n 5, 167–8.

94 Fallding, above n 88, 23, 28; The Biodiversity Consultancy, above n 5, 7–8; McKenney and Kiesecker above n 5, 165–6, 171–4. These ratios vary from scheme to scheme – Queensland has set a maximum ratio of 4:1 in most cases, meaning that proponents will only be required to secure an offset more than four times the size of the development site although connectivity impacts are set at a multiplier of 1 – that is, the offset requirement will be a maximum area no bigger than the area of the residual impact: *Qld Offsets Policy*, above n 92, 7. Offsets for impacts in protected areas are subject to a higher maximum ratio of 10:1: at 17. As Saunders and Bell note, even high ratios are no guarantee of achieving 'no net loss' if restoration success rates are near 0 per cent: Megan Saunders and Justine Bell, Submission No 24 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014, 2. See also Greenpeace, Submission No 61 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets* (Community Groups and NGOs); Justine Bell et al, 'Legal Frameworks for Unique Ecosystems – How Can the EPBC Act Offsets Policy Address the Impact of Development on Seagrass?' (2014) 31 *Environmental and Planning Law Journal* 34.

95 See, eg, Department of the Environment and Energy (Cth), 'How to Use the Offsets Assessment Guide', 3 <https://www.environment.gov.au/system/files/resources/12630bb4-2c10-4c8e-815f-2d7862bf87e7/

the level of formality or incorporation into the statutory framework; provision for limits on 'if and when' offsets are permissible; provisions in relation to spatial scope of program; and equivalence rules (eg, only like-for-like or permitting offsets between different habitat types).[96]

The regime for native vegetation offsets under the *Planning and Environment Act 1987* (Vic) is one of the oldest examples of offset practice and was the focus of our empirical inquiry at the state level. This regime requires offsets to be provided when approval is given for the removal of native vegetation.[97] Three risk pathways – low, medium and high – are used to determine the level of assessment that is required, the applicable decision guidelines and offset requirements. The risk pathway is determined by the location of vegetation and the extent proposed to be removed. The location risk is mapped at a state-wide level, using species habitat mapping, and comprises location risk A, location risk B and location risk C.[98] Small areas of clearing in location risk A require only a 'general' offset; that is, an offset that is not necessarily the same vegetation type, but within the same catchment area.[99] Medium- and high-risk applications involve a greater extent of removal and/or fall in mapped 'locations risk B or C'. These applications require more detailed assessment, including onsite ecological assessment, and will generally require referral to the state conservation agency.[100] 'Specific' offsets are required for medium- and high-risk clearing, involving stricter like-for-like requirements.[101]

At a national level, offsets are not explicitly referred to in the provisions of the *EPBC Act* but their use has developed as an administrative practice. The 2012 Offsets Policy and accompanying 'offsets calculator' tool set standards and guide decision-making.[102] Offsets may not be considered at the referral stage in determining whether a proposal triggers the *EPBC Act* assessment requirements.[103] If a project is considered likely to have a significant impact an

files/offsets-how-use.pdf>. See also Martine Maron et al, 'Locking in Loss: Baselines of Decline in Australian Biodiversity Offset Policies' (2015) 192 *Biological Conservation* 504.

96 Fallding, above n 88.

97 Minister for Planning (Vic), *Victoria Planning Provisions,* 2 April 2016, cl 52.17, made under the *Planning and Environment Act 1987* (Vic). A number of significant changes have been made to this offsetting regime in recent years and more reforms are currently on the table.

98 See *Permitted Clearing of Native Vegetation*, above n 86; Department of Environment and Primary Industries (Vic), *Biodiversity Information Tools Used in Victoria's Native Vegetation Permitted Clearing Regulations: Fact Sheet* (2013).

99 *Permitted Clearing of Native Vegetation*, above n 86, 8–23.

100 Ibid 14–15; Minister for Planning (Vic), *Victoria Planning Provisions*, 29 October 2015, cl 66.02-2. Proposals must be referred if they involve more than 0.5 hectares of vegetation and/or are classified as high risk.

101 *Permitted Clearing of Native Vegetation*, above n 86, 14–15.

102 Department of Sustainability, Environment, Water, Population and Communities (Cth), *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (2012) ('*EPBC Act Offsets Policy*').

103 *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 75(2)(b). See discussion of this restriction in Andrew Macintosh and Lauren Waugh, 'Compensatory Mitigation and Screening Rules in Environmental Impact Assessment' (2014) 49 *Environmental Impact Assessment Review* 1.

assessment and approval is required.[104] At the assessment stage, the Minister must determine the nature of the likely impacts and consider how these impacts can be avoided or minimised.[105] Offsets may be considered to compensate for residual 'significant' impacts that could not be avoided or minimised.

C Criticisms of Offsets

The theoretical underpinnings and practical application of biodiversity offsets have received considerable attention in recent years.[106] Most analyses suggest that there are flaws in the assumptions underpinning offset design and that their implementation and performance has been poor.[107] The impacts of climate change on biodiversity will exacerbate these problems.[108]

The discussion below identifies those criticisms that have particular resonance because of their implications for the role of biodiversity offsetting under climate change. The discussion is framed around the Resilience Alliance's seven prescriptions for operationalising Resilience Thinking, identified above, in order to highlight both the perils of current offsets approaches and the ways in which a Resilience framing could potentially improve the operation of offsets within conservation law in a climate change context.

1 Maintaining Diversity and Redundancy

Resilience Thinking's first operational principle is to maintain diversity and redundancy.[109] The *CBD* and the Principles of ESD found within Australian conservation law and policy also emphasise the importance of conserving biological diversity.[110] Diversity relates to the importance of maintaining species, processes and systems that perform a wide range of ecological functions and provide ecological goods and services. It also requires diversity of response to

104 *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ss 12 (World Heritage properties), 15B (National Heritage places), 16 (wetlands of international importance), 18 (listed threatened species and endangered communities), 20 (listed migratory species), 24B (Great Barrier Reef Marine Park).

105 *Environment Protection and Biodiversity Conservation Act 1999* (Cth) pt 3.

106 See Bull et al, above n 5; McKenney and Keisecker, above n 5; Martine Maron et al, 'Can Offsets Really Compensate for Habitat Removal? The Case of the Endangered Red-Tailed Black Cockatoo' (2010) 47 *Journal of Applied Ecology* 348, 348; Maron et al, 'Faustian Bargains?', above n 85.

107 Bull, above n 5, 374–5; Shelley Burgin, 'BioBanking: An Environmental Scientist's View of the Role of Biodiversity Banking Offsets in Conservation' (2008) 17 *Biodiversity and Conservation* 807 ('BioBanking'); Shelley Burgin, '"Mitigation Banks" for Wetland Conservation: A Major Success or an Unmitigated Disaster?' (2010) 18 *Wetlands Ecology and Management* 49; James Salzman and J B Ruhl, 'Currencies and the Commodification of Environmental Law' (2000) 53 *Stanford Law Review* 607; The Biodiversity Consultancy, above n 5; Environment Defenders Office (Vic), 'Reforming Native Vegetation Offset Rules in Victoria' (Report, 6 May 2013) ('*Reforming Native Vegetation Offset Rules in Victoria*').

108 Greenpeace, above n 94; Queensland Murray-Darling Committee, Submission No 22 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Industry) ('*QMDC Submission*').

109 Karen Kotschy et al, 'Principle 1 – Maintain Diversity and Redundancy' in Reinette Biggs, Maja Schlüter and Michael L Schoon (eds), *Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems* (Cambridge University Press, 2015) 50.

110 *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 3A(d).

stressors and different environmental conditions, in recognition that systems that have a range of species that perform the same functions but which respond to stressors in different ways are more resilient.[111] Under this principle, the conceptual framing of Resilience Thinking also encompasses redundancy, function and response. Redundancy ensures that more than one species or element of a system performs the same critical functions – providing a form of ecological insurance to guard against system failure should one element collapse.[112] Arrangements that focus on efficiency, such as relying on a small number of sites where a species is currently present, or allowing for general offsets without regard for the representation of various vegetation types across the landscape, undermine functional redundancy and response diversity and make systems more vulnerable. By assigning each function to only one system component, the chances of system shocks triggering the failure or transformation of a system increase dramatically.[113]

Offsetting undermines this fundamental Resilience principle in five ways. Firstly, while offsetting is held out to be a conservation tool, it only arises in response to a proposal for development that would adversely affect conservation values. This context sets up a seemingly unavoidable bias in favour of offsetting:[114] the availability of offsetting as an option may lead decision-makers to move to offsets directly, with inadequate attention to avoidance and minimisation options that precede offsets in the mitigation hierarchy.[115] This tendency was confirmed in our empirical inquiry of decision-making in Victoria and was frequently raised in the submissions to the Commonwealth Inquiry.[116]

Secondly, while the 'no net loss' objective of offsetting is theoretically consistent with maintaining diversity and redundancy, it is questionable whether this goal is achievable in practice. There are several reasons for this. Where averted loss offsets are used, 'no net loss' is only achievable if there is a high probability of the offset site also being destroyed or substantially degraded in the future. Yet effective implementation of the laws that triggered consideration of offsets in the first place should also apply to the offset site, and militate against

111 Thorsten B H Reusch et al, 'Ecosystem Recovery after Climatic Extremes Enhanced by Genotypic Diversity' (2005) 102 *Proceedings of the National Academy of Sciences of the United States of America* 2826*;* J Emmett Duffy et al, 'Biodiversity Enhances Reef Fish Biomass and Resistance to Climate Change' (2016) 113 *Proceedings of the National Academy of Sciences of the United States of America* 6230; Walker and Salt, above n 45, 69–72.

112 Walker and Salt, above n 45, 71. See also Karen Kotschy et al, above n 109.

113 Walker and Salt, above n 45, 71.

114 For a discussion of the pervasive bias in favour of development approval (often involving offsets) in planning decisions, see David Farrier, Andrew Kelly and Angela Langdon, 'Biodiversity Offsets and Native Vegetation Clearance in New South Wales: The Rural/Urban Divide in the Pursuit of Ecologically Sustainable Development' (2007) 24 *Environmental and Planning Law Journal* 427, 434–5, 447.

115 Shari Clare et al, 'Where Is the Avoidance in the Implementation of Wetland Law and Policy?' (2011) 19 *Wetlands Ecology and Management* 165; *Reforming Native Vegetation Offset Rules in Victoria*, above n 107; Environment Defenders Office (Vic), 'A Framework for Action? Implementation and Enforcement of Victoria's Native Vegetation Clearing Controls' (Report No 4, 10 July 2012) <http://www.edo vic.org.au/downloads/files/law_reform/edo_vic_monitoring_report_4-native_vegetation.pdf>.

116 Interviews with local government biodiversity officers and planners and ecological consultants (Victoria, June – September 2014).

its destruction too. If there is a high risk of the offset site being cleared, such that protecting it offers extra benefit, this points to more fundamental inadequacies in the legal regime for biodiversity protection under climate change.[117]

Restoration offsets have the potential to increase diversity and redundancy by enhancing, re-establishing or creating new habitat. But the time lag between destruction of the development site and restoration of the offset site means there will almost certainly be a net loss in the short-to-medium term.[118] With climate change, this time lag may jeopardise the long-term viability of the species or ecological community that it is designed to benefit. Limiting restoration offsets to sites that have been restored in advance could overcome this problem, though in practice there have been few advanced offsets to date.[119] The spatial scale at which the 'no net loss' or 'improve or maintain' goals are applied is rarely specified. Without clarity about the scale of net 'maintenance or improvement' of biodiversity, local-scale impacts are likely to be accepted in 'exchange' for regional, statewide or even national-scale benefits.

The third way in which offsets undermine rather than maintain diversity and redundancy is that a reduction in diversity is highly likely in jurisdictions that allow for non-equivalent or cross-trading of offsets. At the time of our inquiry, the Victorian regime did not require that offsets for low-risk clearing matched the type or characteristics of the vegetation lost unless rare or threatened species were affected. Rather, offsets were required to meet a biodiversity equivalence measure[120] and be located in the same catchment management area.[121] Victorian

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117 These include: failure to protect critical habitat for threatened species; inadequacy of the protected area estate; and the absence of a precautionary approach to habitat and ecosystem conversion and loss given the high risk of biodiversity decline and species extinctions posed by climate change: Australian Conservation Foundation, Birdlife Australia and Environmental Justice Australia, 'Recovery Planning: Restoring Life to Our Threatened Species' (Report, July 2015) <https://d3n8a8pro7vhmx.cloudfront.net/auscon/pages/1011/attachments/original/1466846598/Recovery_Planning_Report.pdf>. See also Maron et al, 'Stop Misuse of Biodiversity Offsets', above n 5.

118 Maron et al, 'Faustian Bargains?', above n 85, 5. See also Peta Norris, 'Seeking Balance: The Promise and Reality of Biodiversity Offsetting' (2014) 31 *Environmental and Planning Law Journal* 137, 147: 'Retention of existing biodiversity values, while important to conservation, is unlikely to result in "no net loss"'. See also Clare et al, above n 115.

119 Burgin, 'BioBanking', above n 107, 811–12. See generally Emma Solomon, 'Security for Biodiversity Offsets in NSW' (2011) 28 *Environmental and Planning Law Journal* 92. The Commonwealth has developed a policy on advance offsets: Department of the Environment (Cth), *Policy Statement: Advanced Environmental Offsets under the Environment Protection and Biodiversity Conservation Act 1999* (2016). Similarly, in Victoria, a compliant offset must be secured before the vegetation is removed: *Permitted Clearing of Native Vegetation*, above n 86, 23.

120 *Permitted Clearing of Native Vegetation*, above n 86, 9, 18–23. The strategic biodiversity equivalence measure combines site-based information (eg, condition and extent of clearing) with landscape scale information. For low risk applications not involving rare or threatened species, the applicable measure is the strategic biodiversity score. The assessment guide explains that:

> The strategic biodiversity score of native vegetation at a site is a measure of the site's importance for Victoria's biodiversity, relative to other locations across the landscape.
>
> The score is derived using a spatial prioritisation tool that ranks locations in Victoria for their conservation priority on the basis of rarity and level of depletion of the types of vegetation, species habitats, and condition and connectivity of native vegetation. All native vegetation in Victoria has a strategic biodiversity score. Strategic biodiversity scores are mapped in the *Strategic biodiversity map*: at 9.

decision-makers expressed concern that these rules were leading to the loss of particular vegetation types (eg, grasslands) and the aggregation of offsets in distant areas, using different vegetation communities that were more abundant, cheaper, and available for offsets.[122]

The mere availability of offset options may also undermine the principles of diversity and redundancy because it can curtail other conservation initiatives on both public and private land.[123] There is already anecdotal evidence that some state governments have suspended the gazettal of new protected areas on public land, so that these sites might be available to be used as offsets in the future.[124] Similarly, the possibility that high conservation value sites might be required for offsets in the future may discourage private landowners or conservation volunteers from undertaking voluntary conservation efforts, such as revegetation and pest management.[125] On the other hand, offsets can provide a valuable source of private investment in conservation and stewardship, creating incentives for landowners to undertake such activities when they would not have done so.

Finally, the approach taken to 'no net loss' in Australian policy and practice 'locks in' current trajectories of species decline because 'no net loss' is measured relative to background rates of loss of species, populations, and ecological communities and predictions of future extinction.[126] Rather than *maintaining* diversity or redundancy, by stabilising or reversing current rates of decline, the effect of 'no net loss' is merely to prevent a proposed development from accelerating that decline. The *EPBC Act Offsets Policy* adopts a standard of 'improving or maintaining' conditions, but in practice this is interpreted in the same way as 'no net loss', and does not require that a development contribute to the reversal of species decline.[127] Moreover, it only applies where impacts are likely to be 'significant' – the *EPBC Act Offsets Policy* does not apply if the impact of a specific development is likely to be small, even if there is a risk of significant impacts arising from cumulative insignificant impacts.[128]

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121 Ibid 22.

122 Interviews with local government biodiversity officers and planners and ecological consultants (Victoria, June – September 2014). See also Foerster and McDonald, above n 75.

123 Maron et al, 'Stop Misuse of Biodiversity Offsets', above n 5, 402; Susan Walker et al, 'Why Bartering Biodiversity Fails' (2009) 2 *Conservation Letters* 149, 153–4.

124 David Hogg Pty Ltd, Submission No 16 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 3 April 2014, 3 (Individual). See generally Ascelin Gordon et al, 'Perverse Incentives Risk Undermining Biodiversity Offset Policies' (2015) 52 *Journal of Applied Ecology* 532.

125 Maron et al, 'Stop Misuse of Biodiversity Offsets', above n 5, 402–3.

126 Maron et al, 'Locking in Loss', above n 95.

127 The predecessor to current Victorian offsets policy adopted an explicit overarching goal of 'net gain' rather than 'no net loss'. But the only attempt to assess progress towards this goal found that net losses in vegetation quality on private land outweighed the gains made through offset establishment and better management of public lands: Department of Sustainability and Environment (Vic), 'Native Vegetation: Net Gain Accounting' (Approximation Report No 1, 2008) 14–17.

128 *EPBC Act Offsets Policy*, above n 102, 7. See also Jessica T Dales, 'Death by a Thousand Cuts: Incorporating Cumulative Effects in Australia's *Environment Protection and Biodiversity Conservation Act*' (2011) 20 *Pacific Rim Law & Policy Journal* 149.

2 Managing Connectivity

Under a changing climate, species, ecological communities and whole ecosystems will need to move across the landscape in response to changing temperatures, precipitation regimes and extreme events.[129] The more fragmented a species' habitat, the greater the risk of its extinction[130] and enhancing landscape connectivity is both a key climate change adaptation strategy and a core prescription for promoting Resilience.[131] Despite the importance of corridors, there is a striking absence of landscape-scale strategic planning in Australia to systemically identify and prioritise the protection of connectivity corridors.[132] Further, there are no consistent requirements for connectivity between development and offset sites.[133]

The application of ecological equivalence requirements in offsetting practice has sometimes meant that destruction of relatively large parcels of one vegetation type is offset by a package of smaller, fragmented sites.[134] While proximity is a goal, in practice offset sites may be spatially remote – either in absolute terms or relative to the migration opportunities of the species or ecological communities concerned.[135] Given this fragmentation and sometimes distant location, it is concerning that there is no general requirement that offsets demonstrate connectivity between the development and offset sites or between the offset sites themselves.[136] While some schemes are moving towards more explicit consideration of connectivity, as is the case in Victoria and Queensland,[137] or

129 Vasilis Dakos et al, 'Principle 2 – Manage Connectivity' in Reinette Biggs, Maja Schlüter and Michael L Schoon (eds), *Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems* (Cambridge University Press, 2015) 80.

130 Barry Pogson, 'Habitat Fragmentation Reduces Biodiversity' (2015) 347 *Science* 1325, 1325–6; *QMDC Submission*, above n 108.

131 Pogson, above n 130; Heller and Zavaleta, above n 4, 24.

132 For example, despite releasing a National Wildlife Corridors Plan in 2012 to prioritise federal government funding for conservation in a strategic manner at a landscape-scale, no corridor has been declared: Department of the Sustainability, Environment, Water, Population and Communities (Cth), *National Wildlife Corridors Plan: A Framework for Landscape-Scale Conservation* (2012). However, the Queensland scheme establishes Strategic Offset Investment Corridors in which offsets may be used to strategically connect protected and other high value environmental areas: *Qld Offsets Policy*, above n 92, 15. The *Qld Offsets Policy* also explicitly identifies connectivity as a 'conservation outcome' that may be delivered by proponent-driven offset sites: at 10 [2.3.1.6]; and assessments of the significance of development impacts on prescribed regional ecosystems must take into account local and regional fragmentation of connectivity areas: Department of Environment and Heritage Protection (Qld), *Queensland Environmental Offsets Policy: General Guide* (2015) pt 3.5 ('*Qld General Guide*').

133 The *Qld Offsets Policy* does make recommendations about how to achieve a conservation benefit for impacted matters, including that 'wherever possible offsets should be delivered within a Strategic Offset Investment Corridor *closest to the impacted site*': *Qld Offsets Policy*, above n 92, 6 (emphasis added).

134 This is borne out by an examination of the offsets packages that are publicly available, most of which involve the identification and securing of numerous small parcels of ecologically equivalent land.

135 The Victorian offsets scheme operates largely at a catchment scale, and in most circumstances this is an appropriate scale, particularly given existing catchment management institutions and their role in developing regional biodiversity strategies to guide the selection and aggregation of offset sites. Similarly, the *Qld Offsets Policy* emphasises proximity to the impact site: *Qld Offsets Policy*, above n 92, 6.

136 Cf ibid.

137 Ibid 4; *Qld General Guide*, above n 132, 6; Department of Environment and Heritage Protection (Qld), *Galilee Basin Offset Strategy* (2013) 20 ('*Galilee Basin Offset Strategy*'). One Victorian State policy-

prefer more connected offsets packages, these requirements are not consistently imposed. The lack of provision for connectivity was raised as a concern by Victorian practitioners, who suggested that climate change should, in many cases, militate in favour of offsets located closer to the development site, even if they are of lower quality, to provide better options for connectivity and adaptation.[138]

3 Managing Slow Variables and Feedbacks

Resilience Thinking requires that mechanisms be put in place to manage slow variables and feedback.[139] These are the factors that trigger tipping points or the crossing of thresholds. Climate change is almost certain to become the most important slow variable affecting Australian biodiversity,[140] so the failure to consider climate change impacts in assessments of the impacts of development and of the suitability of offsets further undermines the capacity of those processes to promote Resilience. There is no legislative scheme for offsets in Australia that explicitly refers to climate change and limited evidence that future impacts are considered in policy or practice.[141] Our empirical inquiry in Victoria, and submissions made to the Commonwealth Senate Inquiry confirmed that future climate change impacts are not routinely considered by decision-makers.[142] For example, when assessing the significance of the impact of proposals on the development site under the *EPBC Act*, no account is taken of other stressors, such as climate change. The future importance of the site as a climate refuge for species that are already present or those experiencing range shifts is not considered; only its present value and significance.[143] Similarly, the future climatic suitability of the proposed offset site is not evaluated.[144] For most jurisdictions, provided the ecological equivalence standard and other criteria are met, the offset will be considered acceptable. This is the case even if the suitability of an offset site will diminish in the future as a result of changing

maker interviewed for this study considered that the biodiversity mapping that guided offsets into strategic areas did prioritise corridors and critical habitat, but this view was not widely expressed: Interview with state government vegetation policy officer (Melbourne, Victoria, 16 July 2014).

138 Interviews with local government biodiversity officers and planners and ecological consultants (Victoria, June – September 2014).

139 Reinette Biggs et al, 'Principle 3 – Manage Slow Variables and Feedbacks' in Reinette Biggs, Maja Schlüter and Michael L Schoon (eds), *Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems* (Cambridge University Press, 2015) 105.

140 Woinarski, Burbidge and Harrison, above n 17, 4536, note that existing pressures such as changing fire regimes and invasive species are currently most significant for many Australian species, but these are likely to be overtaken in significance by climate change over the course of this century. See also *Australia's Biodiversity and Climate Change*, above n 2, 3.

141 For example, the Victorian planning policies governing vegetation conservation and offsets do not reference climate change as a consideration for decision-makers.

142 Interviews with local government biodiversity officers and planners and state government policy officers (Victoria, June – September 2014).

143 Humane Society International, Submission No 28 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 4 April 2014 (Community Group/NGO) 2.

144 Interview with state government policy officer (Melbourne, Victoria, 16 July 2014): 'Long term climate change risks – no … not really a direct influence on selection of offset sites'.

precipitation patterns or higher temperatures, or another site would be preferable because, for example, it is located at higher altitude or further south.[145]

Victoria's strategic biodiversity mapping, which is used to measure the impact of vegetation clearing and the suitability of offset sites, does prioritise important habitat and corridors at a landscape scale, but has not explicitly incorporated future climate change into its modelling.[146] Practitioners interviewed for this study expressed concern at the lack of consideration for climate change impacts and argued that climate change should be taken into account in prescriptions for equivalence, proximity and other factors.[147]

The Queensland Government's *Galilee Basin Offsets Strategy* developed under the *Environmental Offsets Act 2014* (Qld) lists 'the contribution to long-term climate change resilience of biodiversity' as one of six indicative criteria for identifying areas with high conservation value for inclusion in the strategic footprint,[148] but no further reference is made to this, nor is there any explanation of how this was operationalised as climate modelling of the vegetation of the region is not listed as a data source used in the process. The mapping of strategic footprints shows that the vast majority are located north of the Galilee Basin mining area, a direction that is generally presumed to be less suitable under future climate change.

4 Fostering Complex Adaptive Systems Thinking

Complex adaptive systems ('CAS') thinking is a mental model that recognises complexity, unpredictability, and interlinkages in social–ecological systems.[149] Basing management actions on CAS thinking is considered to be a precondition for promoting Resilience.[150] While it refers to a way of interpreting the world and approaching problems, CAS thinking is often operationalised through comprehensive scenario and strategic planning that takes account of diverse sectors and stakeholders.[151] In other cases, CAS thinking has been encouraged through agency organisational culture.[152]

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145 See, eg, Chris D Thomas et al, 'Protected Areas Facilitate Species' Range Expansions' (2012) 109 *Proceedings of the National Academy of Sciences of the United States of America* 14 063, 14 066–7. Significant benefits may accrue from creating access to protected areas at higher altitudes, into which smaller range shifts are required to track a shifting climatic niche than poleward movement in Australia. Note, however, the significant (especially topographical) limitations on most Australian terrestrial species reaching higher altitude areas: see *Australia's Biodiversity and Climate Change*, above n 2, 94–5.

146 Interview with ecological consultant (Victoria, 20 August 2014); Interview with state government policy officer (Melbourne, Victoria, July 2014); Interview with local government biodiversity officer and planner (Victoria, 19 June 2014).

147 Interviews with local government biodiversity officers and planners (Victoria, 19 June 2014, 17 July 2014); Interview with state government policy officer (Melbourne, Victoria, 16 July 2014); Interview with ecological consultant (Victoria, 20 August 2014).

148 *Galilee Basin Offset Strategy*, above n 137, 20.

149 Erin L Bohensky et al, 'Principle 4 – Foster Complex Adaptive Systems Thinking' in Reinette Biggs, Maja Schlüter and Michael L Schoon (eds), *Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems* (Cambridge University Press, 2015) 142, 144.

150 Ibid.

151 Bohensky et al, above n 149, 150–5, 158–64.

152 Ibid 158–64.

Both the theory and practice of offsetting in Australia tend to undermine rather than promote CAS thinking. The ad hoc, proponent-driven nature of offsetting often occurs without regard for landscape-scale context. Current practice reflects a linear approach to system relationships and causation – it locks in the approval of a development regardless of what is subsequently discovered about its impacts, interactions with other change processes, or the adequacy of offsets. If it is applied at all, the precautionary principle is invoked at the approval stage, and there is limited capacity for the process to evolve and adjust based on interactions and responses.[153]

Offsets also tend to simplify ecological relationships, reducing sites to a set of biodiversity or component parts. Offsetting tends to assume that biodiversity values of a development site relate only to the presence of a specific listed species, can be reliably measured and accounted for, and can be traded across time and space.[154] Ecological equivalence metrics typically relate to a small number of ecological values, particularly threatened species. Rarely is the full suite of site-specific functions or dependencies, considered in calculating the value of either the development or offset site (eg, for wetland ecosystems this may include stormwater management, flood control, water purification or peri-urban amenity).[155] This underplays the uniqueness and complexity of each site and the ways in which climate change is likely to impact them in different ways.[156]

5 Encouraging Learning

Change processes and the adaptiveness of social–ecological systems lie at the heart of Resilience Thinking. Knowledge is never complete, so management must be responsive and adaptive to new conditions and new understandings of influences and interactions.[157] Adaptive management approaches are typically proposed to meet this requirement, though implementation of the concept ranges in formality and detail.[158] As noted above, the front-end system of environmental

153 Garver, above n 53, 236–7; Ruhl, 'Law's Complexity: A Primer', above n 49, 907–8. The potential for adaptive management in development approvals in Australia is considered in Jan McDonald and Megan C Styles, 'Legal Strategies for Adaptive Management under Climate Change' (2014) 17 *Journal of Environmental Law* 25.

154 Bull et al, above n 5, 371.

155 Salzman and Ruhl, above n 107, 666–7; Burgin, '"Mitigation banks" for Wetland Conservation', above n 101, 52.

156 Salzman and Ruhl, above n 107, 666–7; Tristan Kimbrell, 'Moving Species and Non-moving Reserves: Conservation Banking and the Impact of Global Climate Change' (2010) 22 *Fordham Environmental Law Review* 119.

157 Georgina Cundill et al, 'Principle 5 – Encourage Learning' in Reinette Biggs, Maja Schlüter and Michael L Schoon (eds), *Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems* (Cambridge University Press, 2015) 174.

158 Craig, '"Stationarity is Dead" – Long Live Transformation', above n 36. See generally J B Ruhl, 'Regulation by Adaptive Management – Is it Possible?' (2005) 7 *Minnesota Journal of Law, Science and Technology* 21; Ruhl, 'Climate Change Adaptation', above n 41; Craig R Allen et al, 'Adaptive Management for a Turbulent Future' (2011) 92 *Journal of Environmental Management* 1339; Robert L Fischman and Jillian R Rountree, 'Adaptive Management' in Michael B Gerrard and Katrina Fischer Kuh (eds), *The Law of Adaptation to Climate Change: US and International Aspects* (American Bar Association, 2012) 19.

impact assessment and development approval in which biodiversity offsetting is located makes this very hard.[159] There is a strong assumption that environmental impact assessment will be able to identify and assess the full range of potential impacts and mitigation strategies and propose offsets that can compensate for residual impacts.[160] Offset requirements are imposed as conditions attaching to approval, but once approval has been given, there is limited capacity to revisit offsets. It is possible to enforce a condition if offset undertakings are not delivered in full, but, to our knowledge, there has been no instance in which additional offsets have been required because the performance of initial commitments falls short of projections, or where new circumstances such as climate change impacts demand an alternative approach.[161]

Adaptive or learning approaches are impossible with limited or low quality data,[162] yet no offset program has comprehensive mandatory reporting or auditing requirements.[163] Some approvals may require that a proponent report on their

159 Ruhl, 'Climate Change Adaptation', above n 41, 413–19. See also J B Ruhl and Robert L Fischman, 'Adaptive Management in the Courts' (2010) 95 *Minnesota Law Review* 424, 438.

160 Craig, '"Stationarity is Dead" – Long Live Transformation', above n 36, 65–6; Ruhl, 'Climate Change Adaptation', above n 41, 413–19.

161 A project proponent has recently sought to have a Commonwealth offset requirement revisited in order to reduce its obligations, where the impact of the project was less than anticipated, but the application was rejected by the Environment Department: see Kate Wild, 'INPEX Joint Venture Seeks to Dump $30 Million of Federal Environmental Projects', *ABC* (online), 31 March 2016 <www.abc.net.au/news/2016-03-31/inpex-joint-venture-seeks-to-dump-federal-environmental-projects/7289310>.

162 The following submissions to the *Inquiry into Environmental Offsets* raised this issue: Richard Hobbs and Leonie Valentine, Submission No 25 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Researcher); Philip Gibbons, Submission No 21 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 3 April 2014 (Researcher); Megan Evans, Submission No 26 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Researcher); Gary Middle, Submission No 27 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Researcher); National Environmental Law Association, Submission No 31 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Professional body); Yung En Chee and Quantitative & Applied Ecology Group, Submission No 57 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Researcher).

163 The inadequacy of monitoring, evaluation, and mechanism to learn from past measures is a widely-held concern – 23 of 90 submissions made comments about compliance with offset requirements and 39 of 90 submissions questioned whether the effectiveness of offsets was being assessed. See Hobbs and Valentine, above n 162; Gibbons, above n 162; Friends of the Earth Australia, Submission No 58 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 7 April 2014 (Community group/NGO); David Hogg Pty Ltd, above n 124; Environment Institute of Australia and New Zealand, Submission No 88 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, April 2014 (Professional body) ('*EIANZ Submission*'); WWF-Australia, Submission No 73 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 11 April 2014 (Community group/NGO); Australasian Bat Society Inc, Submission No 69 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Community group/NGO); Central West Environment Council, Submission No 66 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Community group/NGO); North Queensland Conservation Council, Submission No 18 to Senate Standing Committee on Environment and

compliance with conditions, but none impose requirements to monitor the effectiveness of offsets in terms of achieving the 'no net loss' objective.[164] What monitoring there is tends to be done informally and internally and is generally undocumented.[165] Even where measurable performance criteria are set and assessed, there is no accompanying requirement that information be incorporated into future management of the site or that it inform future offset design. To our knowledge, there has never been a case in which an agency has evaluated project impacts or the effectiveness of agreed offsets and required additional measures be implemented to meet a shortfall in conservation outcomes.[166]

The lack of adaptive or learning approaches in offset practice is particularly concerning given the weight of evidence suggests that restoration offsets rarely deliver the benefits intended, even in the absence of climate change.[167] In one published study, an area of Golden Bell Frog habitat 19 times larger than the development site had to be created to meet a 'no net loss' standard.[168] Current

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Communications, Parliament of Australia, *Inquiry into Environmental Offsets* (Community group/NGO); Lock the Gate Alliance, Submission No 20 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 3 April 2014 (Community group/NGO); Anita Foerster and Jan McDonald, Submission No 23 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Researcher); Su Wild-River, Submission No 38 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Consultant); Australian Network of Environmental Defender's Offices, Submission No 60 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Community group/NGO) ('*ANEDO Submission*').

164 *QMDC Submission*, above n 108; Interviews with state government policy officers (Melbourne, Victoria, 16 July 2014). The Friends of the Earth submission discusses the only Commonwealth approval issued before 2013 that contained an outcome requirement – monitoring and reporting on the 'success of habitat utilisation': Friends of the Earth Australia, above n 163, citing Assistant Secretary, Queensland and South Australia Assessment Branch, *Final Approval Decision: Caloundra South Master Planned Community*, EPBC 2011/5987, 6 June 2013.

165 *EIANZ Submission*, above n 163.

166 Watson Community Association, Submission No 54 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 4 April 2014 (Community Group/NGO); Birdlife Australia, Submission No 77 to Senate Standing Committee on Environment and Communications, *Inquiry into Environmental Offsets,* 11 April 2014 (Community Group/NGO).

167 In a review of available literature, Suding found that restoration efforts to recover a degraded system were successful between a third and a half of the time, but restoration for the creation of new habitat had far lower success rates: Katharine N Suding, 'Toward an Era of Restoration in Ecology: Successes, Failures and Opportunities Ahead' (2011) 42 *Annual Review of Ecology, Evolution, and Systematics* 465. Simulation analysis shows that very high offset ratios of 10s to 100s of units for each unit lost are required if there is to be robust and comprehensive accounting of uncertainty: Atte Moilanen et al, 'How Much Compensation Is Enough? A Framework for Incorporating Uncertainty and Time Discounting when Calculating Offset Ratios for Impacted Habitat' (2009) 17 *Restoration Ecology* 470, discussed in Yung En Chee and Quantitative & Applied Ecology Group, above n 162, 10; David B Lindenmayer et al, 'Not All Kinds of Regrowth Are Created Equal: Regrowth Type Influences Bird Assemblages in Threatened Australian Woodland Ecosystems' (2012) 7(4) *PLoS ONE* 1, cited in Greenpeace, above n 94; See also Evans, above n 162, 4; Maron et al, 'Can Offsets Really Compensate for Habitat Removal?', above n 106, 348; Maron et al, 'Faustian Bargains?', above n 85, 144; Philip Gibbons and David M Lindenmayer, 'Offsets for Land Clearing: No Net Loss or the Tail Wagging the Dog?' (2007) 8 *Ecological Management & Restoration* 26, 29–30. See also Martin F Breed, Andrew J Lowe and Peter E Mortimer, 'Restoration: "Garden of Eden" Unrealistic' (2016) 533 *Nature* 469.

168 Pickett et al report on a large-scale project that expanded its offset site based on new developments and monitoring over a ten year period: Evan J Pickett et al, 'Achieving No Net Loss in Habitat Offset of a

systems do not allow for this kind of adjustment: there is currently no offsets regime that requires ratios this large and the need for dramatically more habitat was only apparent following long-term intensive monitoring of the offset site.[169]

In some cases, the desire to manage approvals promptly and confer investor certainty has led the Commonwealth to approve developments on condition that a suitable offsets package be delivered in the future, without requiring that sites be identified and secured before approval is given or clearing commences.[170] Indeed in some cases there is no guarantee at the time the approval is granted that adequate offsets are in fact available.[171] There have been instances where a proposed offset package has had to be augmented because independent review exposed its inadequacy from the outset,[172] but these reported cases have only arisen where proposed offset sites were made public and found lacking by independent scientists.[173] These cases of inadequacy were not detected through any form of structured agency monitoring or oversight. Recent reforms to the Victorian regime have markedly improved the initial process of offset approval. Proof of an offset is now required *before* approval to clear vegetation is given, whereas it was not uncommon previously for approval to be granted before offset arrangements were finalised.[174] There has also been a shift away from relying on first party offsets (provided by the proponent on their own land) towards strategically located, larger and better managed offsets, purchased from a third party and regulated centrally at a state level via the Native Vegetation Credit Register.[175] This shift provides greater certainty that offsets will meet required

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Threatened Frog Required High Offset Ratio and Intensive Monitoring' (2013) 157 *Biological Conservation* 156.

169 Ibid.

170 See, eg, the approval of the Minister for Sustainability, Environment, Water, Population and Communities (Cth), *Approval: Development of a Natural Gas Liquefaction Park Associated with the Gladstone LNG Project*, EPBC 2008/4057, 22 October 2010; Minister for Sustainability, Environment, Water, Population and Communities (Cth), *Approval: Queensland Curtis LNG Project – LNG Plant and Onshore Facilities*, EPBC 2008/4402, 22 October 2010; Minister for Sustainability, Environment, Water, Population and Communities (Cth), *Approval: Australia Pacific LNG Project – Development of a LNG Plant and Ancillary Onshore and Marine Facilities on Curtis Island*, EPBC 2009/4977, 21 February 2011; Minister for Sustainability, Environment, Water, Population and Communities (Cth), *Approval: To Develop, Construct, Operate and Decommission the Coal Seam Gas Field Component of the Queensland LNG Project, Including Expansion of the QGC Operated Coal Seam Gas Fields in Surat Basin*, EPBC 2008/4398, 22 October 2010.

171 Greenpeace, above n 94; Lock the Gate Alliance, above n 163; National Parks Association of NSW, Submission No 51 to Senate Standing Committee on Environment and Communications, *Inquiry into Environmental Offsets*, 4 April 2014 (Community Group/NGO).

172 Lock the Gate Alliance, above n 163.

173 The offsets package for the Maules Creek coal mine had to be increased because several errors were identified by independent scientists in both the identification of affected communities and the assessment of offset sites. Greenpeace, above n 94, Lock the Gate Alliance, above n 163. See also *Northern Inland Council for the Environment Inc v Minister for the Environment* (2013) 218 FCR 491.

174 *Permitted Clearing of Native Vegetation*, above n 86, 23.

175 Department of Environment and Primary Industries (Vic), 'Native Vegetation Credit Register: Introduction' (Information Sheet No 1, October 2013). In 2014, the Victorian Government introduced the Native Vegetation Credit Market Bill 2014 (Vic) to the Parliament to further streamline security and management arrangements for offsets. This proposed legislation sought to make all biodiversity offsets subject to similar management, reporting and compliance standards by creating one single security

standards and be managed more effectively over the long term. However, there is no explicit provision for reviewing the effectiveness of offsets and altering requirements should the anticipated biodiversity gain not be achieved.[176]

The absence of adaptive management mechanisms for offsetting is alarming given the uncertainties surrounding how climate change will affect species habitats and protected species, as well as other variables such as weeds and other pests. Promoting the resilience of Australia's biodiversity to climate impacts will demand far more rigorous monitoring of both compliance and effectiveness of conservation measures generally and offsets in particular. Beyond this, it is essential that mechanisms exist to revise existing approvals and offset arrangements, and to inform the design of future options.

6 Broadening Participation

Effective engagement with a wide range of stakeholders in resource decision-making and management is important for sharing knowledge, building trust, and creating shared understandings.[177] The value of public participation is widely endorsed among both Resilience and Sustainability scholars and practitioners,[178] and will become more important as climate change produces more complex interactions within social–ecological systems.[179] It is concerning, therefore, that offset practice in Australia has tended to reduce opportunities for meaningful public engagement.

The Commonwealth Offsets Policy emphasises the importance of transparency, but the way that offsets are typically negotiated has curtailed public participation in three key ways:

1. in the threshold question of whether earlier steps in the mitigation hierarchy have been satisfied;
2. in evaluating the adequacy and suitability of proposed offsets; and
3. in assessing compliance with and performance of offset requirements.

While practice varies, there is widespread concern that current development approvals processes only provide for public participation after the options of avoidance and mitigation have been exhausted.[180] The formal proposals that are subjected to public comment typically outline mitigation and offsets strategies that have already been discussed informally with regulators, and there is a concern that this limits public input into the development of alternative strategies.[181]

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mechanism. However, the Bill is yet to be passed, and following a change of government in late 2014, its future is uncertain.

176 Interviews with state government policy officers (Melbourne, Victoria, 16 July 2014).

177 Anne M Leitch et al, 'Principle 6 – Broaden Participation' in Reinette Biggs, Maja Schlüter and Michael L Schoon (eds), *Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems* (Cambridge University Press, 2015) 201.

178 Ibid.

179 Ibid.

180 Lock the Gate Alliance, above n 163.

181 Friends of Ken Hurst Park, Submission No 65 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 4 April 2014 (Community

The scrutiny of offset arrangements is also dramatically curtailed by the growing practice under the *EPBC Act* of granting approval subject to the subsequent development of an offset management plan: '[c]urrently, there is little transparency at the federal level relating to where proposed offset sites are, what project they relate to, where they are at in the approvals process, and who carried out the ecological surveys'.[182] Offset management plans are often prepared after approval is granted and therefore do not form part of the consultation process. Supplementary public consultation is rarely conducted to scrutinise the adequacy of the proposed offsets. Moreover, the content of these plans is often treated as commercial-in-confidence until they are completed and there are often no formal mechanisms to enable public evaluation of offset assessments.[183] As noted above, new rules in the Victorian scheme seek to protect against this by requiring proof of an offset *before* approval to clear vegetation is given.[184]

It is extremely difficult to obtain comprehensive information about the location, completion and performance of offsets even once they have been agreed. The Native Vegetation Credit Register in Victoria records the ownership, trading and use of native vegetation credits (third party offsets),[185] but the Commonwealth has not yet established an offsets register, despite the Offsets Policy explicitly committing to this 'where appropriate'[186] and strong public opinion in favour of doing so.[187] Under the Commonwealth scheme, compliance reports do not have to be made public and in some cases *Freedom of Information Act 1992* (Cth) requests have been ignored:[188]

Group/NGO); Environmental Decisions Group, Submission No 50 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 4 April 2014 (Community Group/NGO), and the references cited therein. See also *Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure (NSW)* (2013) 194 LGERA 347; *Warkworth Mining Ltd v Bulga Milbrodale Progress Association Inc* (2014) 86 NSWLR 527.

182 Australasian Bat Society Inc, above n 163, 2.

183 Gibbons, above n 162, 1; Mackay Conservation Group, Submission No 75 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 4 April 2014, 4.

184 *Permitted Clearing of Native Vegetation*, above n 86, 23. To our knowledge, this requirement has yet to be tested.

185 Department of Environment and Primary Industries (Vic), above n 175.

186 *EPBC Act Offsets Policy*, above n 102, 26.

187 Twenty-one submissions to the Senate Inquiry endorsed the publication of maps and a searchable register of approved offsets. Thirty-five called for greater transparency more generally. Western Australia and Queensland have publicly available offsets registers. The Western Australian Offsets register is located at: Government of Western Australia, *Environmental Offsets Register* <https://offsetsregister.wa.gov.au/public/home/>. The Queensland Offsets Register is located at: Queensland Government, *Environmental Offsets: Environmental Offsets Framework* (1 July 2016) <https://www.qld.gov.au/environment/pollution/management/offsets/>. However, the Queensland register lists only one land-based offset and the offset site for that project formed part of the development site.

188 *EIANZ Submission*, above n 163, pt 5; Watson Community Association, above n 166, 4; Greenpeace, above n 94, 7; Friends of Ken Hurst Park, above n 181; David Hogg Pty Ltd, above n 124, 2; *ANEDO Submission*, above n 163, 16; WWF-Australia, above n 163, 2. See also the following submissions to the *Inquiry into Environmental Offsets*: Regional Development Australia, Hunter, Submission No 11 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 2 April 2014 (Regional Group); Friends of Grasslands, Submission No 13 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 3 April 2014 (Community Group/NGO); Canberra Ornithologists Group,

> the Department of Environment noted that they don't publish management plans, offset plans etc on their website but leave that to the proponents. Failure of the proponents to publish that information does not seem to concern the Department … Basic tenets of transparency and accountability aren't being met.[189]

7 Promoting Polycentric Governance Systems

Polycentric governance models comprise multiple autonomous governance actors, interacting vertically across jurisdictions, horizontally across sectors and between public and private spheres.[190] If they are well connected by appropriate boundary organisations or other coordinating mechanisms, polycentric governance structures are most agile in dealing with change: response or intervention can come from the actor with the greatest capacity and agency at a given time or place.[191]

As a market mechanism that operates within a traditional regulatory land use planning and development approvals structure, offsetting overtly embraces new forms of governance. Offsets provide opportunities for private and non-governmental actors to become more engaged by establishing a market for conservation. This is especially the case for advanced offset schemes involving third parties, such as the Victorian Native Vegetation Credit Register and the NSW BioBanking program, which engage private landowners to manage their land for conservation.

While there is significant potential for private landowners to contribute to conservation through effective offsets, the role of land trusts and other private land conservancies remains poorly defined in current offset practice. The operation of offsets could be enhanced through expanded engagement with private land trusts and other NGOs with experience in conservation management.[192]

Submission No 36 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Community Group/NGO); Wildflower Society of WA, Submission No 64 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 4 April 2014 (Community Group/NGO); Conservation Council ACT Region, Submission No 78 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 14 April 2014 (Community Group/NGO); Nature Conservation Society of South Australia, Submission No 89 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 23 April 2014 (Community Group/NGO); The Wilderness Society, Submission No 84 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 17 April 2014 (Community Group/NGO); Northern Inland Council for the Environment, Submission No 90 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*, 23 March 2014 (Community Group/NGO).

189 Friends of the Earth Alliance, above n 163, 7.

190 Ibid 7.

191 Michael L Schoon et al, 'Principle 7 – Promote Polycentric Governance Systems' in Reinette Biggs, Maja Schlüter and Michael L Schoon (eds), *Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems* (Cambridge University Press, 2015) 226.

192 Trust for Nature, Submission No 45 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 4 April 2014, 3 (Community Group/NGO).

The potential for Indigenous engagement in offsetting is also significant.[193] Indigenous communities own 20 per cent of Australia's landmass, including vast tracts of high conservation value land. The Commonwealth Offsets Policy recognises the importance of offsets that provide co-benefits in terms of development and employment opportunities.[194] At present, Indigenous cultural values are poorly recognised in the strongly species-driven approaches to offsets and associated measures of ecological equivalence.[195] A detailed examination of this issue is beyond the scope of this article, but as communities whose economic, social and cultural wellbeing will be adversely affected by climate change, there are both opportunities for mutual benefit from offsetting and risks to cultural assets if done poorly.[196]

V A ROLE FOR OFFSETS IN PROMOTING RESILIENCE TO CLIMATE CHANGE?

The potentially catastrophic effects of climate change on Australia's terrestrial biodiversity demand that conservation laws do the best possible job of promoting the resilience of linked social–ecological systems. Legal arrangements for development approval, land use and biodiversity conservation need reform to ensure that they reflect the complexity, inter-relationships and dynamism of social–ecological systems. To do this, conservation laws generally, and offset practice in particular, need to promote diversity and redundancy, enhance ecological connectivity, manage for system complexity, and take an adaptive learning approach that promotes broad participation and polycentric governance models. This Part identifies key ways in which offset law and practice should do this. It starts with recommendations about the overarching framework in which offsets are located before focusing on specific aspects of offset design and implementation.

A Locating Offsets within a More Climate-Adaptive Conservation Framework

The nature and extent of climate impacts may force us to develop a more pragmatic set of conservation goals that involves accepting that some losses are

193 See Indigenous Land Corporation, Submission No 19 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 4 April 2014 (Community Group/NGO).

194 *EPBC Act Offsets Policy*, above n 102, 12.

195 Greenpeace, above n 94, 7, discussing poor protection of culturally significant places of the Gomeroi Traditional Custodians within the project boundary of the Maules Creek Coal Project. See also Indigenous Advisory Committee, Submission No 82 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 11 April 2014, 2, 5.

196 Indigenous Advisory Committee, above n 195; Department of Environment (Cth), Submission No 79 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets*.

inevitable and focusing more strongly on ecosystem function and services.[197] Resilience thinking itself offers no guidance on the normative question of what our conservation policies should try to achieve, but the principles and prescriptions discussed in Parts III and IV provide useful mechanisms by which to undertake the difficult policy-setting processes that climate change will demand.

While our overarching conservation aspirations may require some reconsideration, particularly in relation to the conservation of individual species or ecological communities, there is still strong evidence that completion of the National Reserve System so that we have a Comprehensive, Adequate and Representative ('CAR') system of reserves is critical.[198] A CAR reserve system gives us the best chance of safeguarding diversity, even if the composition of that diversity in those locations changes.[199] Achieving the CAR criteria for some sub-regions will have implications for biodiversity offsets. In some cases, it will mean reserving all remaining sites containing certain vegetation types, because they are so poorly represented in the current reserve system and so little remains outside of reserves. If offsets schemes are to retain a like-for-like standard of ecological equivalence, as is the case for the Commonwealth, it will be hard to gain approval for new activities in these areas as no suitable alternative offset sites will be available.

B A Strategic Context for Offsetting

Across Australia, there is a profound absence of systems approaches in current conservation planning, and little monitoring or response to critical slow variables, such as pollution, climate change and demographic shifts. Climate change will exacerbate problems that arise from the poor state of strategic, landscape-scale planning.[200] A strategic, bioregional or landscape-scale approach to conservation planning would articulate the ecological values of each area in order to guide trade-offs between multiple sectoral and land use priorities, over both short and long time-scales.[201] While the processes of strategic planning are

197 See generally Dunlop et al, above n 39; McDonald et al, above n 38. While it is not clear what effect the terminology will have on decision-making, the definition of connectivity areas in the Queensland *Environmental Offsets Regulation 2014* (Qld) is noteworthy here for its recognition of the importance of function and not just protection of species and habitat types. The Regulation defines 'connectivity areas' as prescribed regional ecosystems containing remnant vegetation and land that is required for ecosystem functioning: at sch 2 s 3.

198 Michael Dunlop et al, 'Implications for Policymakers: Climate Change, Biodiversity Conservation and the National Reserve System' (CSIRO Climate Adaptation Flagship, September 2012) 9.

199 Ibid. See also Cameron Holley et al, 'Terrestrial Biodiversity Conservation and Natural Resource Management' (Discussion Paper No 3, Australian Panel of Experts on Environmental Law, forthcoming, 2016).

200 *SoE 2011 Report*, above n 16, 638–9 [3.13].

201 More landscape-scale strategic approaches to conservation are supported by *Standard on Biodiversity Offsets*, above n 5; Birdlife Australia, above n 166; Wilderness Society, above n 188; National Environmental Law Association, above n 162; EIANZ Submission, above n 163; Nature Conservation Society of South Australia, above n 188; QMDC Submission, above n 102; Wentworth Group of Concerned Scientists, Submission No 85 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 17 April 2014 (Research).

likely to take time and resources, they may well provide our best opportunity to conduct the kind of deep engagement that is needed if we are to renegotiate conservation objectives under climate change.[202]

Bioregional planning undertaken in accordance with the *EPBC Act*'s strategic assessment requirements could obviate the need for development-specific triggers for approval processes and offsets requirements. Such planning could identify areas that deserve complete protection and are therefore not available for any form of development (even with offsets), as well as areas of strategic conservation importance such as refugia and corridors which should be protected (possibly using offsets), and areas where development may be permissible.[203] Where climate change adaptation strategies require assisted colonisation and ecological replacements, and if other conservation translocations are considered appropriate, strategic planning might also facilitate a shift away from an expectation that historical 'nativeness' be preserved.

In the absence of system-wide conservation planning, there is still considerable benefit to developing strategic plans specifically for offsets. The only jurisdiction to have done this to date is Queensland. Its Strategic Offset Investment Corridors ('SOICs') identify priority areas of intact remnant vegetation that can link existing protected areas. SOICs make the identification of suitable offsets easier and increase overall conservation benefits by enabling the establishment of advanced offsets and promoting connectivity.[204] Such an approach provides a funding source where the up-front investment involved in establishing advanced offsets on a high value site is prohibitively expensive.[205] Over time it is expected that SOICs will be developed for each bioregion. This approach has broad merit, but it requires good quality information,[206] and a clear alignment between the Offset Strategies and other strategic planning documents such as Threat Abatement Plans.[207] Proposed reforms in New South Wales also signal a move towards the establishment of a strategic fund for acquisition of priority sites.[208] In a similar vein, regional strategic approaches to the identification of suitable offset sites are being promoted at a catchment scale in Victoria.[209]

Where strategic offset areas are identified, however, their use implies a departure from a strict ecological equivalence standard. There may be benefits

202 Foerster and McDonald, above n 75, 28–9; Foerster, Macintosh and McDonald, 'Trade-Offs in Adaptation Planning', above n 42, 459, 484–7.

203 For a discussion of strategic landscape-scale conservation planning incorporating offsets, see Kiesecker et al, above n 84.

204 *Qld Offsets Policy*, above n 92, 15 [2.4.5]; Clare et al, above n 115, 172. See also Fallding, above n 88, 24, 31; *Galilee Basin Offset Strategy,* above n 137, 3, 12.

205 Trust for Nature, above n 192.

206 *ANEDO Submission*, above n 163, 12.

207 For example, the *Galilee Basin Offset Strategy*, above n 137, identified offset hubs which the Mackay Conservation Group claims are designated on the State Development Area as sites for future rail infrastructure: Mackay Conservation Group, above n 183, 4.

208 A Biodiversity Stewardship Payments Fund is proposed under the Biodiversity Conservation Bill 2016 (NSW) pt 6 div 7.

209 See discussion of the Goulburn Broken Catchment Regional Native Vegetation Offset Account in Foerster and McDonald, above n 75, 28–9.

from a move away from ecological equivalence measures if it means expanding overall diversity – for example by enhancing the representation or health of under-represented systems or improving the prospects for survival of more vulnerable species or ecological communities. Strategic offsets can also contribute to a more systems-based recognition of multiple values and interests, by allowing for offsets that deliver diverse social or cultural benefits.

Offsets can also strategically advance another key climate adaptation strategy – the reduction of non-climatic stressors that undermine the resilience of species and ecosystems. Fire management, and feral animal or weed control, may in some cases offer greater conservation benefits for some species and habitat types than offsets that focus on reserving alternative sites. Queensland's pre-approved Direct Benefit Management Plan ('DBMP') offsets take this approach. DBMPs outline management actions for reducing threats or otherwise enhancing conservation management on designated land.[210] Over time, for example, conservation introductions or other approved ex situ measures may be incorporated into these offset strategies.

Developing offset activities in a more strategic way is consistent with broad trends around the world,[211] and enables more systematic and transparent prioritisation. As noted in the discussion in Part IV, given the composition of ecosystems is likely to change, strategic offsets may represent a pragmatic and worthwhile policy shift under climate change, with great potential for enhancing resilience, provided they are used to achieve highest benefit, not just lower the cost or burden of offset requirements.[212]

Where strategic offsets, direct benefit offsets and other 'non-equivalent' strategies are implemented, they must be underpinned by an explicit assumption that offsets deliver a net gain or result in a 'trading up' of biodiversity outcomes.[213] This will require greater clarity around the scale at which the no loss or net gain standards are to be measured, with a general preference for bioregional evaluation of both the impact of development and the location of suitable offsets.[214]

While there is great value in developing more strategic, landscape-scale approaches, it is also important that the resulting plans be subject to ongoing learning and adaptation, a feature that is missing from current arrangements, including the strategic assessment measures under the *EPBC Act*: 'strategic assessment essentially approves urban development for approximately 40 years, over many political cycles, and many advances in knowledge, yet has no real capacity to adapt'.[215] Legislative mechanisms will therefore be needed to allow

210 *Qld Offsets Policy*, above n 92, 8 [2.3.1.2], app 6.
211 *Standard on Biodiversity Offsets*, above n 5, 18 (Principle 3: Landscape Context).
212 McKenney and Kiesecker, above n 5, 173.
213 Environmental Decisions Group, above n 181.
214 Bull et al, above n 5, 372; Kiesecker et al, above n 78, 263.
215 Victorian National Parks Association, Submission No 9 to Senate Standing Committee on Environment and Communications, Parliament of Australia, *Inquiry into Environmental Offsets,* 4 April 2014, 2 (Community Group/NGO).

for formal review of strategic plans either periodically or when pre-specified thresholds are crossed.

C Embedding Resilience Principles in Current Offset Practice

Offset practice can promote climate adaptive biodiversity conservation by taking a more strategic, systems-based approach to planning, but there are also ways in which Resilience approaches can improve the way in which offsets are implemented. These are discussed below.

1 Mechanisms for Safeguarding Diversity and Redundancy

All offset schemes should at least establish clear criteria for what constitutes an unacceptable impact on biodiversity and identify values and sites that simply cannot be offset.[216] This includes identifying sites where development is prohibited, including the habitat of critically endangered species. These criteria should be specified in legislation or regulations, so that their application is judicially reviewable.

Since the health of Australia's biodiversity is declining overall, emphasis on diversity and redundancy should also mean raising the bar for offset performance. Continuation of the current 'no net loss' benchmark is inadequate under climate change, when it actually locks in current rates of decline. Rather, new development should be required to make net contributions to Australia's biodiversity, so that offsets become part of the climate-adaptation solution. This will mean specific net gain criteria and minimising the use of averted loss offsets, or at least applying higher standards to the assessment of whether they are likely to be lost in the future. It also means taking both a temporally and spatially strategic approach, including through the use of advanced offsets.[217] While a 'net improvement' measure may be criticised by some as being tantamount to a 'biodiversity tax' on new developments, Resilience-based approaches to biodiversity conservation under climate change may necessitate this higher standard.

2 Taking Explicit Account of Future Climate Change Impacts

To realise the potential of offsets to enhance the climate-adaptiveness of the conservation estate, climate change impacts must be taken into account in all aspects of decision-making. Both the value of the impact site for future conservation efforts under climate change and the climatic suitability of the offset site are important. A recent independent review of Victoria's *Climate Change Act 2010* (Vic) recommended that prescribed decisions under Victorian

216 Foerster and McDonald, above n 75, 22, 28–9; *ANEDO Submission*, above n 163, 12; McKenney and Kiesecker above n 5, 167; *Standard on Biodiversity Offsets*, above n 5, 18 (Principle 2: Limits to What Can Be Offset).

217 Ascelin Gordon et al, 'Assessing the Impacts of Biodiversity Offset Policies' (2011) 26 *Environmental Modelling & Software* 1481, 1487.

planning legislation should take climate change impacts into account.[218] This would be a valuable indirect mechanism by which to improve the climate-suitability of development approval and offset site selection, and should be incorporated into decision criteria under the *EPBC Act* and other development approvals legislation. However, more specific tools are also needed.

Several options are available. Firstly, a wider range of risk factors can be incorporated into offset calculators and accounting methods.[219] For example, the increased frequency and severity of extreme events, especially bushfire and drought, are likely to make restoration offsets less reliable and averted loss offsets less secure.[220] These risks should increase the offset ratios required. Site selection should also hedge against environmental stochasticity: while there should be a preference for valuable sites, diversification of offsets at multiple sites may reduce the exposure to extreme events or other causes of offset failure.[221] Secondly, much more information is needed about future range shifts for individual species and their habitat to inform the assessment of offset adequacy. Protecting existing remnant vegetation in one area may be highly advantageous, but less valuable in an area where climate impacts will fundamentally alter its composition. There may be a need for proactive identification of climatically suitable areas, and the establishment of advanced offsets for high-risk species and habitats.

Improving the way in which future climate change impacts are considered requires good information. Interview participants in Victoria saw this as a significant limitation: 'the only information we do have is modelling on the impacts on weeds or pests … [we have] no data on what vegetation communities might be at risk and how you would actually put together a strategy to mitigate against that'.[222] It is apparent that considerably more modelling of climate change impacts on biodiversity is needed. To make this modelling useful for conservation planning, more consistency is required in spatial scales and underlying modelling assumptions. In the absence of modelling, site-specific information must be improved. These additional costs should be incorporated into development assessment fees.

3 Promoting Responsive Offset Arrangements

To promote resilience, legal frameworks need to be able to respond to dynamic, complex adaptive system changes.[223] This is critical under a changing climate, when there is uncertainty about which climate scenarios will eventuate in different regions, and their implications for the integrity of individual species

218 Martijn Wilder, Rosemary Lyster and Anna Skarbek, 'Independent Review of the *Climate Change Act 2010*' (Report, Victorian Government, December 2015) 25. This report recommends broadening the range of Acts that are likely to require an assessment of climate change impacts or risks to include the *Planning and Environment Act 1987* (Vic), under which the current biodiversity offset scheme is located.

219 *Reforming Native Vegetation Offset Rules in Victoria*, above n 107, 17.

220 Yung En Chee and Quantitative & Applied Ecology Group, above n 162, 9–10.

221 Ibid.

222 Interview with local government biodiversity officers (Victoria, 17 July 2014).

223 See above Part III.

and ecological communities. It will require a combination of legislative clarification of what conditions can attach to an approval, and organisational commitment to monitor offset performance more rigorously. The limited adaptive approaches so far have generally been in response to the failure of proponents to meet offset requirements. Agencies have permitted extensions or modifications, and these have sometimes entailed a lowering of offset requirements to reflect their achievability in practice.[224]

Improving responsiveness in offset design requires a fundamental shift away from up-front development approval decision-making,[225] towards more iterative processes of adaptive management, backed by strategic planning. This implies several things. Firstly, offsets should only be permissible where the consequences of failure are neither serious not irreversible.[226] That is, adaptive approaches should not replace precaution when precaution is warranted by the high degrees of uncertainty or seriousness of risks.[227] Secondly, offset conditions need to stipulate monitoring requirements for offsets and evaluation measures for offset performance. Monitoring and evaluation requirements will need to be much more onerous than is currently the case, sometimes extending beyond the life of the project itself.[228] Thirdly, it is essential that, where offsets fail to meet biodiversity standards, there is scope to revise requirements, either through adaptive approaches to offset management or by expanding the size of the offset: 'There must be a process, with oversight by experts, in place to track each offset and take corrective action if needed, with this process being independent and including long term monitoring of the offset'.[229] Offset failure may be a consequence of severe weather events, such as bushfire or drought, or an underestimation in initial offset design either because of compromises in site availability or inadequate consideration of other stressors including climate change.[230] Improving the strategic planning context for offsets and the consideration of climate and other slow variables in offset site selection will reduce but not eliminate the burden of such requirements.

Making offset requirements more open-ended is likely to be unpopular with development proponents, and may even be challenged on grounds of uncertainty. Yet such an approach is consistent with broader trends in environmental regulation towards performance-based or outcomes-based conditions.[231] The real

224 Lock the Gate Alliance, above n 163.

225 Ruhl, 'Climate Change Adaptation', above n 41, 413–19; Glicksman, above n 62, 856.

226 Craig R Allen and Lance H Gunderson, 'Pathology and Failure in the Design and Implementation of Adaptive Management' (2011) 92 *Journal of Environmental Management* 1379, 1382–3; Game et al, above n 1, 273.

227 Allen and Gunderson, above n 226 refer to adaptive decisions not being 'safe': at 1382–3.

228 EIANZ Submission, above n 163, pt 5.

229 Friends of Grasslands, above n 188, 3.

230 *EIANZ Submission*, above n 163, pt 5, outlines the factors influencing offset success, citing, among others, Jason T Quigley and David J Harper, 'Effectiveness of Fish Habitat Compensation in Canada in Achieving No Net Loss' (2006) 37 *Environmental Management* 351; Susan Brownlie, Nicholas King and Jo Treweek, 'Biodiversity Tradeoffs and Offsets in Impact Assessment and Decision Making: Can We Stop the Loss?' (2013) 31 *Impact Assessment and Project Appraisal* 24.

231 See Department of the Environment (Cth), 'Outcomes-Based Conditions Policy: *Environment Protections and Biodiversity Conservation Act 1999*' (Report, March 2016) <http://www.environment.gov.au/

challenge will be in articulating biodiversity outcomes with sufficient clarity – operationalising the 'net gain' measure – so that they can be measured and assessed. Surrogate indicators may be appropriate in some cases,[232] provided they do not take a reductionist view of biodiversity or the wider social–ecological system. Financial mechanisms such as offset insurance and performance bonds can also be used to ensure that funding is available for modifications to offset arrangements to control for the residual uncertainty.[233]

Finally, the design and implementation of future offsets must be based on the experience of previous offsets: 'Lessons should be learned from reviews of achievements of conservation gains, with new offset proposals being better targeted to increase conservation gains'.[234] This, too, means much more monitoring and evaluation of offset performance based on consistent protocols that enable information to be made publicly accessible and used to inform future management.[235]

4 Transparency and Participation

Improving the implementation of offsets to enhance the climate resilience of biodiversity requires mechanisms by which to ensure a plurality of views and interests are factored into decision-making. In some cases, this might mean community trade-offs between sites of high conservation value in favour of land of lower conservation significance but with greater recreational, social or Indigenous cultural value. These trade-offs and considerations should be made explicit at the level of both strategic conservation and offset planning, and the determination of individual development applications and offset site selection. More structured processes are needed for meaningful public engagement.[236] This demands greatly improved transparency and scrutiny of offset proposals, and opportunities for public oversight of offset compliance and monitoring of effectiveness.

VI CONCLUSIONS

This article has argued that Resilience Thinking is a valuable complement to current legal frameworks for conservation in Australia in order to promote adaptation to climate change. Resilience Thinking is best placed to account for climate change because it is premised on change in, and the complexity of, social–ecological systems. We have shown how Resilience Thinking can be

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system/files/resources/4519549d-7496-4146-8dd4-58d55a7457cb/files/outcomes-based-conditions-policy.pdf>.

232 Ibid 7.

233 *Reforming Native Vegetation Offset Rules in Victoria*, above n 107, 18.

234 Friends of Grasslands, above n 188, 3.

235 Middle, above n 162, 2; Hobbs and Valentine, above n 162, 2. The cost of better monitoring and evaluation will be high, but should be borne by development proponents as part of the full cost of development: *EIANZ Submission*, above n 163.

236 *Standard on Biodiversity Offsets*, above n 5, 20–1 (Principle 6: Stakeholder Participation).

operationalised, so that one element of Australia's conservation regime – biodiversity offsets – can play a more positive role in promoting Resilience to climate change impacts.

Reform is needed on three levels. First, offsets need to form part of a wider statutory framework that is explicitly aimed at promoting resilience to climate change impacts. Second, offset decision-making should move beyond ad hoc, proponent-driven proposals; it should instead occur as part of a strategic bioregional planning process that expose competing values and make explicit, transparent trade-offs in a climate constrained world. Even in the absence of multi-sectoral planning, offsets are more likely to promote resilience if the location and timing of offsets are decided more strategically. Third, while bioregional planning initiatives are improving, reforms to the practice of offsets can promote resilience to climate impacts. These include raising the standard for offsets to one of net gain or net benefit, taking explicit account of climate impacts and a wider range of risks in offset design and conditions, and incorporating adaptive management requirements such as monitoring of offset performance and amendments to offset packages in cases of underachievement of conservation benefits. Improving transparency and opportunities for more meaningful stakeholder engagement in all stages of offset decision-making is also essential.

These Resilience-oriented reforms are likely to impose additional financial burdens on governments and developers. Embracing complexity, adopting learning approaches, and broadening participation may also take time, and result in more open-ended decision-making and approvals. While this may promote adaptive and responsive laws, it is unlikely to be welcomed by the beneficiaries of current offsets practice. Climate change will impose its own costs on Australia's biodiversity and ecological integrity. These are likely to be both dramatic and irreversible. With the prospect of catastrophic decline in biodiversity as the alternative, enhancing the Resilience-promoting potential of biodiversity offsets is an investment worth making.