Ecological Governance

Reappraising Law's Role in Protecting Ecosystem Functionality

OLIVIA WOOLLEY

CAMBRIDGE

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ECOLOGICAL GOVERNANCE

Ecological degradation has been an object of concern for the international community since the early 1970s, but legal approaches that have been employed to improve the protection of ecosystems have failed to halt this decline. *Ecological Governance* explores how the law should respond to this rapid global deterioration of ecosystems by examining the foundational scientific and ethical considerations for designing laws that are effective for ecological protection. Based on these analyses, it argues that developed states should prioritise the reduction of the ecological stresses for which they are responsible in decision-making on their future courses. The book also proposes structures for governance and associated legal frameworks that would enable the formulation and implementation of policies for ecological sustainability.

OLIVIA WOOLLEY is a lecturer in the School of Law at the University of Aberdeen. In her research, she explores how law can be used more effectively to protect ecosystem functionality, particularly by enhancing the sustainability of developed states.

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CONTENTS

1

Introduction

1.1 Avoiding societal collapse

Jared Diamond's case studies of failed civilisations provide several examples of societies whose collapse was due, in part, to a deterioration in the condition of the ecosystems that supported them.[1] Each case study follows a similar pattern.[2] The functioning of ecosystems on which the society depended was impaired through exploitation that exceeded their carrying capacities or through other disturbances (e.g., deforestation) that fundamentally altered the nature of the system. Resulting shortages of food, water and other essential materials brought famine, conflict and, ultimately, the breakdown of once-complex societal structures. The collapsed societies that Diamond describes operated only at local to regional scales, but all human societies are now faced with the threat of collapse in their support base due to a global deterioration in ecological conditions.[3] As with the historical instances of failure that Diamond studies, this is due to unsustainable levels of resource exploitation and disturbance. However, these are of such magnitude that all of the world's ecosystems are being damaged by them. The situation is exacerbated by anthropogenic climate change, another common contributory factor that Diamond identifies to the demise of societies (although past instances of this occurred naturally),[4] and one which is already affecting the structures and functioning of ecosystems everywhere.

As Diamond observes, an example can be found for every instance of societal collapse of a society that was able to overcome difficult environmental problems and survive.[5] He includes the ability of societies to respond to their problems effectively as one of five factors that can make the difference between their survival and demise when confronted by

[1] J. Diamond, *Collapse: How Societies Choose to Fail or Survive*, 2nd edn (London: Penguin Books, 2011).
[2] Ibid., p. 6. [3] Ibid., p. 7. [4] Ibid., pp. 12–13. [5] Ibid., pp. 10–11.

ecological problems.[6] The principal purpose of this book is to explore the role that law could play in enabling human societies (particularly those of developed states that bear the lion's share of responsibility for the present difficulties) to respond to the deterioration in the condition of ecosystems which imperils them. It presents proposals for a system of governance that seeks to lessen risks of ecosystem failure by securing reductions in the cumulative pressures that human living places on their functioning.

The following section of this chapter offers a brief explanation of the reasons why an urgent legal response is required to the mounting evidence of global ecological degradation. Sections 1.3 to 1.6 of the chapter summarise the proposals for a system of ecological governance that Chapters 2 to 7 set out in detail. The chapter concludes with an overview of the book's structure.

1.2 Ecosystems and ecological degradation

'Ecosystem' is a term used in ecology to refer to all of the organisms and the abiotic environment with which they interact in an area selected for study.[7] It also means the organisational patterns or systems that exchanges between organisms and their environments give rise to.[8] I have this second usage in mind when I refer to ecosystems and their protection, because the functioning of ecosystems, by which I mean the continuity of processes that sustain them,[9] has outcomes, collectively described as 'ecosystem services', which provide essential support for human living on the planet.[10] They include 'provisioning services' that yield food, clean water, fibre and other materials on which humans rely; 'regulating services' that help keep the Earth within liveable bounds by having a positive influence on global-scale processes such as climatic and hydrological cycles; and 'supporting services' such as soil formation, photosynthesis and primary production that enable ecosystems to deliver the other services that they render.

[6] Ibid., pp.11, 14–15.

[7] J. M. Blair et al., 'Ecosystems as Functional Units in Nature' (2000) 14 *Natural Resources and Environment*, 151–2.

[8] Ibid., 152–3.

[9] K. Jax, 'Function and "Functioning" in Ecology: What does it Mean?' (2005) 111 *Oikos*, 641.

[10] Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Washington, DC: Island Press, 2005), pp. 103–22; F. S. Chapin III et al., *Principles of Terrestrial Ecosystem Ecology*, 2nd edn (New York: Springer, 2011), p. 21; K. Wallace, 'Classification of Ecosystem Services: Problems and Solutions' (2007) 139 *Biological Conservation*, 235–46.

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Analyses of ecological conditions that have been conducted during the last decade emphasise the importance of ecosystem services, and therefore of the functioning of ecosystems from which they are derived, for humanity's well-being. The Millennium Ecosystem Assessment, a global survey of ecosystem health, describes humans as being 'fully dependent on Earth's ecosystems and the services that they provide'.[11] The World Wildlife Fund advises that humanity is 'wholly reliant on well functioning ecosystems' to supply services, many of which could not be replaced by technology if they were to be lost.[12] The UK's national ecosystem assessment stresses that the functioning of ecosystems underpins 'our very existence'.[13] This makes their consistent identification of significant deterioration in the ability of ecosystems to provide services all the more disturbing. The Millennium Ecosystem Assessment reports that 60 per cent of the ecosystem services that it examines are being degraded or used unsustainably, and that the condition of ecosystems is expected to worsen during the coming decades.[14] Its supporting studies also suggest that humanity's alteration and disturbance of ecosystems may be increasing the likelihood of non-linear changes in their states that can result not only in the deterioration of services, but also in the abrupt and irreversible withdrawal of their capacity to continue providing them.[15]

Direct human drivers such as the excessive exploitation of ecosystem services and changes to media (e.g., atmospheric composition) with which they interact are immediately responsible for ecological degradation. In turn, these are the product of indirect drivers including requirements for resources to support economic growth, unsustainable levels of consumption, population increases and technological change. It may be difficult to establish the proportional responsibility of indirect driving forces in particular instances of impaired ecosystem functionality because they are 'multiple and interactive'.[16] However, it can be said with confidence that unprecedented economic growth since the Second World War is the predominant cause of environmental decline, and therefore that the world's developed states, whose economies and high standards of living have driven this unbridled expansion, have been the major contributors to

[11] Millennium Ecosystem Assessment, 'Ecosystems and Human Well-Being', p. 49.
[12] World Wildlife Fund, 'Living Planet Report 2012: Biodiversity, biocapacity and better choices' (2012), p. 70, http://www.wwf.org.uk/what_we_do/about_us/living_planet_report_2012/.
[13] UK National Ecosystem Assessment, 'The UK National Ecosystem Assessment: Synthesis of Key Findings', UNEP-WCMC, Cambridge (2011), p. 5.
[14] Millennium Ecosystem Assessment, 'Ecosystems and Human Well-Being', p. 1.
[15] Ibid., p. 1, pp. 88–91. [16] Ibid., p. 64.

the deterioration of ecosystems during this period.[17] The ecological footprints of high-income states significantly exceed those of middle- and low-income states.[18] Together, they accounted for half of the global ecological footprint in 2006, although the states concerned house less than one sixth of the world's population.[19]

The international community of states has expressed strong concern over the deterioration of ecological conditions in each of the periodic meetings convened during the last 40 years to consider how development can be made sustainable.[20] Most of its members have also negotiated and ratified international treaties, such as the Biodiversity Convention,[21] that encourage participating states to improve their protection of ecosystems or to preserve specific types of systems (e.g., wetlands under the Ramsar Convention[22]).[23] However, the inescapable conclusion, to be drawn from

[17] J. G. Speth, *The Bridge at the Edge of the World: Capitalism, the Environment and Crossing from Crisis to Sustainability* (New Haven, CT: Yale University Press, 2008), pp. 1–9.

[18] World Wildlife Fund, 'Living Planet Report 2012', p. 140.

[19] World Wildlife Fund, 'Living Planet Report 2006' quoted in Speth, 'The Bridge at the Edge of the World', pp. 41–2.

[20] The declaration of the states that participated in the first of these meetings, the United Nations Conference on the Human Environment of 1972, notes in its preamble that '[w]e see around us growing evidence of man-made harm in many regions of the earth' including 'major and undesirable disturbances to the ecological balance of the biosphere'. See the 'Declaration of the United Nations Conference on the Human Environment', Stockholm, 16 June 1972, UN Doc-A/Conf.48/14/Rev. 1(1973); 11 ILM 1416 (1972). Principle 7 of the declaration made at the United Nations Conference on Environment and Development of 1992 requests states to 'co-operate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem'. See the 'Rio Declaration on Environment and Development', Rio de Janeiro, 13 June 1992, UN Doc. A/CONF.151/26 (vol. I); 31 ILM 874 (1992). Finally, the many references to ecosystems and their protection in *The Future we Want*, the outcome document of the UN Conference on Sustainable Development of 2012, illustrates that significant concern over ecological conditions remains although many of them are couched in terms of sustainable use rather than outright protection. One of the stronger references recognises the 'severity of the global loss of biodiversity and the degradation of ecosystems', the threats that this presents for food security, access to water and health for 'the rural poor and of people worldwide', and the corresponding importance of 'the conservation of biodiversity, enhancing habitat connectivity and building ecosystem resilience'. See 'Report of the UN Conference on Sustainable Development', Rio de Janeiro, 20–22 June 2012, A/Conf.216/16.

[21] Convention on Biological Diversity, Rio de Janeiro, 5 June 1992, in force on 29 December 1993, 1760 UNTS 79, 31 ILM 818 (1992).

[22] Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 2 February 1971, in force on 21 December 1975, 996 UNTS 246, 11 ILM 969.

[23] Accounts of the evolution of international and European law concerning the protection of ecosystems in this period can be found in: P. Birnie, A. Boyle and C. Redgwell, *International Law and the Environment*, 3rd edn (Oxford: Oxford University Press, 2009), pp. 583–649;

the negative picture that assessments of ecosystem health paint is that this political rhetoric and related legal responses have completely failed to stem the tide of ecological degradation. At best, they may have reduced the rate at which this is occurring.

The main premise of this book is that this perilous situation, and the evident inadequacy of measures taken to date to respond to it, demands something more than a critical analysis of, and tinkering with, the law for protecting ecosystems as it currently stands. Instead, a fundamental reappraisal is required of how we can use law to prevent our cumulative actions from undermining ecosystem functionality. I seek to provide this at the book's outset (Chapter 2) by examining the current understanding in ecology of how ecosystems behave, and considering how this affects long-standing beliefs on which our own behaviours are founded about the relations between humanity and nature. I conclude from this that human societies must show a much higher degree of restraint in their exploitation of the environment. I then go on, in the following chapters, to consider how a system of governance can be established (and law's role in its establishment) that would apply this restraint in public decision-making and encourage those subject to it to prefer ecologically sustainable ways of living in the personal choices they make.

My proposals for governance are intended for use in the developed states whose economies, standards of living and related demands on natural resources are the principal drivers of ecological degradation within, and beyond, their national borders. I recognise that the system would need to be tailored to particular situations and to reflect national circumstances. At the same time, it would be appropriate for any state that is a major contributor to the global deterioration of ecosystems to observe principles that I propose in Chapter 2 such as the under-utilisation of resources and the reduction in reliance on activities that are most likely to engender potentially unwelcome changes in ecosystem structure and functionality. It would also be appropriate for such states to employ the normative precautionary approach in decision-making that I call for in Chapter 3, given the difficulties that all states have in common with predicting the cumulative effects of human activities.

D. Tarlock, 'Ecosystems' in D. Bodansky, J. Brunnée and E. Hey (eds) *The Oxford Handbook of International Environmental Law* (Oxford: Oxford University Press, 2007), pp. 574–95; K. Baakman, *Testing Times: The Effectiveness of Five International Biodiversity-related Conventions* (Nijmegen: Wolf Legal Publishers, 2011), pp. 17–39; K. Mertens, A. Cliquet and B. Vanheusden, 'Ecosystem Services: What's in it for a Lawyer?' (2012) 21 *European Energy and Environmental Law Review*, 31–40.

The following sections provide summaries of the key conclusions that I drew from my reappraisal of law's role in protecting ecosystems about the form that a system of governance that is better equipped than those currently in place to preserve ecosystem functionality should take.

1.3 Overcoming epistemic challenges

The starting point for developing a system of ecological governance must be to identify what it is we wish to protect and how this can best be done. Whilst these questions are simply expressed, providing responses to them is anything but straightforward. The property of ecosystems that ecological scientists argue we should concentrate our efforts on preserving is their resilience.[24] This term is used to describe the ability of ecosystems to retain their structures and functionality in the face of external challenges both from human interventions and as a result of naturally occurring events. However, the resilience of an ecosystem is the product of myriad interactions between the biological components of ecosystems and their habitats. It is not, because of this complexity, amenable for use as a benchmark against which the ecological tolerability of activities can be judged. A related difficulty is that we cannot establish with any degree of confidence how activities affect the resilience of an ecosystem individually, and even less so when their cumulative effects are taken into account.

If this predicament were limited to inadequate knowledge of how ecosystems function, it would be conceivable (although perhaps not realistic in view of ecological complexity and the depths of our current ignorance) that we could move towards a point, through intensive research, where we are better able to predict how activities will affect resilience. However, two additional considerations call into question whether prediction-based decision-making could ever provide a reliable means of determining if proposed actions are compatible with the goal of preserving ecosystem functionality. The first is that ecosystems are constantly evolving due to internal dynamics and in response to external stimuli. As a result, resilience and the contributions that species make to this are not static. The second is that we do not know what challenges ecosystems will encounter or how this will affect their ability to withstand fundamental change in their structures and functionality. As a consequence, even if we could measure the resilience of an ecosystem at any particular point, this would not tell us

[24] See my discussion of resilience at Chapter 2, Section 2.3.

whether it is resilient *enough* to maintain its structure in the face of future disturbances.

Both of these considerations are significant for the design of a system of governance that aims to maintain resilience. The conclusion I draw is that, if we cannot advance this objective by identifying points at which the system is under threat, our aim should be to bolster resilience by progressively reducing the erosive effects of our actions on it.[25] This approach would at least ensure that ecosystems are as well placed as they can be to maintain their functionality. We should also reduce reliance on activities that are most likely to overwhelm resilience, and particularly those that would unbalance the natural systems (e.g., the climate) with which ecosystems interact.[26]

In amongst this realm of unknowns and unknowables, there are a number of certainties (or, at least, strong likelihoods) that are also highly relevant to the design of ecological governance. The first is that our activities clearly do combine to undermine ecosystem resilience and to trigger changes in their structures. This is readily apparent both from the assessments that I refer to in Section 1.2, and from studies of ecosystems that have undergone regime shifts.[27] In view of this, we must find some way of acting to reduce the pressures that our activities place on natural systems notwithstanding uncertainty over their effects. Secondly, the resilience of all ecosystems is likely to be confronted by changes in climate resulting from historic and current anthropogenic carbon emissions.[28] Whilst we do not know the extent to which the climate will change or with what consequences for ecosystem health, the risk is present and heightens the urgency with which we should act to reduce the stresses that human societies generate.

In view of these tangible concerns, the first main issue I address is how a system of governance could be developed with the objective of reducing the cumulative erosive effects of our actions on resilience. The principal complicating factor (amongst several resulting from the uncertain world in which ecological governance operates) is, as I discuss in the following section, how effective controls can be devised to reduce threats to

[25] Chapter 2, Section 2.4. [26] Chapter 2, Section 2.6.

[27] Chapter 1, Section 1.2. See also Chapter 2, Section 2.2.2.

[28] Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report – Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Core writing team, A. K. Pachauri and A. Reisinger (eds) (Geneva: IPCC, 2008).

ecosystem health in circumstances where confidence in our ability to comprehend ecosystem behaviour is itself significantly eroded.

1.4 Normative precaution

Growing appreciation of our difficulty with predicting how proposed action may affect highly complex natural systems has been recognised in the evolution of the precautionary principle.[29] This provides a guide for decision-makers in circumstances where there is uncertainty about the effects of development. However, the principle in its current form and the direction that it gives fall far short of what is required to assist with addressing a situation that combines the certainty that human intervention has the potential to fundamentally alter ecosystem structures with our limited understanding of how anthropogenic stressors interact to undermine resilience. I argue in Chapter 3 that a new conception of precaution is required which is attuned to prevailing uncertainty both over the impacts that our actions have on ecosystem functionality and over whether ecosystems are at risk of failure.[30] A reconfigured precautionary principle would require that steps be taken as a matter of course to reduce levels of anthropogenic stress with a view to alleviating threats of harm to ecosystems. Normative precaution would institute stress reduction as the default position in decision-making over what goals we should pursue as a society, and on how their pursuit should be conducted.

Additionally, new legal and institutional structures are required that establish the maintenance of resilience as the core objective of policy-making, policy implementation and regulation. I propose a legal framework for policy-making in Chapter 3 that is built around this objective, and which uses two key mechanisms for exploring how ecological stresses can be reduced. The first is the assessment of different options for achieving policy objectives with a view to identifying those that would most likely be compatible with ecosystem functionality.[31] Principles of governance would require that the least ecologically consequential options be preferred and used where possible in policy formation (substitution[32]), and that options deemed to be too incompatible with the overarching objective of maintaining resilience for continued use should be phased out (sunsetting[33]).

[29] See my discussion of the precautionary principle at Chapter 3, Section 3.2.
[30] Chapter 3, Section 3.2.3. [31] Chapter 3, Section 3.3.3.
[32] Chapter 3, Section 3.3.2.3. [33] Chapter 3, Section 3.3.2.4.

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